

An Outline of
Niigata University

School of Medicine, Faculty of Medicine

Graduate School of Medical and Dental
Sciences (Medicine)

2022 – 2023



CONTENTS

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| ◆ PHILOSOPHY AND GOAL IN EDUCATION | 1 |
| ◆ Living Up to Society's Expectations SOMEYA Toshiyuki Dean, School of Medicine, Niigata University | 2 |
| ◆ Fostering Leaders in Advanced Biosciences and Highly Specialized Medical Personnel to Move Advanced Medicine Forward NAKAMURA Kazutoshi Director, Graduate School of Medical and Dental Sciences, Niigata University | 3 |
| ◆ ORGANIZATION | 4 |
| ◆ THE SIX-YEAR MEDICAL PROGRAM | 5 |
| ◆ HISTORY | 6 |
| ◆ FIELD INTRODUCTION | 8 |
| ◆ INTERNATIONAL EXCHANGE | 26 |
| ◆ PROJECTS | 28 |
| ◆ DATA | 30 |
| ◆ BUILDING LAYOUT | 33 |





PHILOSOPHY AND GOAL IN EDUCATION

Philosophy

Contribute to human well-being through medical science

Goal

Develop human resources that

1. contribute holistic medical care with rich humanity and high ethical nature
2. contribute as a leader of highly specialized medical teams
3. contribute as medical researchers and educators with a wide perspective and great interest in learning
4. contribute to health, medical care, social well-being and welfare administration
5. contribute to local health care and global medical activities
6. maintain inquiring minds, research minds, self-learning attitudes continuously



Contents and Features in Education

The Medical Program in the School of Medicine educates future medical practitioners and researchers who will be involved in fields related to medical science. In addition to providing students with sufficient knowledge, we also help them become doctors with rich humanity and high ethical nature, and we implement the following professional education in order to contribute to human well-beings through medicine:

- an integrated educational program from fundamental to clinical medicine in accordance with international standards
- the introduction of active learning in the curriculum for all students
- a medical research practicum to experience cutting-edge medical research
- participation-style training (clinical clerkship) for diagnosis and treatment where students learn from primary care to highly advanced medical technology by joining medical teams at the Niigata University Medical and Dental Hospital and the affiliated hospitals
- an international exchange program to foster international sense (English conversation, short periods of study abroad, etc.)



We Expect Our Students to

- be strongly interested in study and scientific research in order to become good medical practitioners and researchers
- have good educations and kind hearts and act in harmony with others
- think broadmindedly and have positive attitudes

Living Up to Society's Expectations

SOMEYA Toshiyuki

Dean

School of Medicine, Niigata University



Our medical program has been pursuing medical education and research for more than a hundred years since our foundation. Our history can be traced back to 1910, when National Niigata Medical College was founded. In 1922 we became National Niigata Medical University, which was the sixth national university school of medicine; in 1949 we became Niigata University School of Medicine as we are known today. In 2020, we celebrated the 110th anniversary of our founding. Our school has more than 10,000 alumni; many of them are doctors and researchers involved in medical science at the international level. Taking pride in our traditions, we must steadily work to continue to create history.

—A new approach for the School of Medicine—

Niigata University School of Medicine has been implementing changes within the School such as systematically improving the undergraduate and graduate schools, acquiring personnel, obtaining the certificate for the assessment of medical education in accordance with international standards, designing a new curriculum and furthering international exchange programs. Nevertheless, the environment for all the universities in Japan is becoming more and more challenging so as to make this work seem insufficient.

We must take this difficult situation, in which universities are now placed, as an opportunity for new development, and discover a new image of a school of medicine that meets societal expectations. We should use the potential of a medical school to elevate medical standards and innovate here in Niigata. Obtaining financial support from society at large is also necessary. Therefore, bilateral cooperation between the Faculty of Medicine and the Medical and Dental Hospital becomes increasingly important. For our School of Medicine to develop into the next age, we must face and address such numerous problems day by day, working to solve them and improve our program.

—To foster young power for the future—

Under the educational philosophy of contributing to human well-being through medical science, our School of Medicine has been educating young medical practitioners and researchers. We have established an environment where we can educate students having sufficient knowledge, inquiring minds, education and humanity to become medical professionals who can pursue all medical areas of expertise: clinical areas, medical research and medical administration. The following are our six educational goals:

We develop professionals who

1. contribute holistic medical care with rich humanity and high ethical nature.
2. contribute as a leader of highly specialized medical teams.
3. contribute as medical researchers and educators with a wide perspective and great interest in learning.
4. contribute to health, medical care, social well-being and welfare administration.
5. contribute to local health care and global medical activities.
6. maintain inquiring minds, research minds, self-learning attitudes continuously.

The Faculty of Medicine, School of Medicine contributes to

the improvement of regional medicine, health, and welfare by focusing not only on clinical medicine but also on preventive medicine, while collaborating with social resources such as medical institutions, medical associations, and administrative agencies in the local community. Based on our experience with disasters and new coronavirus infections, we are also working to train doctors who have the comprehensive medical skills that are essential for society in the future as well as doctors with social medical skills who understand the imbalance between insurance and medical needs and resources in each region and work to solve them through multidisciplinary collaboration including the government.

In addition, we are expanding our activities overseas. We are conducting exchanges in medical science and medical care with Europe, the United States, countries around the Sea of Japan rim and other Asian countries. International Student Week, exchange among medical students, is held in summer by student volunteers as well as providing opportunities for medical research training and clinical training for students in Europe, the United States, and Asia.

We hope the students studying at the Faculty of Medicine in the Niigata University School of Medicine will learn cutting-edge advanced medical care and community medicine in this blessed environment of Niigata, set high ambitions with a global perspective, work hard together and aim to be professionals who can contribute to society through medical science and medical care.

—Gazing into the future of medicine—

Niigata University also has the Graduate School of Medical and Dental Sciences, enabling our alumni and others to continue their studies and research.

In research, we have achieved promising results in many areas, including studies in cerebral nerves, kidneys, cancer, circulatory organs, digestive organs, cytobiology and infectious diseases and so on. Our research and results are internationally well-known and respected. Some of our achievements are introduced on the website of Niigata University School of Medicine.

We encourage students to study at the Graduate School of Medical and Dental Sciences after finishing the School of Medicine. Through research we can learn much that is helpful when we work as clinicians.

—Mission and community—

The mission of a university naturally includes education, research and contribution to society. Niigata University School of Medicine emphasizes medical practice rooted in Niigata, fostering the ability to work and learn in the world, and expanding into the global community.

In the midst of the current times where competition and evaluation predominate, we describe a picture of the future to realize our wishes. We face difficult conditions, but we hope our students will devote themselves to their studies and research with pride, determined to search for a way to a hopeful future. We sincerely hope Niigata University School of Medicine enjoys the confidence and love of the people in our community.

Fostering Leaders in Advanced Biosciences and Highly Specialized Medical Personnel to Move Advanced Medicine Forward

NAKAMURA Kazutoshi

Director

Graduate School of Medical and Dental Sciences, Niigata University



Niigata University's Graduate School of Medical and Dental Sciences has integrated medical and dental departments, which has eliminated the walls between conventional medical and dental departments and courses. Education and research respond to environmental changes that surround medical and health care. The school focuses on educating highly specialized medical personnel such as researchers who will focus on advanced bioscience research in the 21st century, doctors and dentists who will provide advanced medical care due to this research, and public health practitioners who will provide preventive medicine in the community and international society.

