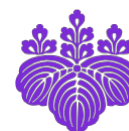# Guidelines of Application of Doctoral Program in Medical Sciences
**Graduate School of Comprehensive Human Sciences, University of Tsukuba**

## NUMBER OF STUDENTS TO BE ADMITTED

Limited

## QUALIFICATION OF APPLICANTS

**The qualification for the admission includes at least one of the followings:**

(1) Obtain a Master's degree *1

(2) Individuals who have completed 18 years of school education outside Japan.

(3) Individuals who have been qualified through our admission screening and was judged to have accomplished equivalent to Master's degree. The applicant must be 24 years or older before enrollment to the above program.*2

*1 The degree qualification will be examined individually.
*2 For category (3), applicants must submit necessary documents for the admission screening.

*To apply for Dual Doctoral Degree Program, the applicant must be enrolled in: The University of Medicine and Pharmacy at Ho Chi Minh City (Vietnam), University of Science at Ho Chi Minh City (Vietnam) or National Taiwan University.*

## PROFICIENCY IN ENGLISH

It is necessary for applicant to demonstrate an adequate command of the English language to benefit from studies at this University. All applicants, if their first language is not English or if their studies at university have not been conducted solely in English, must demonstrate English language proficiency by taking the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) and having their score reported directly to University of Tsukuba, Graduate School of Medical Sciences (TOFEL center code: 7902). TOEFL and IELTS score reports must be dated within two years of enrollment in this University. Photocopies are accepted.

## REQUIRED DOCUMENTS

| | | |
|---|---|---|
| 1 | **Application Form** | Fill out the attached application form designated by University of Tsukuba. Please select which program you wish to apply. |
| 2 | **Reference Form** | Applications will be considered with academic references. Reference form should be accompanied with at least one letter of recommendation. |
| 3 | **Picture** | Attach a picture of yourself taken within three months, facing forward without hat on the Application Form Size: 4 cm x 3cm (h x w). |
| 4 | **Application Fee** | 30,000 yen (will not be charged to the applicants with Japanese Government Monbukagakusho Scholarship or if applied for Dual Doctoral Degree Program). Payment by credit card is available at: https://e-shiharai.net/english/?schoolcode=OPU5100850000000 due by application deadline. Payment in Japan is available through post office, banks, convenience stores and various banking institutions. Please contact for the instruction by e-mail: iga-in@un.tsukuba.ac.jp. |
| 5 | **Certificate of Graduation** | Submit a graduate certificate from the graduate school which fulfills our qualification requirements, normally from the University/College (or the department) where a master's degree was awarded. |
| 6 | **Transcript** | All applicants are required to provide evidence of their academic qualifications for the application. Submit a transcript of the graduate school, which fulfills our qualification requirements, normally from the university (or the department) where a master's degree was awarded. If you are a transfer student, submit transcripts from both schools, before and after the transfer from your current University. |

| 7 | **English Language Proficiency** | If English is not your first language, request your TOEFL or IELTS score sent directly to this University (TOFEL code: 7902). Photocopies are accepted. |
|---|---|---|
| 8 | **Photocopy of your passport** | ※ If you do not have a passport yet, you are required to submit Family Register or Certificate of Citizenship issued by your home country. |

## APPLICATION PROCEDURE

Please verify all the documents carefully and submit the documents to:

Academic Service Office for the Medical Sciences Area
University of Tsukuba
1-1-1 Tennodai, Tsukuba, Ibaraki 305-8575, Japan

Please use the attached recommendation letter form. The letter may be sent from the referee as an email attachment or with the application forms in a sealed envelop.

Information about Exam will be issued by e-mail when the application documents are accepted.

Applicants must contact their prospective supervisor about the specialized research field in advance. (Applicants for the Cooperative Graduate School System must contact the sub-supervisor at the University of Tsukuba as well.)

If your supervisor is from Cooperative Graduate School System or a specific supervisor（※）, you are required to have a sub-supervisor. If this is your case, please write on your application form the name of the sub-supervisor that is listed on "List of teacher research fields" with parenthesis. If parenthesis is blank on the list or if you cannot identify your sub-supervisor, please contact Academic Service Office for the Medical Sciences, University of Tsukuba [e-mail: iga-in@un.tsukuba.ac.jp]

<Click on the program name below for information on research fields.>

[ Medical Sciences ]

Application Period:  Please refer to our web page for the application deadline.

