Graduate School of Comprehensive Human Sciences

Degree Programs in Comprehensive Human Sciences

〈Doctoral Program in Medical Sciences〉

Please contact the supervisor of your preferred field in advance, or ask the contact person to the office as below for guidance about your choice.

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〈Doctoral Program in Medical Sciences〉

Molecular Medical Sciences		
Research Area	**Faculty**	**Research**
Molecular Biological Oncology	IRIE Kenji, HISATAKE Koji, NISHIMURA Ken	Regulation of gene expression, cell polarization, and asymmetric cell division are critical for generating cellular diversity in development and differentiation of living organisms. These processes are dynamically regulated, and loss of their regulation is involved in the pathogenesis of human diseases including cancer. Our research focuses on the molecular mechanisms of transcriptional regulation, chromatin remodeling, mRNA localization, and translational control in development and differentiation using biochemical, cell biological, and genetic approaches. Roles of gene regulation in cell reprogramming and differentiation as well as development of an efficient system to induce reprogramming and differentiation.
Physiological Chemistry	OHBAYASHI Norihiko	Membrane trafficking systems, which are activated by a wide variety of agonists, such as hormones, neurotransmitters and growth factors, are important for homeostasis and pathogenesis. To understand these issues, we are focussing on the projects as follows: (1) Physiological functions of membrane trafficking pathways and their relations with pathogenesis; (2) Roles of membrane trafficking pathways in neuronal functions and tumorigenesis/metastasis. (3) Development of novel anti-cancer drugs based on membrane trafficking systems.
Molecular Neurobiology	MASU Masayuki	Our main research focus is to study the molecular mechanisms that regulate neural network formation and higher brain functions using integrative approaches, which include molecular biology, biochemistry, pharmacology, developmental biology, and neuroanatomy. Major research topics are as follows. ・Development and function of the corticospinal tract ・Regulatory mechanism of spinal motor nerve formation ・Regulation of dopamine signal transmission

Anatomy and Embryology	TAKAHASHI Satoru	・Elucidation of molecular mechanism of pancreatic beta-cell development and its application. ・Functional analysis of large Maf transcription factor family, MafB and c-Maf in macrophage development and functions. ・Elucidating biological roles of carbohydrates using glycosyltransferase conditional KO mice. ・Study of diseases and drug discovery by development of novel imaging system. ・Elucidation of etiology and gene function in desease model mice.
Anatomy and Neuroscience	TAKEI Yosuke	① Animal model studies on synaptic dysfunction in schizophrenia and autism. ② Cell-biological studies on synaptic dysfunction in schizophrenia and autism. ③ Studies on synaptic dysfunction caused by inflammation. ④ Studies on neuropsychiatric diseases caused by disrupted intracellular tranbsport.
Molecular and Developmental Biology	KOBAYASHI Makoto	Studies of following issues using zebrafish: ・Development of hematopoietic stem cells ・Development of digestive organs ・Defense against oxidative and/or organelle stresses ・Dietary antioxidants and health life extension ・Human disease models

Human Medical Biology		
Research Area	**Faculty**	**Research**
Laboratory Animal Science	MIZUNO Seiya	・Development of mouse models for human diseases ・Development of genome modification technology for producing mutant mice ・Development of mouse resource including cre-driver/reporter mice
Experimental Pathology	KATO Mitsuyasu	Experimental study to elucidate the roles of transforming growth factor-b-related molecules in tissue maintenance and carcinogenesis such as stemness induction and reset of cell division lifespan aiming for the establishment of novel molecular targeting therapy. Multidisciplinary studies will be conducted including, molecular cell biology, live imaging, experimental pathology of genetically modified mice, three-dimensional quantitative tissue analysis, mathematical modeling, and analysis of protein structure.
Diagnostic Pathology	MATSUBARA Daisuke	1. Study about molecular mechanisms of multistep carcinogenesis including precancerous or background lesions 2. Drug discovery for prevention, early diagnosis and therapy of carcinoma based on the genome abnormalities detected in early carcinoma 3. Application of fetal protein to cancer diagnosis and therapy.