The Graduate School of Medicine consists of three departments, and provides education and research guidance for graduate students under the following features and educational philosophy:

1. Molecular and Cellular Medicine Program: Researches and analyzes diseases using molecular cellular biology. Develops preventive methods and treatments for diseases. We foster advanced bioscience researchers and highly specialized medical personnel involved in molecular cell medicine.
2. Bio-functional Regulation Medicine Program: Comprehends the living body synthetically from the perspective of the organs. Researches and analyzes biological functions and pathological conditions. Develops preventive methods and treatments for diseases. We foster advanced bioscience researchers and highly specialized medical personnel involved in bioregulatory medicine.
3. Regional Disease Control Medicine Program: Researches and analyzes diseases in relation to society, time and space. Develops prevention and control methods for regional diseases corresponding to the low-birthrates, aging society and information society. We foster advanced bioscience researchers and highly specialized medical personnel involved in community disease control.

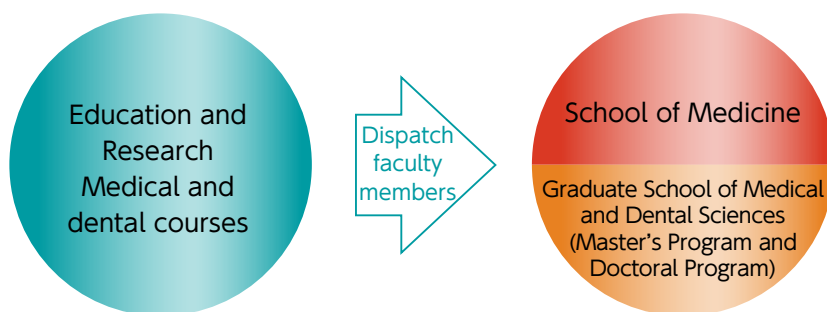
Distinctive research areas of our medical research school include neurology and brain research, kidney research, big data and artificial intelligence (AI), and global health. With regard to neuro/brain research, many basic and clinical courses in a wide range from basic research in neuroscience to disease are conducted in collaboration with the Brain Research Institute, the only national university corporation affiliated with Niigata University. Regarding kidney research, Kidney Research Center affiliated with the Graduate School (Basic research division: Molecular Kidney Pathology; Clinical research divisions: Kidney and Collagen Disease Medicine; Pediatric Research, Kidney and Urology; Collaborative research divisions: Functional Molecular Medicine, Pathological Nutrition, Biofluid Biomarker Center) is conducting basic and clinical research on kidney disease. In addition, big data research aimed at the prevention and treatment of chronic diseases is being conducted mainly through the Medical AI Center, and international healthcare research aimed at combating infectious diseases around the world is also being vigorously pursued.

As part of our international exchange and contribution, we welcome international students from many countries. Among those countries, Niigata University has been promoting medical exchange with Russia for more than 20 years due to our geographical closeness. We both welcome international students and send our students abroad through double degree programs and short-term study abroad programs with Russian medical universities.

We are working to foster many leaders to spearhead advanced biosciences and highly specialized medical personnel who will contribute to the local and international communities based on the education and research at our graduate school.

ORGANIZATION

Our university has the Education and Research Institute. All faculty in charge of the undergraduate and graduate schools are members of the Institute, which dispatches faculty to the undergraduate and graduate schools to teach and research.



School of Medicine Courses

| Field | Representative teacher | |
|-------------------------------------------------|------------------------|----------------------|
| ● Anatomy | Professor | SATO Noboru |
| ● Neurobiology and Anatomy | Professor | TAKEBAYASHI Hirohide |
| ● Microscopic Anatomy | Professor | SHIBATA Shinsuke |
| ● Neurophysiology | Professor | HASEGAWA Isao |
| ● Developmental Physiology | Professor | SUGIYAMA Sayaka |
| ● Omics and Systems Biology | Professor | MATSUMOTO Masaki |
| ● Neurochemistry and Molecular Cell Biology | Professor | IGARASHI Michihiro |
| ● Pharmacology | Professor | HIRASHIMA Masanori |
| ● Molecular Pathology | Professor | KONDO Eisaku |
| ● Bacteriology | Professor | MATSUMOTO Sokichi |
| ● Virology | Professor | FUJII Masahiro |
| ● Preventive Medicine | Professor | NAKAMURA Kazutoshi |
| ● International Health | Professor | SAITO Reiko |
| ● Immunology and Medical Zoology | Professor | KATAKAI Tomoya |
| ● Forensic Medicine | Professor | TAKATSUKA Hisakazu |
| ● Cellular Physiology | Professor | KANKI Tomotake |
| ● Cardiovascular Medicine | Professor | INOMATA Takayuki |
| ● Hematology, Endocrinology and Metabolism | Professor | SONE Hirohito |
| ● Respiratory Medicine and Infectious Diseases | Professor | KIKUCHI Toshiaki |
| ● Gastroenterology and Hepatology | Professor | TERAI Shuji |
| ● Psychiatry | Professor | SOMEYA Toshiyuki |
| ● Pediatrics | Professor | SAITOH Akihiko |
| ● Digestive and General Surgery | Professor | WAKAI Toshifumi |
| ● Thoracic and Cardiovascular Surgery | Professor | TSUCHIDA Masanori |
| ● Orthopedic Surgery and Rehabilitation | Professor | KAWASHIMA Hiroyuki |
| ● Plastic, Reconstructive and Aesthetic Surgery | Professor | MATSUDA Ken |
| ● Pediatric Surgery | Professor | KINOSHITA Yoshiaki |
| ● Dermatology | Professor | ABE Riichiro |
| ● Urology | Professor | TOMITA Yoshihiko |