## SELECTION METHOD

Selection will be based on (a) Academic records (b) Oral examination (c) English proficiency during the interview. Prospective applicant will be contacted by e-mail after the preliminary screening based on the submitted documents. Date and location of an interview will be arranged. The applicant will be able to select the venue where the oral examination will be offered.

## ADMISSION PROCEDURE

Succeed applicants will receive an instruction on the admission procedure by e-mail. An official letter from the University of Tsukuba will be sent by e-mail.

## TUITION AND FEES

Admission Fee: 282,000 yen (will not be reimbursed once received).

Tuition Fee: First Half of Academic Year (April - September): 267,900 yen
Second Half of Academic Year (October - March): 267,900 yen
*Tuition Fees Amount: 535,800 yen annually

*Applicants are advised to make a sufficient financial plan for their tuition fee and living expenses in Japan.*

*Both tuition and fee are waived for (a) Dual Doctoral Degree Program candidate and (b) applicants with Japanese Government (Monbukagakusho) Scholarship.*

## NOTES

1) Application that is incomplete will not be processed.
Validation seals of the institution are required on the copies of Certificate of Graduation and Academic Transcript.

2) Application documents will not be returned to the applicants.

3) The inquiries about the result of Achievement Test are not accepted.

4) Please contact the International Office of further questions on admission or application procedure.
E-mail: iga-in@un.tsukuba.ac.jp.

# Application form for Doctoral Program in Medical Sciences
**Graduate School of Comprehensive Human Sciences, University of Tsukuba**
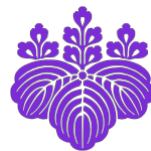
PLEASE PRINT OR TYPE ALL SECTIONS

## 1. APPLICATION FOR:   ☐ F all (October), 2020   ☐ Spring (April), 2021

☐ Doctoral Program in Medical Sciences (Four-years; including Japanese applicant living abroad)

☐ Dual Doctoral Program (for applicant enrolled in foreign graduate school affiliated with University of Tsukuba to obtain                doctoral degree from both institutes)

## 2. PERSONAL DATA

Family Name _____     Middle Name _____

First Name _____     Title (Mr./Ms./Dr., etc.) _____

Nationality _____     Date of Birth (d/m/y) _____

Address _____

_____     Postal code _____

Telephone _____     Mobile _____

E-mail _____     Skype ID _____

## 3. PROPOSED STUDIES

List the 2nd and 3rd choices in case the 1st choice is not selected. If your supervisor is from Cooperative Graduate School System or a specific supervisor（※）, you are required to have a sub-supervisor.

|                | Research Field | Supervisor and Sub-Supervisor |
|----------------|----------------|-------------------------------|

1st choice : _____          _____

(Sub) _____

2nd choice : _____          _____

(Sub) _____

3rd choice : _____          _____

(Sub) _____

## 4. DEGREE OR DIPLOMAS AWARDED OR TO BE AWARDED

| University / College | Degree (AA, BA, MSc, etc.) | Major | Course Dates | Conferred or expected date (month/year) |
|---|---|---|---|---|
| _____ | _____ | _____ | _____ to _____ | _____ |
| _____ | _____ | _____ | _____ to _____ | _____ |
| _____ | _____ | _____ | _____ to _____ | _____ |
| _____ | _____ | _____ | _____ to _____ | _____ |

## 5. EMPLOYMENT HISTORY

| Name and Address of employer (including country) | Type of Contract (fixed, temporary or permanent) | Position | Dates |
|---|---|---|---|
| | | | _____ to _____ |
| | | | _____ to _____ |
| | | | _____ to _____ |
| | | | _____ to _____ |

## 6. LANGUAGE

First Language_____ Other Languages_____

| English Language Test Taken (e.g. TOEFL, IBT) | Date of Test (month/year) | Overall Score | Written Score |
|---|---|---|---|
| | | | |
| | | | |

Official copy of English language proficiency test must be sent to the Registrar office when the results are available.