Immunology	SHIBUYA Kazuko	The goal of the research is to clarify the mechanisms of the immune system which plays a major role for immune defense against pathogens and cancer, using molecular and cellular biology and genetic engineering. Students will also challenge to understand and control failured immune system such as autoimmune diseases, allergy, and inflammatory diseases. In addition, thorough collaboration with pharmaceutical companies and ventures, students will leran how to translate the basic research to drug discovery and development.
Regenerative Medicine and Stem Cell Biology	OHNEDA Osamu	1) The molecular mechanisms of stem cell and stromal cell interaction is investigated related to hypoxic environment. Based on the knowledge, basic research for regenerative medicine will be developed toward clinical therapy in the future. 2) The molecular mechanisms of cancer initiating cells and tumor vascularization is investigated under hypoxic conditions. 3) In the research for clinical application of stem cells, our lab is particularly involved in the research and development of new cell therapies using extracellular vesicles released by stem cells.
Infection Biology (Molecular Virology)	KAWAGUCHI Atsushi	We aim to understand molecular mechanisms of virus-host interplays which determine the pathogenicity and species specificity of emerging infectious diseases including avian influenza virus. We are also interested in the innate immune response aginst virus infection.
Infection Biology (Bacteriology)	MORIKAWA Kazuya	・ Infection, adaptation, and evolutionary strategies based on population heterogeneity. ・ Development of anti-virulence therapeutic strategies
Infection Biology (Molecular Parasitology)	HO Kiong	We are interested in understanding the mechanism of gene expression in protozoan parasites that is responsible for major public health concerns, such as Malaria and sleeping sickness disease, with a goal in identifying parasite-specific processes that can be exploited as targets for novel therapeutic interventions. Messenger RNA capping is an attractive target for anit-protozoan drug development because the enzyme responsible for cap formation is completely different between the parasite and the human host. We also aim to understand how damages in the RNAs are recognized and repaired in the cells. One of the few facts that have been established is that RNA ligase - an enzyme that joins the two ends of RNA together - is a key component of this repair process. Understanding of the function and mechanism behind cellular responses to RNA damage may also provide useful therapeutic targets, as breakage in the RNA accumulate in cancer cells and during stress condition.

Neurophysiology	KOGANEZAWA Tadachika	We are electrophysiologically approaching to mechanisms of cardiovascular and respiratory regulation by the central nervous system using in vivo and in situ preparation of rodents. At present, we are especially studying that: ・Cardiovascular regulation by the central nervous system ・Mechanisms of the neurogenic hypertension ・Respiratory regulation by the central nervous system
Cognitive and Behavioral Neuroscience	MATSUMOTO Masayuki	The goal of our research is to understand neural mechanisms underlying psychological phenomena such as attention, emotion, memory, learning and decision making. In particular, we are investigating the role of monoamine systems, such as dopamine and serotonin, in cognitive functions. Using electrophysiological and pharmacological techniques in non-human primates, we are identifying monoamine signals associated with cognitive processing and are examining how the signals promote cognitive operations. These studies will provide more mechanistic accounts of cognitive disorders.
Medical Physics	SAKAE Takeji	1. Improving quality and reliability in X-ray and particle radiotherapy. 2. New treatment technique using an accelerator. 3. New technique for quality control in medical applications of radiation. 4. New calculation method to estimate proton-induced dose distribution in the body of the patient.
Biomedical Engineering	MIYOSHI Hirotoshi	The aims of our researches are development of bioartificial organs, e.g., ex vivo expansion systems of hematopoietic stem/progenitor cells, bioartificial livers, and bioartificial vascular grafts, from the viewpoint of tissue engineering. Establishment of basic technologies required for these developments is also our interest.
Matrix and Stem Cell Biology	YANAGISAWA Hiromi	-Identification and functional analysis of novel extracellular matrix proteins of the vessel wall. - Molecular mechanism of mechanotransduction in the vessel wall. - Identification of vascular wall stem cells. - Molecular mechanism of growth and rupure of aortic aneurysms - Identification of the niche matrix for epidermal stem cells and functional analysis.
Stem Cell Therapy	YAMAZAKI Satoshi	We understand stem cells while incorporating various fields such as molecular biology, embryology, immunology, engineering, and mathematics into the stem cell system that exists from ontogeny to adulthood, also build creative stem cell therapy system. Furthermore, we conduct research with the big goal of development co-creative R & D results provied to many patients through joint research with domestic and overseas companies and universities.
In Silico Drug Design	HIROKAWA Takatsugu	We propose the supporting and developing of in silico drug discovery using molecular modeling and simulation based on fundamental technologies such as homology modeling, docking simulation, molecular dynamics (MD) simulation, chemical biology and cheminformatics.

Kidney and Vascular Pathology	( )	We investigate the mechanism of progressive kidney disease, using human biopsy samples and feasible animal models. Particularly, pathophysiology of the glomerular filtration barrier and the mechanism of glomerulosclerosis from the view of podocyte biology. Unique pathology of renal vasculartures as a cause of renal disease is also our interesting point. (This lab will not accept new students.)