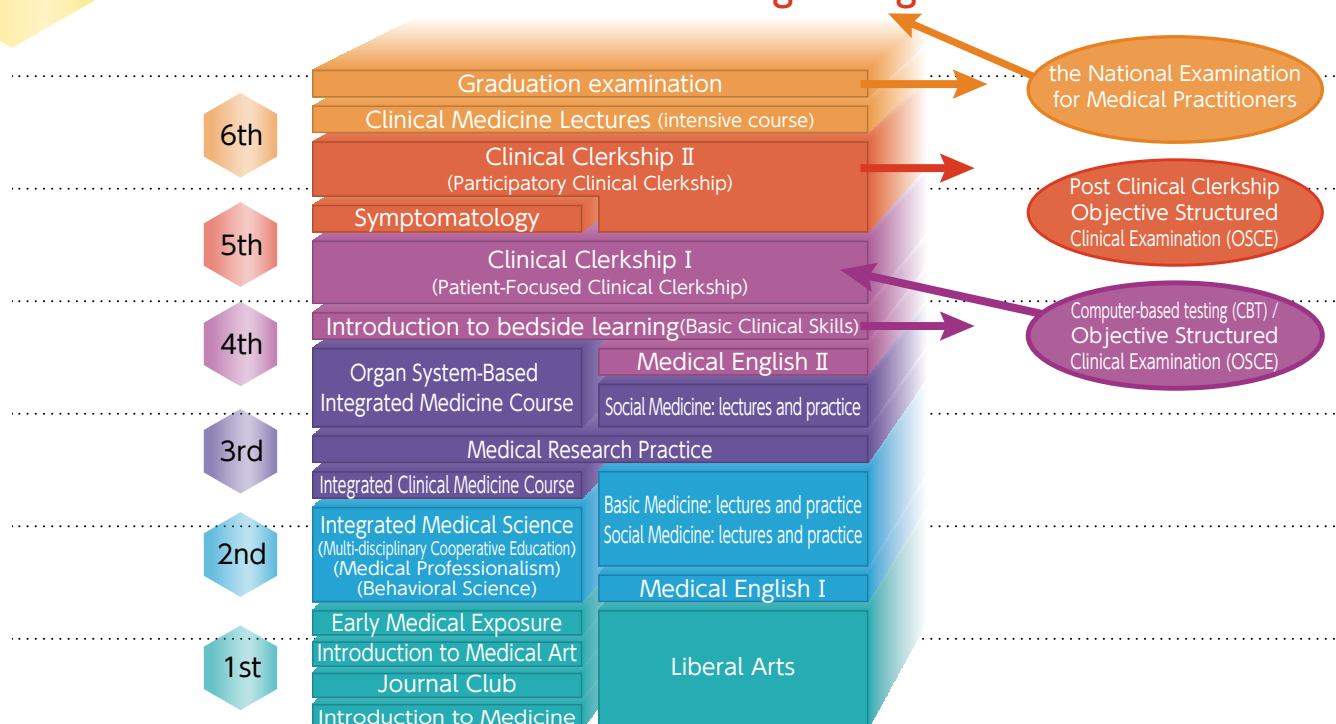
| Field | Representative teacher | |
|-----------------------------------------------------------------|-----------------------------------------|--------------------|
| ● Ophthalmology | Professor | FUKUCHI Takeo |
| ● Otolaryngology - Head and Neck Surgery | Professor | HORII Arata |
| ● Radiology and Radiation Oncology | Professor | ISHIKAWA Hiroyuki |
| ● Obstetrics and Gynecology | Professor | YOSHIHARA Kosuke |
| ● Anesthesiology | Professor | BABA Hiroshi |
| ● Emergency and Critical Care Medicine | Professor | NISHIYAMA Kei |
| ● Medical Oncology | Professor | SAIJO Yasuo |
| ● Clinical Pathology | Professor | AJIOKA Yoichi |
| ● Neurosurgery(Brain Research Institute) | Professor | FUJII Yukihiko |
| ● Neurology(Brain Research Institute) | Professor | ONODERA Osamu |
| ● Cell Biology(Kidney Research Center) | Professor | KAWACHI Hiroshi |
| ● Clinical Nephrology and Rheumatology (Kidney Research Center) | Professor | NARITA Ichiei |
| ● Bioinformatics(Medical AI Center) | Professor | OKUDA Shujiro |
| ● Medical Education Center | Professor | SOMEYA Toshiyuki |
| ● Disaster Medical Education Center | Specialty Appointed Prof. | TAKAHASHI Masashi |
| ● Myanmar Infectious Disease Research Center | Professor | SAITO Reiko |
| ● Histopathology Core Facility | Professor | AJIOKA Yoichi |
| ● Niigata Regional Medical Support Center Medical Branch Office | Specialty Appointed Assistant Professor | MIZUSAWA Takeshi |
| ● Cause of Death Education Center | Professor | TAKATSUKA Hisakazu |
| ● Center for Research Promotion | Professor | SOMEYA Toshiyuki |
| ● General Medicine | Specialty Appointed Prof. | KAMIMURA Kenya |

● Administration Office

- Academic Planning Section
- General Affairs Section
- Accounting Section
- Student Affairs Section
- Entrance Examination and Clinical and Practicum Section

THE SIX-YEAR MEDICAL PROGRAM

Contribute to human well-being through medical science



Medical Education Program of Niigata University was accredited by the Japan Accreditation Council for Medical Education (JACME) in 2013. At the beginning, JACME was consisted of Six Medical Universities, Niigata University, Tokyo Medical and Dental University, the University of Tokyo, Chiba University, Tokyo-Jikeikai Medical University, and Tokyo Women's Medical University. The accreditation was supported partly by the Grant of Ministry of Education, Culture, Sports, Science and Technology, Japan. JACME was certificated to be the agency to perform accreditation of Medical Education by the World Federation of Medical Education (WFME) on March 2016 and the Medical Education Program of Niigata University School of Medicine was accredited to satisfy the standards for Basic Medical Education by JACME on April 2017.

At the accreditation, expertise of JACME suggested following eight issues to be solved:

- (1) Introduction of outcome-based medicine.
- (2) Cooperation between faculty of preparatory education and faculty of medical education.
- (3) Harvesting competency of medical research for students.
- (4) Vertical integration of basic and clinical medicine.
- (5) Introduction of behavioral science and interprofessional education.
- (6) Introduction of more than two years of clinical clerkship where students join professional team and round core disciplines of medicine, surgery, pediatrics, OB-GYN, psychiatry, and general practice/family medicine.
- (7) Introduction of the post-clinical clerkship OSCE (Post-CC OSCE).
- (8) Introduction of formative assessment of clinical clerkship such as port-folio, etc.

We started new curriculum since 2014. Specific changes of the new curriculum we made according to the suggestions are

as follows:

- (1) Based on outcome-based medicine, faculties of preparatory course and medical course communicate more frequently than before. At the same time, students can choose German, French, Russian, Chinese, Italian, Spanish and Korean as second language. We also start "Introduction to Medical Science" for the Year 1 students to enhance students' motivation for medicine.
- (2) In order to harvest competency of medical research for students, we moved "Medical Research Practice" from Year 4 to Year 3 to provide students with longer research time until graduation.
- (3) Vertical integration of basic and clinical medicine for Year 2 students with active learning such as problem-based learning (PBL) and team-based learning (TBL). Students learn behavioral science and Interprofessional medicine by active learning.
- (4) The clinical clerkship is performed between January of Year 4 and July of Year 6. The entire training period has been extended from 52 to 66 weeks. Year 5 students round core disciplines of medicine, surgery, pediatrics, OB-GYN, and psychiatry three weeks, respectively. Students join as member of professional team, communicate and investigate patients, check data of patients, and attend conference to discuss patient diagnosis and treatment. Students write electrical records of the patients and electrical port-folio everyday. Students are assessed by faculty formatively and summatively during clinical clerkship.
- (5) Implementation of post-clinical clerkship OSCE trial in 2016 and common achievement test organization (CATO) Post-CC OSCE trial in 2017. Students are mandatory to pass Post-CC OSCE at graduation since 2017.

Medical education of Niigata University will be accredited again until March 2022.

HISTORY

Before National Niigata Medical College

- 1869 A pharmaceutical institution (Shiran Pharmaceuticals) and a vaccination center (Niigata Prefecture Medical Office) were established on the grounds of Shofuku-ji Temple located in Gono-cho (present Nishibori-dori 7), Tera-machi, Niigata City (May 12)
- 1870 Niigata Temporary Hospital (Kyoritsu Hospital) established
- 1873 Opened Niigata Hospital at Yoko-sanban-cho, Niigata
- 1876 Control of Niigata Hospital transferred to Niigata Prefecture and renamed Niigata Prefectural Hospital Medical School
- 1879 Niigata Prefectural Hospital Medical School changed its name to Niigata Prefectural Medical School (B-type Medical School)
- 1883 Renamed Prefectural A-type Niigata Medical School
- 1888 Abolished Prefectural A-type Niigata Medical School

1910

National Niigata Medical College established (April 6)

The college received 728 applications by the end of May, which was the application deadline. The inaugural class of 70 students was admitted after the entrance examination.



