

# List of teacher research fields

## <Biomedical 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.
Anatomy and Embryology	TAKAHASHI Satoru	<ul style="list-style-type: none"> <li>• Elucidation of molecular mechanism of pancreatic beta-cell development and its application.</li> <li>• Functional analysis of large Maf transcription factor family, MafB and c-Maf in macrophage development and functions.</li> <li>• Elucidating biological roles of carbohydrates using glycosyltransferase conditional KO mice.</li> <li>• Study of diseases and drug discovery by development of novel imaging system.</li> <li>• Elucidation of etiology and gene function in disease model mice.</li> </ul>

Research Area	Faculty	Research
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 transport.
Molecular and Developmental Biology	KOBAYASHI Makoto	We are studying following issues at both molecular and animal levels using zebrafish: • Hematopoietic stem cell formation • Digestive organ formation • Cellular defense against oxidative and stresses • Gerontology and aging study • Foods and chemicals for healthy life extension

Human Medical Biology		
Research Area	Faculty	Research
Laboratory Animal Science	SUGIYAMA Fumihito	• 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- $\beta$ -related molecules in stem cell biology, tissue maintenance and carcinogenesis aiming for the establishment of novel molecular targeting therapy using macrocyclic peptides. Multidisciplinary studies including, molecular cell biology, live imaging, experimental pathology of genetically modified mice, three-dimensional quantitative tissue analysis, mathematical modeling, and analysis of protein structure will be conducted.
Cancer Signaling	Peter ten Dijke	Elucidate the underlying molecular and cellular mechanisms by which TGF- $\beta$ and BMP growth factor signaling pathways are corrupted in cancer, vascular and other diseases. Develop therapeutic strategies to normalize the aberrant TGF- $\beta$ /BMP signaling pathways using chemical biology approaches. We take a multi-disciplinary approach, employing peptide chemistry, molecular and cell biological techniques, molecular imaging in cultured cells and living animals, and leading edge proteomic and genomic technologies.
Diagnostic Pathology	NOGUCHI Masayuki	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.

Research Area	Faculty	Research
Kidney and Vascular Pathology	NAGATA Michio	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 vasculatures as a cause of renal disease is also our interesting point.
Immunology	SHIBUYA Akira 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 failed immune system such as autoimmune diseases, allergy, and inflammatory diseases. In addition, thorough collaboration with pharmaceutical companies and ventures, students will learn 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 cell therapy in the future. 2) The molecular mechanisms of cancer initiating cells and tumor vascularization is investigated under hypoxic conditions.
Infection Biology (Molecular Virology)	KAWAGUCHI Atsushi	We aim to understand molecular mechanisms of virus-host interplays which determine the pathogenicity and species specificity of influenza virus. We are also interested in the innate immune response against influenza virus infection.
Infection Biology (Bacteriology)	MORIKAWA Kazuya	We study how pathogenic bacteria (especially, Gram positive pathogens) cope with bactericidal factors from host and environment. Main focuses are the followings: - Population heterogeneity - Dynamics of cellular structures: nucleoid and membrane - Host-pathogen interaction in vitro
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 anti-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.

Research Area	Faculty	Research
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: <ul style="list-style-type: none"> <li>• Cardiovascular regulation by the central nervous system</li> <li>• Mechanisms of the neurogenic hypertension</li> <li>• Respiratory regulation by the central nervous system</li> </ul>
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	<ol style="list-style-type: none"> <li>1. Improving quality and reliability in X-ray and particle radiotherapy.</li> <li>2. New treatment technique using an accelerator.</li> <li>3. New technique for quality control in medical applications of radiation.</li> <li>4. New calculation method to estimate proton-induced dose distribution in the body of the patient.</li> </ol>
Biomedical Engineering	MIYOSHI Hirotohi	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	<ul style="list-style-type: none"> <li>- Identification and functional analysis of novel extracellular matrix proteins of the vessel wall.</li> <li>- Molecular mechanism of mechanotransduction in the vessel wall.</li> <li>- Identification of vascular wall stem cells.</li> <li>- Identification of niche components for epidermal stem cells.</li> <li>- Mechanism of aging in epidermal stem cells.</li> </ul>

Genome and Environmental Medicine		
Research Area	Faculty	Research
Molecular Genetic Epidemiology and Public Health Medicine	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, systemic sclerosis and rheumatoid arthritis. ②Molecular mechanisms of HLA and other genes associated with autoimmune rheumatic diseases
	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
Genetic Medicine	NOGUCHI Emiko	Human genetics and genomics research including genome-wide linkage 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	KUMAGAI Yoshito	We have been examining the reactivity and toxicology of environmental 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.
	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
Legal Medicine	HONDA Katsuya	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.