## 7. LETTER OF RECOMMENDATION

If you have research experience in academic institutions during the past 5 years, you are required to obtain letters of recommendation from faculty who is familiar with your study. If you have any work experience, the second recommender should be from your employer. If you have no record of employment, the second recommender should be from another academic.

**FIRST RECOMMENDER**

Name _____ Position _____

Address _____

Tel _____ Fax _____

E-mail _____

**SECOND RECOMMENDER**

Name _____ Position _____

Address _____

Tel _____ Fax _____

E-mail _____

YOU SHOULD SEND YOUR REFERENCES IN A SEALED ENVELOPE WITH YOUR APPLICATION FORM

## 8. FINANCIAL PLAN

**Who is paying your tuition?**

☐ I will pay my own fees.

☐ I have been awarded sponsorship. I will send an original document to Registrar and complete the details below.

☐ I have applied for sponsorship. Decision expected (month/year) _____

| NAME & ADDRESS OF SPONSOR | AMOUNT OF AWARD |
|---|---|
| | |
| | |
| | |

**Who is paying your living costs?**

☐ I will pay my own fees.

☐ I have been awarded sponsorship. I will send an original document to Registrar and complete the details below.

☐ I have applied for sponsorship. Decision expected (month/year) _____

| NAME & ADDRESS OF SPONSOR | AMOUNT OF AWARD |
|---|---|
| | |
| | |
| | |

*I certify that the statements made by me on this form are correct and complete. I certify that I will not be concurrently registered for another Degree of the University of Tsukuba. I understand that, if admitted to the University, the University will not be able to provide any financial assistance. To be signed and date by applicant.*

Signature _____ Date:_____

**Experiences in Public Health**

Name of Applicant: _____     Date of Birth: _____

This is to certify that the above person has engaged in the activities as follows:

| | |
|---|---|
| Name of the Institution: | |
| Current status: | |
| Duration: | From : _____ to _____ .    ( _____ years and _____ months). |
| Outline of Activities: | |
| Name and Position of Academic Advisor: | Academic Advisor: _____<br><br>Position: _____ |

Date: _____     Signature: _____

Name: _____

Title *: _____

Institution: _____

Address: _____

_____

Telephone: _____

e-mail: _____

*\* The title of the certifier should be equivalent to that of the representative of the organization.*

## Field of Study & Study Program

(1)  Describe your current field of study:

(2)  Describe your study and research you plan to pursue (use additional pages, if necessary) :

# Reference Form for Doctoral Program in Medical Sciences
**Graduate School of Comprehensive Human Sciences, University of Tsukuba**

PLEASE TYPE OR PRINT AND COMPLETE ALL SECTIONS

## TO THE APPLICANT:  APPLICANT DETAILS

**(Applicant should complete this part and submit this form to the recommender)**

Family Name _____     Middle Name _____

First (Given) Name _____     Title (Mr./Ms./Dr., etc.) _____

Date of Birth (day/month/year) _____

Program applied for: _____

## TO THE RECOMMENDER:  PLEASE COMPLETE BOTH PAGES

The above student is applying to the Graduate Program in Medical Sciences at the University of Tsukuba. To help us in the selection process, please fill out the required information.

### APPLICANT'S INFORMATION

How long have you known the applicant? _____

What is your relationship with the applicant? (e.g. student/employee) _____

### RECOMMENDER'S INFORMATION

Name _____

Position/Title _____

Organization _____

E-mail _____     Telephone _____

## ASSESSMENT

Please assess the applicant on a scale of Excellent (highest) to Poor (lowest) in relation to the following criteria. Please check the appropriate criteria.

| | Excellent | Very Good | Good | Fair | Poor | Unable to comment |
|---|---|---|---|---|---|---|
| Intellectual ability | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Written communication skills | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Oral communication skills | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Ability to meet deadlines | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Ability to organize workload | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Ability to work independently | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Numerical/mathematical ability | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| English language ability | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Motivation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| OVERALL ASSESSMENT | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## COMMENTS

We would appreciate your comments on the applicant's qualifications for graduate study in the space below. If you prefer writing with a separate recommendation letter, or need additional space, please use official letterhead stationery and mark a cross this part.