Niigata Medical College from the 1914 graduation album



Graduation album of 1915

1915

Dr. Hideyo Noguchi visited our school and lectured (October)



Doctors



A lecture by Dr. Hideyo Noguchi from the 1916 graduation album

1922

National Niigata Medical College became the National Niigata Medical University

1923

Niigata Medical University Relief Team formed after the Great Kanto Earthquake and the team visited Tokyo to provide relief

1939

The four-year Temporary Medical Specialty Department affiliated with Niigata Medical University was established in accordance with Royal Decree No. 315

1944

Renamed as an affiliated Medical Specialty College on March 31 in accordance with Royal Decree No. 200

1947

Emperor Showa (Hirohito) visited our university (Professor Tatsuji Ito and Professor Yasuichi Ito lectured about scrub typhus and Professor Mizuho Nakada about brain tumors)

1949

Niigata University (Faculty of Humanities, Education, Science, Medicine, Engineering and Agriculture) was established in accordance with the proclamation of the National School Establishment Act (Law No. 150 of 1949)



Nippori Nagaku-yama Hongyo-ji Temple from the 1924 graduation album



Emperor's visit from the 1950 graduation album

- 1955** The first 98 students graduated from Niigata University School of Medicine (March)
- 1956** Outpatient building (4-story reinforced concrete) of affiliated hospital was completed
- 1960** The 50th anniversary of Niigata University School of Medicine
- 1967** Niigata University Brain Laboratory established (April)
- 1973** Affiliated Kidney Research Center and affiliated Animal Laboratory Facility of Niigata University School of Medicine established (April)
- 1982** The current affiliated Asahi-machi library branch completed
- 1985** The 75th anniversary of Niigata University School of Medicine
The Yujin Memorial Hall completed as part of the 75th anniversary commemoration project
- 1999** Department of Health Sciences of Medical School established (October)
- 2001** Graduate School of Medical and Dental Sciences established (April)
- 2003** Niigata University Medical and Dental Hospital established (October 1)
- 2004** Became the Niigata University, National University Corporation in line with National Corporation Law
- 2005** New building of Medical and Dental Hospital completed (August)
- 2010** The 100th anniversary of Niigata University School of Medicine
- 2012** Outpatient building of Medical and Dental Hospital completed (April)
- 2014** Redevelopment project of Medical and Dental Hospital completed (June)



Graduation photo from the 1955 graduation album



Affiliated hospital from the 1956 graduation album



Yujin Memorial Hall from the 1990 graduation album



FIELD INTRODUCTION

Anatomy

Professor SATO Noboru

We have active research programs with area of morphogenesis and provide education programs in human gross anatomy through osteology and dissections.

We are researching morphogenesis from the embryological perspective. Neurons go through a series of processes such as production, migration, differentiation, and cell death to form initial neural circuits. We are studying this phenomenon in central and peripheral nerves. We also conduct comparative anatomical analysis of the musculoskeletal formation of the trunk and limbs and study the evolution of vertebrates. Using experimental model animals such as genetically modified mice, birds, and small fish, we study making full use of morphological research methods as well as advanced molecular biological methods. In terms of education, we handle general anatomy and gross anatomy, and we conduct osteology and human anatomy training. We also handle the work related to body donation, which is indispensable for this education. We cooperate with the Niigata White Chrysanthemum Association, a philanthropist group, to receive dissected bodies from the Niigata University School of Medicine and Dentistry and on related events. We interact with the general public, such as medical students, philanthropists, and their families, through anatomy education.



Neurobiology and Anatomy

Professor TAKEBAYASHI Hirohide

We are investigating the developmental mechanism of the nervous system and the pathophysiology of intractable neurological diseases. We are also trying to develop treatment methods for the neurological diseases.

The nervous system develops under the influence of both genetics and the environment. One of our goals is to elucidate the mechanism of development of this complex and sophisticated nervous system. In the developing brain, neural stem cells give rise to neurons and subsequently glial cells. These cells form neural circuits while migrating and differentiating. After birth, the brain develops, receiving information from the sensory organs. In the nervous system, many intractable neurological diseases are caused by abnormalities in neurons and glial cells. We promote research on the

pathogenesis of these intractable neurological diseases and the developmental mechanisms of the nervous system, fully using experimental methods at the molecular, cellular, and individual levels. The knowledge obtained in neurodevelopment can be applied to regenerative medicine, and we are also focusing on developing treatment methods for intractable neurological diseases. International students also enroll. We are committed to creating a research environment where lab members can learn and progress daily. Medical school education also includes embryology and neuroanatomy.



Microscopic Anatomy

Professor SHIBATA Shinsuke

We are trying to reveal the detailed structure and function of the cells and the tissues by using various kinds of cutting-edge microscopic technology, including electron microscope and light microscope.

We are researching to visualize the structure and function of biological samples by imaging them in our laboratory. We use microscopes for observation and develop sample preparation methods for optimal imaging in our research. Optical microscopes, including stereomicroscopes, fluorescence microscopes, and super-resolution microscopes beyond the resolution limits of light, are used to visualize specific molecules along with general histological structural analysis. Among electron microscopes that use electron

imaging with much higher resolution than light, transmission electron microscopes can observe the fine internal structure of samples such as cells and tissues, and scanning electron microscopes can observe the fine surface morphology of samples. Combining molecular biological approaches using light microscopy with very high-resolution imaging techniques using transmission electron microscopy and scanning electron microscopy provides a comprehensive understanding of cells and tissues as well as providing possibilities to apply to structural analyses in a wide range of fields. We are conducting numerous joint research projects with researchers around the world by applying these cutting-edge imaging technologies.



Neurophysiology

Professor HASEGAWA Isao

We aim at clarifying physiological mechanisms by which the cerebral network produces intelligence.

Where does our intelligence come from? We aim at clarifying the physiological mechanisms of the global brain network creating human intellectual abilities such as visual imagery, linguistic comprehension, and social interactions. To achieve this goal, we generate scientifically verifiable hypotheses on the higher-order brain functions with unique primate/rodent animal-model paradigms, and empirically test the hypotheses by physiological recording of the global brain network activity with a millisecond time resolution. To capture the brain-wide neural activity, we have specifically developed a flexible mesh electrocorticographic (ECoG) electrode array and minimally-invasive surgical procedures to gently place it on the brain surface. Researches of heterogeneous backgrounds such as animal neurophysiology, engineering, and clinical medicine work together to promote interdisciplinary medical-engineering collaborating projects.



Developmental Physiology

Professor SUGIYAMA Sayaka

We decipher the mechanism by which children's brains grow flexibly from the functional analysis of genes and neural networks.

The brain is one of the most incomprehensible organs for humans even though it is part of the human body. How do people see the scenery, how do they feel likes and dislikes, how do they remember, and how do they develop their individuality? All the answers are in your brain.

Can babies see and feel? When asked, many students answered that they were the same as adults. In fact, the baby's brain is immature; brain growth is greatly influenced by the surrounding environment and experiences. The experience of listening and speaking is necessary for mastering your native language, and the experience of seeing is also important for improving your eyesight. The time when the neural network of the brain grows significantly by absorbing experiences is called the critical period. There are many unknowns in the mechanism of the critical period. In our laboratory, we analyze the genes necessary for the critical period and the function of the neural network created during the critical period by fully using molecular biology, histology, and physiology, and clarify the growth mechanisms of vision and emotion.

Recently, there has been talk about an increase in mental disorders such as autism. Miswiring of neural networks as the brain develops predisposes us to mental illnesses. If we can understand the mechanism of flexible wiring of neural networks, our research is expected to be useful in the treatment of brain diseases.



Omics and Systems Biology

Professor MATSUMOTO Masaki

We are working to understand the operating principles of life systems through exhaustive protein analysis.

Proteins are important functional elements involved in all biological phenomena. Our laboratory has developed techniques for comprehensively and quantitatively measuring protein expression levels, post-translational modifications, and protein-protein interactions, and has applied them to research on diseases such as cancer. We have developed technologies related to high-throughput and functional

proteomics, including IMPAQT, our original platform for protein absolute quantification. Using these technologies, we are researching basic medical issues such as cancer and aging. Our laboratory gathers researchers with diverse backgrounds; by cooperating, we are rising to the challenge of new life science research that could not be achieved by conventional methods.



Neurochemistry and Molecular Cell Biology

Professor IGARASHI Michihiro

We are tracking the molecular mechanisms involved in nerve growth and axon regeneration, by utilizing new technologies.