Genome and Environmental Medicine		
Research Area	**Faculty**	**Research**
Molecular and Genetic Epidemiology	TSUCHIYA Naoyuki	①Identification of genomic variants associated with susceptibility and clinical characteristics of human autoimmune rheumatic diseases such as systemic lupus erythematosus, ANCA associated vasculitis and systemic sclerosis ②Molecular mechanisms of HLA and other genes associated with autoimmune rheumatic diseases
Medical Genetics	NOGUCHI Emiko	Human genetics and genomics research including genome-wide Iinkage and association analyses and epigenetic analyses. Allergic diseases such as bronchial asthma, atopic dermatitis, seasonal rhinitis, and food allergy are the main targets of our research. Identification of the disease-causing mutation of genetic diseases by next generation sequencers can be performed.
Environmental Medicine	MATSUZAKI Ichiyo	We study interactions between environments and human health, especially focusing on work environment. ・Practical research on the mechanisms of health problems caused by workplace stress factors and the risk management system ・International collaboration with Norwegian researchers for stress coping capacity building ・Research on the effects of rework program in return-to-work from depression
Genome Biology	MURATANI Masafumi	Integrative genome and epigenome analysis of clinical samples to understand mechanisms of cancer development and for discovery of new drug targets and biomarkers. Cell-free DNA and RNA profiling to monitor environmental stress responses in internal tissues.

Bioinformatics	OZAKI Haruka	Development of computational methods for interpreting massive biological data and application of bioinformatics to biomedical problems: (1) AI-based interpretation and prediction of genome functions (2) Development of methods for analyzing single-cell and spatial omics data and their application to disease research (3) Basic and applied research on Research Automation (Laboratory Automation) (4) Data science research on clinical information
International Community Care and Lifespan Development: Empowerment Sciences	ANME Tokie	(1) Community empowerment (2) Plasticity of lifespan development and implications (3) System sciences for health social services
Environmental Medicine	KUMAGAI Yoshito	We have been examining the reactivity and toxicology ofenvironmental electrophiles such as polycyclic aromatic hydrocarbon quinones (contaminated in the atmosphere), arsenic (contaminated in groundwater) and methylmercury (contaminated in fish) in an effort to establish mechanistic pathways that may account for the adverse health effects. The main purpose of our study is to identify molecular targets (e.g., redox sensors) for these chemicals because such environmental electrophiles are covalently bound to protein nucleophiles, and to elucidate adaptive response to the environmental electrophiles, resulting in the decreased toxicity. (This lab will not accept new students.)
Legal Medicine	( )	To settle the medical problems concerning the law, we perform the practice and research as below; Practice: medico-legal autopsy, forensic pathology, toxicology and testing of haemogenetics; Research: studying the genesis of internal and external death, exploring for personal identification on molecular level. (This lab will not accept new students.)

Medical Science of Sleep		
Laboratory	**Faculty**	**Research**
International Institute for Integrative Sleep Medicine (WPI-IIIS) Yanagisawa/Funato Laboratory	YANAGISAWA Masashi	Elucidation of fundamental mechanisms for sleep/wake regulation ①Large-scale, forward genetic screening of genes responsible for sleep/wake regulation in mice ②Discovery and medicinal chemistry of novel drugs for sleep disorders ③Visualizig and manipulating the activity of neurons involved in sleep/wake regulation

International Institute for Integrative Sleep Medicine (WPI-IIIS) Kutsumura/ Saitoh Laboratory	KUTSUMURA Noriki (★)	・Orexin receptor selective agonist/antagonist ・Opioid receptor selective agonist/antagonist Through development such ligands shown above, we aim to create narcolepsy therapeutics, analgesics, and antidepressants, etc. Not only synthesis of compounds but also pharmacological evaluation (in vitro and in vivo) are performed. New drug creation by clarification of plasticity in the central nervous system and change of emotional brain function induced by stress, chronic pain and drugs of abuse.
	SAITOH Tsuyoshi	We use organic chemistry to create innovative molecules contributing to biomedical sciences, such as: 1) Drugs targeting GPCRs such as orexin, adenosine, and opioid receptors 2) Novel chemical probes to visualize biological functions 3) Opto-pharmacological probes for the flexible control of drug function 4) New chemical reactions using electron and photon as external energy.
International Institute for Integrative Sleep Medicine (WPI-IIIS) Sakaguchi Laboratory	SAKAGUCHI Masanori	1) Function of sleep in memory consolidation 2) Developing new *in vivo* imaging techqniue 3) Role of sleep in hippocampal cellular plasticity
International Institute for Integrative Sleep Medicine (WPI-IIIS) Lazarus/Oishi Laboratory	LAZARUS Michael	1) Understanding the control of sleep and wake by motivation 2) Sleep circuits as potential therapeutic targets for insomnia 3) Single-cell gene expression analysis of crosstalk between sleep and immune system
	OISHI Yo	1) Sleep regulation by dopamine-related neural circuits 2) Production and analysis of short-sleeper mice 3) Relationship between anti-histamine and sleepiness
International Institute for Integrative Sleep Medicine (WPI-IIIS) Greene/Vogt Laboratory	VOGT Kaspar	Analysis of neural circuits dynamics in awake and sleeping animals using in-vivo electrophysiology and functional imaging. We are focusing on the cortical neural networks producing deep, so called slow-wave sleep and the mechanisms of its homeostatic regulation. Ultimately we want to understand the vital, restorative effect of deep sleep on brain function.