## OVERALL RECOMMENDATION

Please select one of the following:
- ☐ I strongly recommend this applicant for the program of study
- ☐ I recommend the applicant for the program of study
- ☐ I do not recommend the applicant for the program of study
- ☐ I am unable to comment

Signature _____     Date _____

**Thank you for completing this form. Please sign above and enclose this form in an envelope, seal it and return it to the applicant or send directly to the address below. You may also e-mail the signed form to iga-in@un.tsukuba.ac.jp.**

Academic Service Office for the Medical Sciences Area
University of Tsukuba
1-1-1 Tennodai, Tsukuba, Ibaraki 305-8575, Japan

# Graduate School of Comprehensive Human Sciences
# Degree Programs in Comprehensive Human Sciences

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

〈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.<br>・Functional analysis of large Maf transcription factor family, MafB and c-Maf in macrophage development and functions.<br>・Elucidating biological roles of carbohydrates using glycosyltransferase conditional KO mice.<br>・Study of diseases and drug discovery by development of novel imaging system.<br>・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.<br>② Cell-biological studies on synaptic dysfunction in schizophrenia and autism.<br>③ Studies on synaptic dysfunction caused by inflammation.<br>④ Studies on neuropsychiatric diseases caused by disrupted intracellular tranbsport. |
| Molecular and Developmental Biology | KOBAYASHI Makoto | We are studying following issues at both animal (zebrafish) and molecular levels：<br>・Mechanisms underlying the formation of hematopoietic stem cells and digestive organs<br>・Antioxidant mechanism of functional food ingredients<br>・Screen for new antioxidant food ingredients<br>・Human disease models (e.g. CDG) |

| Human Medical Biology | | |
|---|---|---|
| **Research Area** | **Faculty** | **Research** |
| Laboratory Animal Science | MIZUNO Seiya | ・Development of mouse models for human diseases<br>・Development of genome modification technology for producing mutant mice<br>・Development of mouse resource including cre-driver/reporter mice |
| Experimental Pathology | KATO Mitsuyasu | Experimental study to elucidate the roles of transforming growth factor-β-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 | ( ) | Elucidate the underlying molecular and cellular mechanisms by which TGF-β and BMP growth factor signaling pathways are corrupted in cancer, vascular and other diseases. Develop therapeutic strategies to normalize the aberrant TGF-β/BMP signaling pathways using chemical biology approaches.<br>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 | ( ) | 1. Study about molecular mechanisms of multistep carcinogenesis including precancerous or background lesions<br>2. Drug discovery for prevention, early diagnosis and therapy of carcinoma based on the genome abnormalities detected in early carcinoma<br>3. Application of fetal protein to cancer diagnosis and therapy. |
| 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. |
| 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 failed 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 cell therapy in the future.<br>2) The molecular mechanisms of cancer initiating ceells 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 emerging infectious diseases including avian influenza virus. We are also interested in the innate immune response aginst virus infection. |
| Infection Biology (Bacteriology) | MORIKAWA Kazuya | We study how pathogenic bacteria (especially, Gram positive pathgens) cope with bactericidal factors from host and environment. Main focuses are the followings:<br>- Population heterogeneity<br>- Dynamics of cellular structures: nucleoid and membrane<br>- Post-transcriptional regulation by RNA in bacteria |
| 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:<br>・Cardiovascular regulation by the central nervous system<br>・Mechanisms of the neurogenic hypertension<br>・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.<br>2. New treatment technique using an accelerator.<br>3. New technique for quality control in medical applications of radiation.<br>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.<br>- Molecular mechanism of mechanotransduction in the vessel wall.<br>- Identification of vascular wall stem cells.<br>- Molecular mechanism of growth and rupure of aortic aneurysms<br>- Identification of the niche matrix for epidermal stem cells and functional analysis. |

| 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, systemic sclerosis and rheumatoid arthritis.<br>②Molecular mechanisms of HLA and other genes associated with autoimmune rheumatic diseases |
| Genetic Medicine | 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 | 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. |