We are investigating the molecular basis that supports the function of growth cones (structures with high motility formed at the tips of the projections of developing neurons), which are essential structures for nerve growth and regeneration, and we have clarified the following:

- 1) We are investigating the characteristics the major molecular constituents in the growth cone.
- 2) Using a super-resolution microscope (a fluorescence microscope that can analyze the behavior of molecules that cannot be seen with a normal microscope), we demonstrated that there is new movement linked to the membrane and the cytoskeleton in the most mobile part of the growth cone.
- 3) Using a new technology called phosphoproteomics, we demonstrated that there are specific phosphorylation (modification) sites of proteins in growth cones, and that specific antibodies against new phosphorylation sites can serve as molecular markers for nerve growth and regeneration.
- 4) We discovered that a special membrane structure called a lipid raft is involved in the projection formation (polarity formation) of neurons, and that the molecular groups necessary for polarity formation gather here all at once, resulting in speedy formation.

We are currently analyzing the role of these phosphorylation in nerve growth, the significance of lipid synthesis, and the role of organelles.

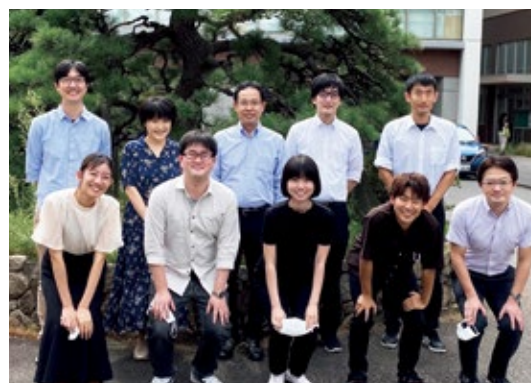


Pharmacology

Professor HIRASHIMA Masanori

We are studying molecular mechanisms underlying the formation and maintenance of the vascular system.

The vascular system comprises blood vessels and lymphatic vessels, which efficiently transport cells and substances to serve as a lifeline throughout the body. Blood vessels are known to be essential for sustaining life, but much is unknown about lymphatic vessels. Therefore, their role in the onset and progression of diseases such as lymphedema (swelling), Alzheimer's disease, and glaucoma is expected to be elucidated. In our laboratory, we are studying molecular mechanisms of lymphatic vascular development, using transgenic mice generated by CRISPR/Cas9 genome editing. We are also studying the relationship between abnormal embryonic vascular development and the risk of developing diseases later in life, and the blood vessels and lymphatic vessels associated with tumors. These studies are conducted in collaboration with experts in various fields both on and off campus.



Molecular Pathology

Professor KONDO Eisaku

We promote the comprehensive pathology for the future medicine with two pillars: Advanced Molecular Tumor Pathology; innovative research for Novel Diagnostic and Therapeutic Technology.

The course specializes in tumor pathology, and the basic pathology field promotes research to elucidate the key molecular mechanisms of invasion and metastasis of malignant tumors, mainly focusing on intractable cancers, for clinical diagnosis and application. Remembering that elucidating the mechanisms of tumor resistance against advanced drugs is also an important issue, we have created a practical pathological research system that integrates molecular and histopathological analyses. Our goal is to find clues for overcoming cancer that can be applied to clinical practice. With the aim of applying the research to cancer therapeutics, all members are working together to implement a variety of approaches, such as non-invasive cancer imaging/therapy technology using tumor-homing peptides as an innovative medical technology for next generation tumor medicine. We believe this research is quite unique in pathological department. Our department aims advanced and comprehensive tumor pathology through crosstalk with the forefront of cancer medicine in the 21st century.



Bacteriology

Professor MATSUMOTO Sokichi

Analysis of pathogenicity and longevity of tubercle bacillus, mycobacteriosis treatment, diagnostic methods and vaccine development.

COVID-19 has caused serious damage. However, one infectious disease causes the same amount of damage every year and has claimed the lives of one billion people, the highest number ever: tuberculosis. In contrast to the eradication of diseases such as smallpox that rivaled tuberculosis, once tuberculosis breaks out, no country is able to eradicate it. A certain number of patients always occur (10 million cases annually) with asymptomatic infections among two billion humans. We are researching, believing that vaccination preventing the onset of tuberculosis and discovering a drug to kill the dormant bacteria that infect humans widely will control tuberculosis. Nontuberculous mycobacterial infection (NTM), which resembles tuberculosis, is intractable and has recently been assumed to be an intractable disease. We are also researching countermeasures against NTM. We are trying to find out the secret of longevity common to living things from the longevity of mycobacteria. Our department has a BSL3 laboratory and is characterized by being able to carry out genetic recombination of *Mycobacterium tuberculosis*, an experiment approved by the Minister of Education, Culture, Sports, Science and Technology within the classroom. Using cutting-edge tools, we approach the biological phenomena of bacteria, and based on that, we research to suppress intractable diseases.



Virology

Professor FUJII Masahiro

We elucidate the pathogenic mechanism of neurodegenerative diseases and leukemia caused by viruses and develop therapeutic medication.

We aim to elucidate the pathogenesis of viral and non-viral neurodegenerative diseases and develop therapeutic agents for them. As for non-viral diseases, we are working to elucidate the pathogenesis of Alzheimer's disease (AD), Parkinson's disease (PD), and amyotrophic lateral sclerosis (ALS). Pathogenic proteins (tau, α -synuclein, TDP-43) form aggregates that are toxic to neurons and cause disease in AD, PD, and ALS. We identified the protein USP10 as a factor that induces the

formation of pathogenic protein aggregates in AD, PD, and ALS. We are analyzing the pathology of AD and ALS using AD and ALS model mice and USP10 knockout mice. We are also developing therapeutic agents that target USP10. As for viral diseases, we are working to elucidate the pathogenesis of neurodegenerative diseases caused by herpes simplex virus, coxsackievirus, and human T-cell leukemia virus type 1. USP10 is also involved in the pathogenesis of viral neurodegenerative diseases.



Preventive Medicine

Professor NAKAMURA Kazutoshi

We are conducting researches to prevent age-related diseases such as dementia and osteoporosis to extend healthy life spans.

Our primary research studies are the Murakami Cohort Study and dementia omics study. The Murakami Cohort Study is a long-term longitudinal follow-up of approximately 14,000 local residents. We are searching for environmental factors related to age-related diseases, such as dementia and osteoporosis. We also use preserved biological samples to measure vitamin D and try to apply it for disease prevention. Dementia omics research is the world's first research aimed at



International Health

Professor SAITO Reiko

We are investigating respiratory viruses such as SARS-CoV-2 and influenza in Japan and Myanmar.

We are developing the "Research on Influenza-like Diseases and Pediatric Meningoencephalitis in Myanmar," was funded by the AMED Emerging and Re-emerging Infectious Diseases Research Platform Creation Project, which is the only overseas research base of Niigata University. By using a next-generation sequencing, we analyze the whole genome of SARS-CoV-2 and investigate what kind of variants are prevalent in Japan and Myanmar. We found that COVID-19 vaccination can prevent the rate of infection and aggravation after collecting the data in Niigata Prefecture. To know the extent of the COVID-19 epidemic, we evaluated the effective reproductive number, and applied it for infectious disease control in Niigata Prefecture and Myanmar. We are also investigating an antibody titer for COVID-19 in medical workers and in facilities for the elderly. Regarding influenza, we are investigating with the cooperation of clinicians nationwide about the prevalence of influenza virus, drug-resistant viruses, and also antibody titers after influenza vaccination. We are also collecting specimens from all over the country for respiratory syncytial virus, which causes common cold in infants, and analyzing virus genes to find out what kind of respiratory syncytial virus is prevalent in each region.