International Institute for Integrative Sleep Medicine (WPI-IIIS) T Sakurai/Hirano Laboratory	SAKURAI Takeshi, HIRANO Arisa SOYA Shingo	1) Elucidation of the function and neural circuits that regulate sleep/wakefulness states. 2) Elucidation of the function and neural circuits that regulate emotion and emotional memory 3) Exploration of biologically active substances that regulate emotion and sleep/wakefulness states 4) Functional and behavioral analysis of the circadian clock system. 5) Analysis of the systems that regulate body temperature and metabolism
International Institute for Integrative Sleep Medicine (WPI-IIIS) Honjoh Laboratory	HONJOH Sakiko	1) The dynamics of thalamocortical system across sleep/wake cycles 2) Elucidation of neural circuits underlying NREM sleep specific EEG patterns 3) Analysis of vigilance state-depedent transcriptional changes 4) Elucidation of the function of vigilance-state specific genes in neural activity
International Institute for Integrative Sleep Medicine(WPI-IIIS) K Sakurai Laboratory	SAKURAI Katsuyasu	1) Functional analysis of the sexual behavior related neural circuits 2) Functional analysis of the pain related neural circuits 3) Functional analysis of the sleep related neural circuits 4) Functional analysis of the emotion related neural circuits 5) Functional analysis of the sensory system related neural circuits

The star (★) indicates the supervisor needs to instruct students with another supervisor without (★).

Clinical Pathogenesis		
Research Area	**Faculty**	**Research**
Radiation Oncology	SAKURAI Hideyuki	We investigate on radiobiological, physical and engineering aspects of radiotherapy with either heavy particles or conventional radiations (photons and electrons). Emphasis is placed on basic researches on proton therapy which is being practiced at the Proton Medical Research Center, University of Tsukuba.
Radiation Health Risk Science	ISOBE Tomonori	Responses in each time phase of radiation disasters are crucial such as an emergency radiation medicine in the aftermath, and continuous physical/mental healthcare, radiation evaluation and risk preperation in the recovery period. In this course, research topics are widely opened to which are related to radiation measurement, protection, health risk management and risk communication aiming for developping new techniques or to establish evidence.

Psychiatriy	ARAI Tetsuaki, SATO Shinji(※) [ARAI Tetsuaki]	On the basis of the knowledge regarding mental functions, we are engaged in the clinical practice for the patients with dementia, schizophrenia, affective disorders, eating disorder and other psychiatric illnesses. In order to elucidate the etiology of these neuropsychiatrical illnesses, we continue a series of basic and clinical studies from biological and psychological viewpoints, using neuropathology, neurochemistry and neuroimaging, epidemiology and social psychiatry.
Disaster and Community Psychiatry	TACHIKAWA Hirokazu	The main focus of our research activities is how to maintain mental health for disaster victims and rescue personnel after a large-scale disaster takes place. Community mental health issues such as suicide prevention, outreach, psychiatric emergency system, or Lieson psychiatry are also studied.
Anesthesiology	TANAKA Makoto	Research field covers clinical physiology and pharmacology of vital organ systems including respiration, circulation, energy metabolism, and central nervous system under surgical or traumatic stress. The effect of anesthesia on responses to these stresses is also studied. We also study cardio-pulmonary-cerebral resuscitation and maintenance of life during cardiac arrest.
Emergency and Critical Care Medicine	INOUE Yoshiaki	1) Clinical and basic research on emergency medicine, multiorgan failure, and toxicology to develop novel treatment strategies. 2) Research on emergency medical system, triage, and disaster medicine.
Pharmaceutical Sciences	HONMA Masato	Clinical pharmacokinetics for evaluating drug efficacy and adverse reactions. 1) Pharmacokinetic analysis for drug disposition 2) Assessing the drug metabolizing enzymes and drug transporters 3) Assessing adverse events including drug interaction in pharmacotherapy
Primary Care and Medical Education	MAENO Tetsuhiro, YOKOYA Shoji, KOBAYASHI Hiroyuki(※) [MAENO Tetsuhiro]	①Clinical research in primary care ②Development of community-based medical system ③Health promotion in the community ④Clinical medical education
Clinical Trial and Clinical Epidemiology	WAGATSUMA Yukiko	Clinical epidemiology has been evolved in modern medicine. That helps to understand the conceptual gaps between structured experience of basic science and the more complex, open-ended problems arising for the care of patients. Based on the principals of clinical trial and the use of clinical epidemiology, we tried to provide the evidence towards improving the care of the patients.

