

## 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.

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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.

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Clinical Surgery		
Research Area	Faculty	Research
Gastrointestinal and Hepato-biliary-pancreatic Surgery	ODA Tatsuya	<ol style="list-style-type: none"> <li>1) Elucidating the molecular mechanisms of the genesis &amp; invasion/metastasis of intractable pancreatic cancer. (3D organoid research, cancer microenvironments, cancer associated fibroblast/ immune cells)</li> <li>2) Development of new diagnostic marker for pancreatic cancer (new glycan marker in serum, exosome, cell free DNA)</li> <li>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.</li> <li>4) research on 1)-3) against various GI &amp; HBP Surgery.</li> <li>5) Precision medicine for surgical patients.</li> </ol>
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 <ol style="list-style-type: none"> <li>1) minimal invasive thoracoscopic surgery for lung cancer,</li> <li>2) angiogenesis and invasion of lung cancer,</li> <li>3) leukocytes-endothelial interaction in acute lung injury,</li> <li>4) novel sealant material for surgery and</li> <li>5) screening of lung cancer with exhaled breath and</li> <li>6) surgical simulation, and estimation of postoperative lung regeneration and function using 3D-CT.</li> </ol>
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

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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(Diagnosics):</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 oxidaiive 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.

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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		
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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.

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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 infectious diseases. 4. Clinical studies among patients with infectious diseases

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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.

<b>Social Medicine</b>		
<b>Research Area</b>	<b>Faculty</b>	<b>Research</b>
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 glycotecchnology.
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