Immunology and Medical Zoology

Professor KATAKAI Tomoya

Immune response in immune organs such as lymph nodes, immune cell function and motility, and molecular mechanism of stromal cells and tissue microenvironment formation.

The immune system is an essential physiological system for protecting our bodies from pathogens and foreign substances and preserving our lives. However, other than infectious diseases, it is deeply related to diseases such as allergies, autoimmune diseases and cancer. In this laboratory, we research the interaction between immune cells and stromal cells in the tissue microenvironment with centering on the structure and function of immune organs such as lymph nodes, which are necessary for the acquired immune system that is responsible for the immunological memory to work efficiently. Particularly using the latest imaging techniques, we are pursuing the relation between the migration or localization of immune cells and the tissue environment, focusing on the dynamic behavior of the immune system.



Forensic Medicine

Professor TAKATSUKA Hisakazu

We are working together with the Center for Cause of Death Investigation on practice and research in a wide range of fields related to forensic medicine.

In forensic medicine, we research in a wide range of fields deeply related to forensic medicine, "Information Learned from Studying the Dead Could Be Used Help the Living" (Thomas A. Gonzales) in autopsy imaging (AI), pathological diagnostics, dentistry, toxicology, isotope studies, biochemistry and abuse. Also, together with the Center for Cause of Death Investigation (<https://ccdi.med.niigata-u.ac.jp/>), which was established in July 2017, we are fostering highly specialized professionals in forensic medicine and those who will lead the next generation as we work to form the "Base for forensic medicine and for education and research related to the investigation of cause of death," which is a project operated by a national university operating expense grant at seven universities nationwide including Niigata University.



Cellular Physiology

Professor KANKI Tomotake

We study mitophagy, a selective degradation of mitochondria by autophagy.

Mitochondria are important organelles that produce a majority of the ATP required for cellular activities, and their quantity and quality need to be properly controlled. It is believed that mitochondrial autophagy (mitophagy), a selective degradation of mitochondria by autophagy, degrades excess or dysfunctional mitochondria to maintain mitochondrial homeostasis. In recent years, mitophagy defects have been implicated in neurodegenerative diseases, and thus mitophagy is attracting a lot of attention. The aim of our study is to elucidate the detailed molecular mechanisms and physiological roles of mitophagy. We have developed systems to induce and detect mitophagy in multiple models such as mammalian cultured cells, mice and yeast. We are currently identifying factors involved in mitophagy, exploring their molecular functions and analyzing the phenotypes of mitophagy-deficient cells.



Cardiovascular Medicine

Professor INOMATA Takayuki

Targeting cardiovascular diseases, we are building new treatment systems based on accumulated clinical data that we will use for research.

Ischemia: observation of vascular lesions using an angioscope and development of diagnostic and treatment methods for unstable plaque using near-infrared autofluorescence imaging. Arrhythmia: elucidation of J-waves, atrial and ventricular arrhythmias, elucidation of the effects of SGLT2 inhibitors on cardiac rhythm, examination of a new mapping method in atrial fibrillation ablation, and research on arrhythmia related to mitochondrial M2 antibody. Heart failure: research on the relationship between alternans and

left ventricular reverse remodeling, myocardial pathological analysis and prediction of left ventricular reverse remodeling using AI, and research on the frequency and course of heart failure in cancer patients. We are conducting diverse research in cooperation with related hospitals in the prefecture. For details, please visit the Cardiovascular Medicine website (<http://www.med.niigata-u.ac.jp/car/>).



Hematology, Endocrinology and Metabolism

Professor SONE Hirohito

We are researching in a wide range of fields from lifestyle diseases to tumors and from basic experiments to big data analysis, including nutrition, food, exercise, examination and AI.

Our department develops prevention, diagnosis, and treatment methods for hematologic diseases (leukemia and malignant lymphoma), endocrine diseases (thyroid and adrenal glands) and metabolic diseases (diabetes, obesity, dyslipidemia, and hypertension). We provide four related endowed courses: "Health Life Extension and Lifestyle Disease Prevention and Treatment Medicine Course," "Prevention of Lifestyle-related Diseases and Medical Checkups," "Regional Medicine and Health Studies," and "Next Generation ICT Medical Science Course." With the Niigata University Health Education Innovation Center, we are active in industry-government-academia collaboration.

In hematologic diseases, we are involved from protocol creation to multicenter joint research. We are also searching for new prognostic factors based on data gathered over many years. In endocrine

and metabolic diseases, we have secured a large amount of scientific evidence useful for on-site treatment and prevention for both lifestyle therapy and pharmacotherapy through big data analysis. Along with basic research aimed at elucidating the pathology in both fields, we are developing tools such as apps through industry-academia joint research.

Our department widely accepts medical professionals other than doctors and researchers outside medicine (biology, science and engineering, informatics, statistics, psychology, food science, body mechanics, sociology, government, general companies, etc.) to increase the depth and quality of research.



Respiratory Medicine and Infectious Diseases

Professor KIKUCHI Toshiaki

Our department conducts active clinical and basic research in various respiratory and infectious diseases.

Respiratory and infectious diseases are diverse and divided into five research groups: diffuse lung diseases, respiratory tumors, allergic diseases, respiratory physiology and infectious diseases.

The Diffuse Lung Disease Group has a unique focus on rare diseases such as interstitial pneumonia and pulmonary alveolar proteinosis.

The Respiratory Oncology Group has designed and carried out a number of independent clinical trials, as well as conducting basic research on anti-tumor immunotherapy in mouse models and novel methods to control cisplatin nephropathy in cooperation with the Renal Group.

The Allergic Disease Group is conducting a survey of asthma treatment and COPD patients

throughout Niigata Prefecture, a survey and research on athlete asthma, and basic research using a mouse model of bronchial asthma.

The Respiratory Physiology Group conducts clinical research focusing on sleep apnea syndrome and perioperative respiratory management through pulmonary rehabilitation.

In the field of infectious diseases, we are conducting basic research on iron metabolism, treatment of infectious diseases and infection control (nosocomial infection control).

For more information, please visit the Internal Medicine of Respiratory and Infectious Diseases website (<https://www.med.niigata-u.ac.jp/resp/welcome.html>).



Gastroenterology and Hepatology

Professor TERAU Shuji

We are developing novel diagnostic and therapeutic modalities aiming to overcome intractable diseases and to improve pathophysiological conditions in the upper and lower gastrointestinal tracts, liver, biliary tract and pancreas.

The mission and vision of our department is to change the future of people by developing new diagnostic and therapeutic methods while challenging incurable diseases and tackling undiagnosed diseases. We aim to nurture the next generation leaders through the training of general gastroenterologists and clinician scientists as part of human resource development.

As for digestive organs, we are interested in organ networks, and we are using various approaches to diagnose and develop treatment methods for homeostasis disruption of digestion, absorption, and metabolism.

Major research topics include the development of regenerative therapy to improve hepatic fibrogenesis and liver regeneration for cirrhosis using mesenchymal stem cells and exosomes (Phase I/II), development



of regeneration inducers (physician-initiated clinical trial), pathological analysis of non-alcoholic steatohepatitis from the viewpoint of organ network and the relationship between digestive diseases and intestinal microbiota, development of new drug therapy using small fish models, development of gene therapy and gene editing therapy for intractable diseases, development of local regenerative medical preparations using bioengineered materials and exosomes for gastrointestinal stenosis and pancreatic juice leakage, exosome research for gastrointestinal cancers, elucidation of nutrient absorption mechanism in the small intestine, and development of new medical equipment using AI and new materials. We are also working on preemptive medical care for digestive diseases associated with aging and lifestyle habits in collaboration with endowed chairs at three locations within Niigata Prefecture.