Biostatistics	GOSHO Masahiko	Research field covers biostatistics for medical studies. To solve statistical issues arising in the process of the design, conduct, analysis, and evaluation of medical studies, we develop novel statistical methods and evaluate the performance of the methods.
Clinical and Translational Research Methodology	HASHIMOTO Koichi, KOYANAGI Tomoyoshi	① Regulatory science ② Clinical trilas for functional foods ③ Improvement of efficiency of practical medicine using AI and IOT ④ Construction of seamless platform for translational research
Clinical Research and Regional Innovation	MATSUSAKA Satoshi	① Development of clinical decision system (Liquid biopsy analysis) for cancer chemotherapy ② Understanding the mechanisms of cancer metastasis and anticancer agent resistance ③ Functional studies of Organoids with Cancer Stem Cell-like Properties
Diagnostic and Interventional Radiology	NAKAJIMA Takahito	We conduct a wide range of research activities from imaging analysis to interventional radiology (IVR). For imaging analysis, AI (artificial intelligence) and radiomics analyses are the main interests of this Ph.D. course. Since we deal with a broad range of diseases from tumors to inflammation, the specialty of radiology is not so important and specialists from other fields are welcome. We also provide guidance and environment for radiologists who wish to conduct clinical research in IVR.

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Clinical Surgery		
Research Area	**Faculty**	**Research**
Gastrointestinal and Hepato-biliary-pancreatic Surgery	ODA Tatsuya	1) Elucidating the molecular mechanisms of the genesis & invasion/metastasis of intractable pancreatic cancer. (3D organoid research, cancer microenvironments, cancer associated fibroblast/ immune cells) 2) Development of new diagnositic marker for pancreatic cancer (bran new glycanmarkaer in serum, exosome, cell free DNA) 3) Development of new treatment strategy for pancreatic cancer (Novel cancer treatmengt by using lectins (carbohydrate recgniizing protein) as a drug carrier, targeting cancer cell suface glycans. 4) research on 1)-3) against various GI & HBP Surgery. 5) Precision medicine for sugegical patients.

Cardiovascular Surgery	HIRAMATSU Yuji SUZUKI Yasuyuki	Student is expected to become an internationally compatible research physician in cardiovascular surgery by understanding pathophysiology of cardiovascular system and acquiring sufficient laboratory skills.
Orthopedic Surgery	YAMAZAKI Masashi	Clinical and basic research on following themes is presented: treatment of spinal disorders, regeneration of peripheral nerve, treatment of osteoarthrosis, regeneration of joint cartilage, artificial knee and hip joints and reconstruction of ligaments.
General Thoracic Surgery	SATO Yukio	This course is programmed to investigate on 1) minimal invasive thoracoscopic surgery for lung cancer, 2) angiogenesis and invasion of lung cancer, 3) leukocytes-endothelial interaction in acute lung injury, 4) novel sealant material for surgery and 5) screening of lung cancer with exhaled breath and 6) surgical simulation, and estimation of postoperative lung regeneration and function using 3D-CT.
Pediatric Surgery	MASUMOTO Koji	In this course, the bioengineered tissue studies using biomaterials are planned for students regarding treatments of severe hypoplastic lungs in congenital diaphragmatic hernia. In addition, if the students would like to study concerning malignant solid tumors in children, we will provide the study program focusing on genetic aberrations related to carcinogenesis and progression of them.
Urology and Andrology	NISHIYAMA Hiroyuki	In this course, the etiology of various urological diseases are studied by means of molecular-biological, morphological, pathophysiological and epidemiological methods. The students are requested to consider the clinical problems concerning prevention, diagnoses, treatments of urological diseases and quality of life, and to plan and perform research projects in problem oriented manner
Plastic and Reconstructive Surgery	SEKIDO Mitsuru	Research of tissue change after free flap transfer, wound healing, and process of functional recovery. Research of adequate tissue, quantity and nature for reconstructive surgery
Breast and Endocrine Surgery	HARA Hisato	Resurch about the hardnes of Breast and Endocrine tumor by elastography.
Obstetrics and Gynecology	SATO Toyomi, HAMADA Hiromi	The program is designed to learn the physiology (anatomy, menstrual cycle, maternal and fetal physiology, delivery) and the pathology (maternal and fetal diseases and gynecologic diseases) of female genital organs and to conduct researches/experiments for these conditions and diseases.