Research Area	Faculty	Research
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 single-cell informatics methods and their application to disease research (3) Epigenome data analyses for regenerative medicine research (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

Medical Science of Sleep		
Research Area	Faculty	Research
Behavioral Neuroscience Molecular Pharmacology	YANAGISAWA Masashi	Elucidation of fundamental mechanisms for sleep/wake regulation ① Large-scale, forward genetic screening of genes responsible for sleep/wake regulation in mice ② Discovery and medicinal chemistry of novel drugs for sleep disorders ③ Visualizing and manipulating the activity of neurons involved in sleep/wake regulation
Medicinal Chemistry / Organic Chemistry/ Neuropharmacology	NAGASE Hiroshi KUTSUMURA Noriki	Design and synthesis of orexin receptor agonists. Design and synthesis of opioid ligands. Research and development of drugs for narcolepsy. Research and development of drugs for severe pain, depression, pollakiuria, malaria, other protozoal diseases, and cancer. Through pharmacological evaluation (in vitro and in vivo) of the compounds developed above, we aim to create drugs with a new mechanism. 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.

Research Area	Faculty	Research
Biochemistry / Chemical Biology / Neuroscience Biochemistry / Chemical Biology / Neuroscience	LIU, Qinghua	Integration of biochemical, chemical biological and genetic approaches to identify molecular mechanism of sleep and fear in mice • Quantitative analyses of wild-type and sleep mutant brain proteome and phosphor-proteome to reveal the molecular circuit of sleep • Development of novel and rapid technology for adult- and brain-specific knockdown (or knockout) of candidate sleep and fear genes. • A large-scale forward genetic screen to identify the fearless mutant mice to elucidate the molecular basis of fear and related mental disorders.
Sleep and Memory	SAKAGUCHI Masanori	1) Function of sleep in memory consolidation 2) Developing new <i>in vivo</i> imaging technique 3) Role of sleep in hippocampal cellular plasticity <a href="http://iis.php.xdomain.jp/sakaguchi/www/">http://iis.php.xdomain.jp/sakaguchi/www/</a>
Systems Sleep Biology	LAZARUS Michael	1) Understanding the control of sleep and wake by motivation 2) Sleep circuits as potential therapeutic targets for insomnia 3) Link between REM sleep loss and the desire for junk food 4) Elucidation of neural mechanisms of short-sleep 5) Analysis of the effects of short-sleep on physiological functions
Neuroscience	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.
Brain maturation / evolution	HAYASHI Yu	1) Elucidation of the function of sleep focusing on brain maturation and aging 2) Elucidation of the evolutionary process of sleep based on molecular and developmental approaches
Molecular Behavioral Physiology	SAKURAI Takeshi	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

Research Area	Faculty	Research
Electrophysiology and molecular biology of sleep	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

【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)	ISHII Syunsuke 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 on 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 achieve “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 flaviviruses (Zika and Dengue).

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 clarify 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
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(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

# List of teacher research fields

## <Clinical Sciences>

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 healthcare and radiation pollution control in the recovery period. In this course, research topics are widely opened to which are related to radiation measurement, protection and health risk management, aiming for developing new techniques or to establish evidence.
Psychiatry	ARAI Tetsuaki SATO Shinji	On the basis of the knowledge regarding mental functions, we are engaged in the clinical practice for the patients with dementia, schizophrenia, affective disorders, autistic spectrum disorder, eating disorder and other psychiatric illnesses. In order to elucidate the etiology of these neuropsychiatric illnesses, we continue a series of basic and clinical studies from biological and psychological viewpoints, using neuropathology, neurochemistry and neuroimaging and epidemiology.
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.

Research Area	Faculty	Research
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	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	ARAKAWA Yoshihiro HASHIMOTO Koichi TAKANO Shingo	① Regulatory science ② Clinical trials for functional foods ③ Improvement of efficiency of practical medicine using AI and IOT ④ Construction of seamless platform for translational research ⑤ Education of experts of integrative celerity research process for translational researches
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

※This mark indicate specific supervisor.

Please write the name of supervisor mentioned in bracket at the Sub-Supervisor section of your form.

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 diagnostic marker for pancreatic cancer (bran new glycanmarker in serum, exosome, cell free DNA) 3) Development of new treatment strategy for pancreatic cancer (Novel cancer treatment by using lectins (carbohydrate recognizing protein) as a drug carrier, targeting cancer cell surface glycans. 4) research on 1)-3) against various GI & HBP Surgery. 5) Precision medicine for surgical patients.
Cardiovascular Surgery	HIRAMATSU Yuji	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 osteoarthritis, regeneration of joint cartilage, artificial knee and hip joints and reconstruction of ligaments.
General Thoracic Surgery	SATO Yukio ICHIMURA Hideo(※) [ 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 SHIMAZUI Toru(※) [ 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