Psychiatry

Professor SOMEYA Toshiyuki

We research molecular genetics and clinical pharmacology of mental disorders centering on schizophrenia and autism spectrum disorders.

We are researching molecular genetics with the goal of elucidating the molecular pathogenesis of schizophrenia and autism spectrum disorders and to develop radical treatments based on the results. Based on the findings obtained in our research, we are comprehensively analyzing the effects of risk gene mutations on neuronal development (neurite outgrowth and synapse formation) through high-content screening in collaboration with the Department of Neurochemistry.

We are also investigating brain activity in a nonverbal false belief task, working with humans (magnetoencephalography) and monkeys (electrocorticogram and needle electrodes) in collaboration with the Department of Neurophysiology to elucidate the brain basis of the disorder

of Theory of Mind, which is the core symptom of autism spectrum disorder.

In addition, we are researching individual differences in responsiveness and side effects to psychotropic drugs, clinical pharmacology on the relationship between psychotropic symptoms and sex hormones and inflammatory cytokines as well as conducting large-scale investigations on perinatal mental health and pathological research on perinatal depression.

For details, please visit the website of the Department of Psychiatry, Niigata University School of Medicine (<http://www.niigata-dp.org>).



Pediatrics

Professor SAITOH Akihiko

We are researching the diagnosis, cure, and prevention of childhood diseases to protect the future for children.

In the Department of Pediatrics, we are vigorously researching diagnosis, treatment, and prevention in a wide range of fields, including infectious diseases, blood, tumors, circulatory organs, endocrine secretion, metabolism, kidneys, collagen, neonatal, and neurological diseases in children.

Our main research areas are the following: Infectious diseases - focusing on microbial diagnosis of severe infections, we conduct research on the pathology of parechovirus-A3 infection which causes severe infections, especially in newborns and early infants, as well as the research related to new treatment methods.

Blood and tumors - research for application to pediatric cancer diseases of CAR (Chimeric Antigen Receptor)-T cell therapy, which is attracting attention as a new cancer treatment method. Endocrine secretion and metabolism - research on genetic diagnosis of unknown endocrine and metabolic diseases and development of new treatment methods for childhood Graves' disease. Circulatory organs - elucidation of risk factors for coronary artery lesions in Kawasaki disease and identification of causative genes for arrhythmia in children. Renal and collagen disease - role of macrophages and urinary megalin in children's renal disease. Neonatal area - relationships between premature infants and intestinal microbiota and innate immunity. Nerves - genetic analysis of acute encephalopathy and convulsive disorders.

These studies are important for protecting the future of children and are highly regarded both in Japan and overseas.



Digestive and General Surgery

Professor WAKAI Toshifumi

We strongly promote development research on comprehensive genomic analysis in solid tumors using next-generation sequencing.

Personalized medicine and precision medicine that find the optimal treatment through comprehensive genomic analysis are starting. In our laboratory, we work with domestic and overseas research institutions and companies to establish a platform for optimal treatment based on comprehensive genomic analysis adapted to Japanese patients. In order to embody the value of new medical care as quickly as possible in Japan, we establish an academic system that combines pharmacogenomics with surgical oncology based on next-generation sequencing analysis. We promote the global activities of young researchers, strategically build an international network, and educate and enhance research and competitiveness as a world-class interdisciplinary cancer genome analysis research base. Based on genetic alterations, we focus on preventive medicine that diagnoses and predicts diseases that are likely to occur in the future so that we can then intervene. While implementing clinical research on both the results of pancreas transplantation from brain death donors and the long-term follow-up results, we are elucidating the engraftment mechanism of islet cell transplantation and researching to construct the basis for the development of transplantation treatment methods for diabetes.



Thoracic and Cardiovascular Surgery

Professor TSUCHIDA Masanori

In the Department of Thoracic Surgery, we are implementing basic research for the highly specialized clinical application from children to adults both in General Thoracic Surgery and Cardiovascular Surgery.

In the respiratory surgery group, the adequacy of reduced surgery, evaluation using a semi-quantitative CT evaluation method, and clinical research such as joint resection of the aortic wall combined with stent-graft insertion are being examined and conducted. In Japan, we participate in and register cases with the Japan Clinical Oncology Group (JCOG) and strive to contribute to the development of lung cancer surgical treatment. The Niigata Respiratory Surgery Research Group has been formed in Niigata Prefecture and has started a joint randomized comparative trial with other facilities. In basic research as well, we are collaborating with other departments on research such as gene analysis using next-generation sequencers.

The Pediatric Cardiovascular Surgery Group conducts clinical research, including a review of the remote outcomes of surgical treatment for complex cardiac malformations, and published reports both in Japan and overseas. Participating in research using the synchrotron radiation phase-contrast CT method in multicenter joint research, we have made many presentations on the results in the successful visualization of the impulse conduction system.

The Adult Cardiovascular Surgery Group is working on the research and development of stent grafts with a new concept. The Group succeeded in transplanting the developed stent grafts into large animals. We participated in a clinical trial of a new stent graft treatment in Japan. Currently, we are preparing to participate in clinical research in the future.



Orthopedic Surgery and Rehabilitation

Professor KAWASHIMA Hiroyuki

Orthopedic surgery widely works on clinic, research and education, targeting motor organs such as bones and joints.

Orthopedic surgery deals with musculoskeletal organs like bone, cartilage, joints, muscles, tendons, ligaments and other exercisers. Our subspecialty groups are as follows; 1) spinal surgery, 2) lower extremity such as hip joint, knee joint, 3) sports medicine, 4) pediatric orthopedics, 5) osteoporosis and bone metabolism, 6) bone and soft tissue tumors, 7) hand surgery and microsurgery, 8) trauma including fractures and soft tissues, pelvis, spinal cord injury, and 9) rheumatoid arthritis and other joint disorders. Our department of orthopedic surgery is the fourth oldest in Japan and 2017 marked our 100th anniversary lecture. In clinical research, we are engaged in a lot of large-scale, high evidence-level research such as an epidemiological survey of proximal femoral fractures in all of Niigata prefecture, Matsudai knee osteoarthritis survey, the Sado project, and multicenter collaborative research on spinal deformity in patients with rheumatoid arthritis. In basic research, the tumor and rheumatoid group is conducting state-of-the-art research, fully using biomolecular procedures. Preoperative three-dimensional planning and intra-operative support using special jig for the knee and hip joint diseases, rehabilitation research and clinical research are also being conducted.



Plastic, Reconstructive and Aesthetic Surgery

Professor MATSUDA Ken

We conduct basic research on peripheral nerve regeneration, lymphatic regeneration and wound healing, and clinical research on reconstructive surgery.

In our clinical practice, we are responsible for advanced reconstructive surgery using microsurgery, treatment of congenital anomalies such as cleft lip and palate, facial palsy, facial bone fractures, extensive burns, intractable ulcers, and skin laser treatment, etc.

We are also engaged in basic research that directly leads to the development of new surgical techniques. These include research on the mechanism of plasticity in peripheral nerve regeneration for reconstructive surgery of facial nerve or brachial plexus, research on wound healing, research on simulated and model surgeries for reconstruction of the upper and lower jaw, and research using artificial intelligence. In addition to lectures about general plastic surgery, we are in charge of several lectures on dermatology and plastic surgery, lectures on musculoskeletal system, and clinical practice. We are also committed to microsurgical education and actively provide all medical students, as well as residents, and graduate students, with instruction in microscopic microvascular anastomosis and other techniques under the microscope.



Pediatric Surgery

Professor KINOSHITA Yoshiaki

We research focusing on pediatric surgical diseases. We mainly study adolescent surgical diseases from newborns to 15-year-olds.