Neurosurgery	KOMATSU Yoji(※), MATSUMARU Yuji [MATSUMARU Yuji]	1) **Neurooncology** 1)-1 **Neurooncology(Advanced Therapeutics):** Boron neutron capture therapy(BNCT), Proton therapy, Tumor vaccination, Gene thrapy, Photodynamic diagnosis and treatment (PDD, PDT) 1)-2 **Neurooncology(Diagnostics):** Molecular maker and gene analysis of brain tumor(glioma, pediatric brain tumor, craniopharyngioma), Intraoperative neurophysiological monitoring (MEP, SEP, EEG), Imaging study(Intraoperative MRI, Tractography, PET) 2) **Cerebrovascular disease:** Neuroprotection using nanoparticle and stem cell therapy for ischemic stroke. Prevention of carotid artery restenosis. Evaluation of oxidaive stress in brain. 3) Analysis of **cerebral function, perfusion and metabolism using neuroimaging** (functional -MRI, MR spectroscopy, diffusion tensor imaging, PET) 4) Neurorehabilitation using **Robot Suit HAL**, Brain machine interface 5) **Functional neurosurgery** for epilepsy, involuntary movement, central pain and Headache 6) **Gene therapy and regeneration therapy** using DDS (Angiogenesis, bone regeneration) 7) **Pediatric Neurosurgery:** Epigenetic biomarkers from woman with neural tube defect affected pregnancies 8) **Development of advanced medical equipment and device** (laser endoscope, new device of endoscopic surgery)
Visual Science and Ophthalmology	OSHIKA Tetsuro	The course is designed to learn the anatomy and physiology of the eye as well as the pathophysiology of visual disturbance. The causes and mechanism of visual disturbance are investigated. Both basic and clinical researches are conducted on various ocular diseases.
Otolaryngology & Head and Neck Surgery	TABUCHI Keiji	The pathogeneses of the various diseases in otology and neuro-otology are investigated with the pathophysiological, electrophysiological and molecular biological methods.
Oral and Maxillofacial Surgery	BUKAWA Hiroki, YANAGAWA Toru(※) [BUKAWA Hiroki]	The aim of our research is to study the relationship between the morphology and function of the oral and maxillofacial region by experimental and clinical approaches, and to investigate the morphological and functional disorders related to the cause andlocation in disease of oral the and maxillofacial region.
Rehabilitation Medicine	HADA Yasushi	This program is designed to learn various fields related to rehabilitation medicine (disability medicine, clinical neurophysiology, prosthetics and orthotics), and conduct clinical research related to rehabilitation medicine through Medical engineering cooperation, robot rehabilitation, disabled sports medicine.

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Clinical Medicine		
Research Area	**Faculty**	**Research**
Hematology	CHIBA Shigeru	We focus on mechanisms of normal hematopoiesis and blood cancers, and aim at developing new therapeutics. The students acquire necessary techniques required for carrying out their own research under an appropriate plan. Those techniques cover wide range of fields such as cell biology, molecular biology, biochemistry, animal studies, genome science, bioinformatics, and clinical studies.
Biomedical Informatics and Management	OHARA Makoto	① Research for standardization and interoperability of medical information ② Research for medical safety, patient safety, and quality of medical care. ③ Epidemiological and clinical research using DWH of EHR. ④ Research for the mechanism of medical care itself
Molecular Sportology	TAKEKOSHI Kazuhiro	① Personalized treatment for exercise through using genetic information ② Research for anti-doping ③ Exercise and hormone, especially catecholamine ④ Exercise and stress marker, especially salivary Chromogranin A (collaborated with Prof. Omori)
Cardiovascular Medicine	IEDA Masaki, MIYAUCHI Takashi	Research for etiology, pathophysiology, prevention and molecular biology of cardiovascular diseases. Clinical and experimental studies for pathophysiology of cardiovascular diseases, pharmacological and non-pharmacological treatments and further prevention of the diseases.
Pulmonology	HIZAWA Nobuyuki, ISHII Yukio(※), SATO Hiroaki(※) [HIZAWA Nobuyuki]	Clinical and basic research for regulation of airway inflammation and remodeling. Molecular biology and genetic epidemiology of chronic obstructive pulmonary disease, asthma and interstitial pneumonia. Clinical studies on lung cancer.
Nephrology	YAMAGATA Kunihiro	The mechanisms of the progression and therapeutic approaches for the renal diseases will be lectured from viewpoints of pathology, immunology, biochemistry, physiology, molecular biology, byoinfomatics and clinical epidemiology. Based on the current information, experiments to clarify unknown problems are planned and performed with our well-trained lecturers.