Research Area	Faculty	Research
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	MATSUMURA Akira KOMATSU Yoji(※)  [ MATSUMURA Akira ]	<p>1) <b>Neurooncology</b></p> <p>1)-1 <b>Neurooncology(Advanced Therapeutics):</b> Boron neutron capture therapy(BNCT), Proton therapy, Tumor vaccination, Gene thrapy, Photodynamic diagnosis and treatment (PDD, PDT)</p> <p>1)-2 <b>Neurooncology(Diagnostics):</b> 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)</p> <p>2) <b>Cerebrovascular disease:</b> Neuroprotection using nanoparticle and stem cell therapy for ischemic stroke. Prevention of carotid artery restenosis. Evaluation of oxidaive stress in brain.</p> <p>3) Analysis of <b>cerebral function, perfusion and metabolism using neuroimaging</b> (functional -MRI, MR spectroscopy, diffusion tensor imaging, PET)</p> <p>4) Neurorehabilitation using <b>Robot Suit HAL</b>, Brain machine interface</p> <p>5) <b>Functional neurosurgery</b> for epilepsy, involuntary movement, central pain and Headache</p> <p>6) <b>Gene therapy and regeneration therapy</b> using DDS (Angiogenesis, bone regeneration)</p> <p>7) <b>Pediatric Neurosurgery:</b> Epigenetic biomarkers from woman with neural tube defect affected pregnancies</p> <p>8) <b>Development of advanced medical equipment and device</b> (laser endoscope, new device of endoscopic surgery)</p>
Visual Science and Ophthalmology	OSHIKA Tetsuro	Anatomy and physiology of the eye and pathophysiology of visual disturbance are studied. The causes of visual disturbance and the mechanism of its occurrence are investigated. Both basic and clinical researches of new therapy, control and prevention against visual disturbances are conducted.
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.

Research Area	Faculty	Research
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 and location in disease of oral and maxillofacial region.

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Clinical Medicine		
Research Area	Faculty	Research
Gastroenterology	HYODO Ichinosuke SHODA Junichi YANAKA Akinori(※)  [ HYODO Ichinosuke or SHODA Junichi ]	The present course provides the novel diagnostic and therapeutic approaches for the gastrointestinal disorders. The goal of this course is to clarify the pathogenesis and to develop the new treatment in gastrointestinal, hepatobiliary, and pancreatic cancer and inflammatory diseases.
Cardiovascular Medicine	AONUMA Kazutaka IEDA Masaki KOIKE Akira NOGAMI Akihiko HONMA Satoshi 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(※) IEKI Ryuji(※)  [ 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.
Neurology	TAMAOKA Akira	Molecular pathogenesis of Alzheimer's disease, Neurobiology of degenerative disorders, Gene therapy for muscular dystrophies, Neuroimmunology, Neurophysiology, Clinical Neurology, Organoarsenic intoxication.
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 and molecular biology. Based on the current information, experiments to clarify unknown problems are planned and performed with our well-trained lecturers.

Research Area	Faculty	Research
Hematology	CHIBA Shigeru NINOMIYA Haruhiko	The objective of our research is to understand physiological mechanisms of blood production system and pathophysiology of blood disorders, including hematologic malignancies, bone marrow failure, and coagulation disorders. The students will achieve expertise in cell and molecular biology and protein chemistry, by handling patients' samples and disease-modeling mice.
Clinical Immunology	SUMIDA Takayuki	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.
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, neuropsychiatric 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 HORIGOME Hitoshi(※) KAMODA Tomohiro(※)  [ 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	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

Research Area	Faculty	Research
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.

Social Medicine		
Research Area	Faculty	Research
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 disabled people. 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, psychiatric, 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 disease 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
Translational Science on Drug Discovery (API)	ITO Hiroyuki  [ (Sub)CHIBA Shigeru ]	We implement translational science 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 mutant animal disease models, using bioimaging technologies, and so on.
Function of Biomolecule (AIST)	NARIMATSU Hisashi  [ (Sub)SHODA Junichi ]	Many proteins in our body are post-translationally glycosylated and ‘glycoproteins’ are essential for regulating proteins’ function and involved in many diseases. To study medical science through analyses of biological functions of glycans, we discovered many human glycosyltransferase genes that are responsible for the synthesis of glycans. In addition, we have been developing new technologies in glycomics and glycoproteomics, by which we can determine complex structures of carbohydrate chains and glycopeptides with specific glycans. We aim to find biomarkers for diagnosis, to analyze knockout mice of disease model mice, and to develop new strategies for drug discovery via glycoscience and glycotechnology.
Genomics-based Drug Discovery (Eisai)	MIYAMOTO Norimasa  [ (Sub)CHIBA Shigeru ]	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 <i>in vitro</i> and <i>in vivo</i> 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.

(API)=Astellas Pharma Inc

(AIST)=National Institute of Advanced Industrial Science and Technology

(Eisai)=Eisai Co. Tsukuba Research Laboratories