| | | |
|---|---|---|
| Environmental Medicine | MATSUZAKI Ichiyo | We study interactions between environments and human health, especially focusing on work environment.<br>・Practical research on the mechanisms of health problems caused by workplace stress factors and the risk management system<br>・International collaboration with Norwegian researchers for stress coping capacity building<br>・Research on the effects of rework program in return-to-work from depression |
| 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. |
| 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.<br><br>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:<br>(1) AI-based interpretation and prediction of genome functions<br>(2) Development of methods for analyzing single-cell and spatial omics data and their application to disease research<br>(3) Epigenome data analyses for regenerative medicine research<br>(4) Data science research on clinical information |
| International Community Care and Lifespan Development: Empowerment Sciences | ANME Tokie | (1) Community empowerment<br>(2) Plasticity of lifespan development and implications<br>(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<br>①Large-scale, forward genetic screening of genes responsible for sleep/wake regulation in mice<br>②Discovery and medicinal chemistry of novel drugs for sleep disorders<br>③Visualizig and manipulating the activity of neurons involved in sleep/wake regulation |
| Medicinal Chemistry / Organic Chemistry/ Neuropharmacology | KUTSUMURA Noriki (★) | ・Orexin receptor selective agonist/antagonist<br>・Opioid receptor selective agonist/antagonist<br>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.<br>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. |
| Biochemistry / Chemical Biology / Neuroscience Biochemistry / Chemical Biology / Neuroscience | LIU Qinghua | Integration of biochemical, chemical biological and genetic approaches to identify moleuclar mechanism of sleep and fear in mice<br>・Quantitative analyses of wild-type and sleep mutant brain proteome and phosphor-proteome to reveal the mocleular circuit of sleep<br>・Development of novel and rapid technology for adult-and brain-specific knockdown (or knockout) of candidate sleep and fear genes.<br>・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<br>2) Developing new *in vivo* imaging techqniue<br>3) Role of sleep in hippocampal cellular plasticity<br>http://iiis.php.xdomain.jp/sakaguchi/www/ |
| Systems Neuroscience/Pharmacology | LAZARUS Michael | 1) Understanding the control of sleep and wake by motivation<br>2) Sleep circuits as potential therapeutic targets for insomnia<br>3) Link between REM sleep loss and the desire for junk food<br>4) Elucidation of neural mechanisms of short-sleep<br>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. |

| Molecular Behavioral Physiology | SAKURAI Takeshi HIRANO Arisa | 1) Elucidation of the function and neural circuits that regulate sleep/wakefulness states.<br>2) Elucidation of the function and neural circuits that regulate emotion and emotional memory<br>3) Exploration of biologically active substances that regulate emotion and sleep/wakefulness states<br>4) Functional and behavioral analysis of the circadian clock system.<br>5) Analysis of the systems that regulate body temperature and metabolism |
|---|---|---|
| Electrophysiology and Molecular Biology of Sleep | HONJOH Sakiko | 1) The dynamics of thalamocortical system across sleep/wake cycles<br>2) Elucidation of neural circuits underlying NREM sleep specific EEG patterns<br>3) Analysis of vigilance state-depedent transcriptional changes<br>4) Elucidation of the function of vigilance-state specific genes in neural activity |

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

【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) | ( )<br><br>[(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.<br>#. Standardization of generation of iPS cells and maintenance of iPS cells<br>#. Researches for effective utilization of iPS cells derived from patients (which is called disease-specific iPS cells or patient-specific iPS cells)<br>#. Generation of novel cell lines such as those immortalized at the stages of hematopoietic stem/progenitor cells, erythroid progenitor cells and so on<br>#. Development of new ways for utilization of conventional human cancer cell lines using genome editing technology and so on. |
| International Medicine (NCGM) | ( )<br><br>[(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) | ( )<br><br>[(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.<br>·We study protective immune responses to flaviviruses (Zika and Dengue). |
| Protein Metabolism (TMIMS) | ( )<br><br>[(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.<br>1) Developing of state-of-the art proteomics methods for ubiquitin research<br>2) Deciphering the ubiquitin code<br>3) Elucidation of proteasome dynamics in vivo<br>4) Analysis of patient-derived proteasome mutant mice |

(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

| Clinical Pathogenesis | | |
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| 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. |
| 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(※) [ARAI Tetsuaki] | 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 |

※ This mark indicate specific supervisor.