Metabolism and Endocrinology	SHIMANO Hitoshi, YAGYU Hiroaki(※), MATSUZAKA Takashi [SHIMANO Hitoshi]	Investigation of the molecular mechanisms of pathophysiology of energy metabolism and endocrinological homeostasis focusing on diabetes, dyslipidemia, obesity, atherosclerosis, NASH, neuropsyciatric diseases and endocrine diseases will lead us to novel strategies and therapies of various diseases. You can learn molecular and biological technology of gene regulation and multi-omics, and experience mystery of life and joy of research through both cell and animal experiments with a wide variety of organs including liver, pancreatic beta cells, adipocytes, skeletal muscle and brain.
Clinical Laboratory Medicine	KAWAKAMI Yasushi	Pathophysiological study on human diseases (lifestyle-related disease, malignant tumor, genetic disease or infectious disease) using the techniques of genetic analysis containing SNP and DNA microarray for the purpose of screening and diagnosis.
Pediatrics and Child Health	TAKADA Hidetoshi	The purpose of our research is to 1. Investigate the physiologic and pathologic processes of growth and development in terms of molecular mechanism in embryogenesis, differentiation, apoptosis and regeneration. 2. Create methods on the basis of the above results to improve human health and control diseases. 3. Cultivate researchers who can apply ideas of bioethics to improve quality of lives of infants and children.
Infectious Diseases	SUZUKI Hiromichi HITOMI Shigemi	1. Epidemiological investigation of serious infectious diseases and HIV infection. 2. Molecular investigation of pathogenic and drug-resistant factors of microorganisms. 3. Evaluation of precautions against transmissible infections diseases. 4. Clinical studies among patients with infectious diseases
Medical Oncology	SEKINE Ikuo	This course provides pathological, biological and clinical approaches to the etiology, pathophysiology, diagnosis and treatment of malignant diseases. Based on the current knowledge, the theme of research is discussed and determined.
Cancer Immunotherapy and Immunology	KANEKO Shin	Our research covers basic and applied sciences related to T-cell-based cancer immunotherapy including researches to explore new cancer targets, to analys anti-tumor mechanisms of immune cells, to improve T-cell functions through gene manipulation and iPSC-based rejuvenation, and to develop manufacturing process for practical application of immune cell therapy.
Dermatology	NOMURA Toshifumi	We aim to unveil hitherto-unknown pathomechanisms of genetic skin diseases to offer novel therapeutic strategies for the patients.

Gastroenterology	TSUCHIYA Kiichiro	We will try to elucidate the pathophysiology and develop novel therapy for intractable digestive diseases including inflammatory bowel disease and malignant tumors by molecular biological and regenerative medicine methods. In addition, we will practice clinical science that integrates basic and clinical research by utilizing clinical information and samples.
Neurology	( )	Molecular pathogenesis of Alzheimer's disease, Neurobiology of degenerative disorders, Gene therapy for muscular dystrophies, Neuroimmunology, Neurophysiology, Clinical Neurology, Organoarsenic intoxication. (This lab will not accept new students.)
Clinical Immunology	( )	The purpose of our research is to reveal the molecular mechanism of autoimmune diseases such as rheumatoid arthritis, Sjögren's syndrome, and systemic lupus erythematosus by immunological and molecular biological approaches. The final goal is to establish the disease-specific treatments targeted on the molecules which play important roles in pathogenesis of autoimmune diseases. (This lab will not accept new students.)

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Social Medicine		
Research Area	**Faculty**	**Research**
Public Health Medicine	YAMAGISHI Kazumasa	・Public health practice and epidemiological evaluation of lifestyle-related disease prevention program in communities (speaking proficiency of Japanese required) ・Management of community-based genome cohort study of lifestyle-related diseases
Health Services Research	TAMIYA Nanako	Health services research for quality improvement in medical and health care, long-term home care or institutional care for old or disablepeople. International comparison of community health care system Quality indicator and standardization of medicine Health service research for broad area of clinical medicine including emergency and critical care, geriatric, pediatric, psychatiric, palliative medicine etc.
Social Psychiatry and Mental Health	SAITO Tamaki	Psychiatric research for evaluation and support system for marginal fields of psychiatry, such as hikikomori, non-school attendance, child abuse, domestic violence, and addiction.
Health Care Policy and Health Economics	KONDO Masahide	Studies on health care policy and health system Studies on health economics Studies on disese control measures

【Cooperative Graduate School】(Applicants for the Special Selection of Working Individuals Examination cannot choose a faculty member of the Cooperative Graduate School System as their supervisor.)

(Sub) indicates the Sub-Supervisor.

Research Area	Faculty	Research
Cell Engineering (RIKEN)	NAKAMURA Yukio [(Sub)TAKAHASHI Satoru]	Cell engineering technologies are developing very rapidly, e.g., the technology to generate iPS cells, direct conversion of differentiated cells to another lineage, genome editing by CRISPR/Cas9 and so on. We perform the following researches. #. Standardization of generation of iPS cells and maintenance of iPS cells #. Researches for effective utilization of iPS cells derived from patients (which is called disease-specific iPS cells or patient-specific iPS cells) #. Generation of novel cell lines such as those immortalized at the stages of hematopoietic stem/progenitor cells, erythroid progenitor cells and so on #. Development of new ways for utilization of conventional human cancer cell lines using genome editing technology and so on.
International Medicine (NCGM)	KANO Shigeyuki [(Sub)KAWAGUCHI Atsushi]	To conduct the researches on International Medicine of global importance particularly on emerging and re-emerging infectious diseases which require international cooperation for their containment. Such socio-economic researches on human behavior or habitat, population movement, ecological or environmental factors are also indispensable for the control of the disease. Many issues for the achievement of the "Sustainable Development Goals (SDGs)" such as poverty, hunger, malnutrition, education, water safety, gender discrimination, vaccine or drug production in the context of Global Health are to be clarified and resolved to accelerate the "Universal Health Coverage (UHC)".
Virology (NIID)	TAKAHASHI Yoshimasa [(Sub)KAWAGUCHI Atsushi]	・We aim to clarify immune evading approaches that are utilized by rapidly mutating viruses, and to clarify how the immune responses counteract the viral escapes. ・We study protective immune responses to SARS-CoV-2, Zika, and Dengue viruses.
Protein Metabolism (TMIMS)	SAEKI Yasushi [(Sub)KAWAGUCHI Atsushi]	The ubiquitin-proteasome system (UPS) regulates almost all cellular pathways and maintains protein homeostasis by selective degradation of cellular proteins. Accordingly, dysregulation of the UPS causes various diseases and aging. We aim to cralify the principles of the UPS and to develop therapeutic strategy for UPS-related diseases. 1) Developing of state-of-the art proteomics methods for ubiquitin research 2) Deciphering the ubiquitin code 3) Elucidation of proteasome dynamics in vivo 4) Analysis of patient-derived proteasome mutant mice

Translational Science on Drug Discovery (API)	(　　) [(Sub)ARAI Tetsuaki]	We implement drug discovery research by using translational science methods that leads to discovery of innovative medicines meeting unmet medical needs. We investigate more direct and effective connection between basic research and patient care in the clinical stage by establishing novel animal disease models, using bioimaging technologies, etc., and aim at actualizing precision medicine. （This lab will not accept new students.）
Genomics-based Drug Discovery (Eisai)	MIYAMOTO Norimasa [(Sub)ARAI Tetsuaki]	Functional genomics and pharmacological methods are used to elucidate the mechanisms of how disease targets molecules related to the disease. These methods are also used to understand drug-induced side effect mechanisms. Pharmacokinetics and drug metabolism mechanisms are being studied for novel drug candidates. Innovative *in vitro* and *in vivo* non-clinical study models are established after elucidation of the relationship of the drug target molecule and the disease or the drug candidates and their side effects in order to verify human prediction accuracy and the validity of introduction to clinical study. Various human stem cell-derived cells are used for research in clinical prediction.
Celluar and Molecular Biotechnology Research Institute （AIST）	KUNO Atsushi SUMARU Kimio TATENO Hiroaki 【(Sub)ODA Tatsuya】	(Kuno) Molecular and Cellular Glycoproteomics Research Group (Sumaru) Applied Molecular Function Research Group Novel in vitro physiological models are developed by applying on-plate cell processing technology and new cell culture system composed of microstructured functional polymers as scaffolds to various cells including desease-specific iPS cells. (Tateno) Multicellular Systen Regulation Research Group Using a new multi-omics analysis technology that simultaneously measures glycans and RNA at the single cell resolution, we analyze the microbiome, cancer cells, stem cells, etc. We aim to clarify cellular heterogeneity and develop novel drugs and diagnostic agents.
Pharmaceuticals and Medical Devices Science （PMDA）	ARAI Hiroyuki SATO Junko 【(Sub)HASHIMOTO Koichi】	Based on regulatory science, we investigate benefit/risk balance of medical products for regulatory approval, and also approprote risk management in timely manner.
Clinical Oncology （NCC）	OHTSU Atsushi 【(Sub) SEKINE Ikuo】	Our clinical researchs/reverse TRs are aimed to develop new oncology agents including imunne-cell therapy and establish precision medicine with tissue NGS panel or liquid biopsy. We have various international collaboration studies with top cancer centers overseas, which provide cutting-edge cancer therapy into the oncology clinic.

(RIKEN)＝RIKEN Tsukuba Research Laboratories
(NCGM)＝National Center for Global Health and Medicine

(NIID)＝National Institute of Infectious Diseases
(TMIMS)＝Tokyo Metropolitan Institute of Medical Science
(API)＝Astellas Pharma Inc
(Eisai)＝Eisai Co. Tsukuba Research Laboratories
(AIST)＝National Institute of Advanced Industrial Science and Technology
(PMDA)＝Pharmaceuticals and Medical Devices Agency
(NCC)＝National Cancer Center Japan