Please write the name of supervisor mentioned in bracket as the Sub-Supervisor in the form.

| Clinical Surgery | | |
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| 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)<br>2) Development of new diagnositic marker for pancreatic cancer (bran new glycanmarkaer in serum, exosome, cell free DNA)<br>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.<br>4) Research on 1)-3) against various GI & HBP Surgery.<br>5) Precision medicine for sugegical 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 osteoarthrosis, regeneration of joint cartilage, artificial knee and hip joints and reconstruction of ligaments. |
| General Thoracic Surgery | SATO Yukio<br>ICHIMURA Hideo（※）<br><br>[SATO Yukio] | This course is programmed to investigate on<br> 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 |

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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<br>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（※）<br>MATSUMARU Yuji<br><br>［MATSUMARU Yuji］ | 1) **Neurooncology**<br>1)-1 **Neurooncology(Advanced Therapeutics):** Boron neutron capture therapy(BNCT), Proton therapy, Tumor vaccination, Gene thrapy, Photodynamic diagnosis and treatment (PDD, PDT)<br>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)<br>2) **Cerebrovascular disease:** Neuroprotection using nanoparticle and stem cell therapy for ischemic stroke. Prevention of carotid artery restenosis. Evaluation of oxidaive stress in brain.<br>3) Analysis of **cerebral function, perfusion and metabolism using neuroimaging** (functional -MRI, MR spectroscopy, diffusion tensor imaging, PET)<br>4) Neurorehabilitation using **Robot Suit HAL**, Brain machine interface<br>5) **Functional neurosurgery** for epilepsy, involuntary movement, central pain and Headache<br>6) **Gene therapy and regeneration therapy** using DDS (Angiogenesis, bone regeneration)<br>7) **Pediatric Neurosurgery:** Epigenetic biomarkers from woman with neural tube defect affected pregnancies<br>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<br>YANAGAWA Toru（※）<br><br>［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. |

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

| Clinical Medicine | | |
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| Research Area | Faculty | Research |
| Gastroenterology | ( ) | The present course provides the novel diagnostic and therapeutic approaches for the gastrointestinal disorders. The goal of this course is to clarify the pathogensis and to develop the new treatment in gastrointestinal, hepatobiliary, and pancreatic cancer and inflammatory diseases. |
| Biomedical Informatics and Management | OHARA Makoto | ① Research for standardization and interoperability of medical information<br>② Research for medical safety, patient safety, and quality of medical care.<br>③ Epidemiological and clinical research using DWH of EHR.<br>④ Research for the mechanism of medical care itself |
| Molecular Sportology | TAKEKOSHI Kazuhiro | ① Personalized treatment for exercise through using genetic infomation<br>② Research for anti-doping<br>③ Exercise and hormone, especially catecholamine<br>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(※)<br><br>[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 | ( ) | 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. |
| 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. |

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| 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. |
| Metabolism and Endocrinology | SHIMANO Hitoshi YAGYU Hiroaki(※) MATSUZAKA Takashi<br><br>[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<br>1. Investigate the physiologic and pathologic processes of growth and development in terms of molecular mechanism in embryogenesis, differentiation, apoptosis and regeneration.<br>2. Create methods on the basis of the above results to improve human health and control diseases.<br>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.<br>2. Molecular investigation of pathogenic and drug-resistant factors of microorganisms.<br>3. Evaluation of precautions against transmissible infections diseases.<br>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. |

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| Social Medicine | | |
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| 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 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 |
| 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 |

【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) | (　　　　　) <br><br> [ (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) | (　　　　　) <br><br> [ (Sub) CHIBA Shigeru ] | 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 glyccomics 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) | (　　　　　) <br><br> [ (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 *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. |

(API)＝Astellas Pharma Inc
(AIST)＝National Institute of Advanced Industrial Science and Technology
(Eisai)＝Eisai Co. Tsukuba Research Laboratories