We are focusing on the research of pediatric surgical diseases for children, who are our future.

Our main research in pediatric tumors is the development of a new diagnostic system using an immunological sugar chain analysis method for pediatric solid malignant tumors, investigations into refractory hemangiomas, vascular malformations, lymphangioma, lymphangiomatosis and related diseases, as well as research to establish a treatment method using sirolimus, which is a new treatment for intractable lymphatic abnormalities. For the study of the adolescent to young

adult (AYA) generation, we are developing standard treatments by stratifying risks for patients with rhabdomyosarcoma and Ewing's sarcoma in the AYA generation as well as researching pregnancy for solid cancer and treatment considering late complications. We are also working on creating treatment guidelines for congenital intractable rare urogenital diseases, establishment of a nationwide registry and development of new surgical forms. As basic study, we are researching drug resistance mechanisms using hepatoblastoma cell lines and clinical specimens of hepatoblastoma as well as islet cell transplantation for type 1 diabetes that develops in childhood.

Our mission is to radically cure surgical diseases in children, from diseases that affect many children to those that are extremely rare and have poor prognoses.



Dermatology

Professor ABE Riichiro

We study the elucidation of developing mechanisms of severe drug eruptions, and the identification of the causative genes and the functions of hereditary skin diseases.

Currently, our laboratory promotes two research projects. One is the severe drug eruption group which targets severe cutaneous drug reactions, specifically toxic epidermal necrolysis and Stevens-Johnson syndrome. Although the patients suffering from these diseases can be fatal, the pathogenesis has not been fully elucidated yet. We particularly focus on

the development of the novel therapeutic drugs targeting proteins and receptors related to the epidermal cell death, and the new severity predictive markers. Meanwhile, the hereditary skin disease group identifies the causative genes of genetic skin diseases and analyzes their functions.



Urology

Professor TOMITA Yoshihiko

We proceed basic and clinical research on urological tumors, renal transplantation and pediatric urological diseases.

Our laboratory focuses on research based on not only “bench-to-bedside” but also bedside-to-bench.” In urological tumors, we are also engaged in new drug development, including participating in global clinical trials on the brand new anti-cancer drugs such as immune checkpoint inhibitors. In the field of renal transplantation, our research is focused on several issues, namely, the development of antibody titer measuring system using sugar chain array in ABO-incompatible kidney transplants, anti-HLA antibody inhibitory effect by the anti-IL-6 receptor antibody, and a clinical study on bortezomib medication in chronic

antibody-mediated rejection.

We are examining the diagnosis of congenital urinary-genital diseases for children as well as the treatment process and results. Most treatments for congenital urinary-genital disorders are surgical treatments, which are plastic surgery aimed at preserving functionality. By retrospectively examining many cases, we can obtain information regarding the surgery timing, surgical methods and postoperative follow-up methods, which is useful for more effective medical care.



Ophthalmology

Professor FUKUCHI Takeo

We are focusing on glaucoma. Our research utilizes our experience from many clinical cases and our large number of operations which are notable in Japan.

Vision is very important for people to live. The importance of healthy aging is frequently talked about in our modern aging society. However, people develop ocular diseases with aging, which often greatly influence the daily life of the elderly. In recent years, ophthalmologic instruments and therapeutic techniques have significantly improved, so very fine lesions have been found and treated in an early stage.

We introduce the forefront technology at all times and work on the treatment and research of ocular diseases of all ages from baby to the elderly. We teach the function of vision and its importance through the lecture, and our role is to have students feel the fascination of the most advanced microsurgery through practical training.



Otolaryngology - Head and Neck Surgery

Professor HORII Arata

Our research is covering the broad area of ENT topics from hearing loss to carcinogenesis.

There are three research groups in collaboration with the basic medicine department, we are continuing research that can be applied from basic research to clinical practice. We are also implementing industry-academia joint research.

Audiovestibular group is working to elucidate the pathophysiology of chronic vertigo, which is difficult to diagnose, and to develop treatment methods based on Professor Horii's work. He is on the International Diagnostic Standardization Committee for Psychogenic Vertigo in the Barany Society. In addition to clinical

research, we implement physiological and biochemical research using animal models as well as functional analysis using functional MRI.

Nose and throat group is researching the relationship between olfactory dysfunction and cognitive function, which may lead to the use of olfactory function test as a sensitive biomarker to point early stage Alzheimer type of dementia.

Oncology group is dispatching graduate students in experimental pathology to identify new moisturizing and transposable controlling elements in head and neck cancer and to conduct molecular pathological analyses of the detailed control mechanism. We also participate in nationwide multi-institutional joint research and conduct multiple clinical research projects led by our department.



Radiology and Radiation Oncology

Professor ISHIKAWA Hiroyuki

We research into the fields of radiation oncology, diagnostic radiology, and medical physics.

In diagnostic radiology, we are particularly focused on medical image evaluation. We are currently working with other clinical departments on diagnostic imaging of tumors using deep learning, one of the artificial intelligence technologies. In radiation oncology, we mainly conduct clinical research such as research on cognitive functioning after brain metastasis radiotherapy and research on high-dose-rate interstitial irradiation for prostate cancer. We also cooperate with clinical research led by other departments and co-medicals in order to play a role in the multidisciplinary treatment of cancer. In medical physics, we are researching development of an individualized QA system for IMRT treatment patients applying delta-radiomics, development of a high-precision dose evaluation system considering uncertainty factors of radiotherapy, development of a biological dose evaluation system considering irradiation time, and development of ultra-high-precision irradiation position verification methods that consider the tumor control rate in stereotactic brain radiotherapy.



Obstetrics and Gynecology

Professor YOSHIHARA Kosuke

We are working on clarifying the pathogenesis of obstetric and gynecological diseases and developing new therapeutic strategies by using integrated OMICS data analysis.

We are working on clarifying the pathogenesis of obstetric and gynecological diseases and developing new therapeutic strategies by using Integrated OMICS data analysis and molecular biological analysis. Here we introduce our research on endometriosis and gynecological cancer as follow:

1. Identification of endometriosis pathogenesis
Endometriosis affects 5 to 10% of women of reproductive age in Japan, and causes chronic pelvic pain, dysmenorrhea, and infertility, leading to decreased quality-of-life (QOL). However, the pathogenesis of endometriosis remains unknown. We have performed whole exon sequencing for endometriotic epithelium and normal uterine endometrial epithelium to identify endometriosis-associated gene mutations. We are now working to further elucidate the pathogenesis of endometriosis.
2. Development of molecular targeted therapy for gynecological cancer stem cells
Cancer stem cells which are characterized by tumorigenicity, self-renewal and differentiation capacities, are involved in cancer proliferation, metastasis chemotherapy-resistance. We are working on developing novel therapeutic strategies for gynecological cancer by identifying therapeutic target molecules for gynecological cancer stem cells.

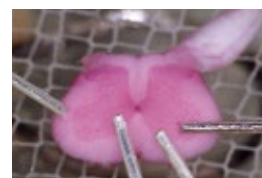
Anesthesiology

Professor BABA Hiroshi

We are studying the action mechanism of analgesics on the transmission of pain sensation information in the spinal dorsal horn and the brain, and the motor function of the spinal anterior horn cells.

Our research uses electrophysiological techniques such as patch clamping and morphological techniques such as immunostaining. We focus on the plastic change mechanism that occurs at the spinal dorsal horn or at the brain level due to the inflammation of peripheral tissues and nerve damage as well as the action mechanism of analgesics that act at the spinal cord level. We are studying the action mechanism of drugs on motor function using the same method from the spinal anterior horn cells. Regarding the patch

clamping, we also perform in vivo patch clamping if necessary, which enables us to see the reaction of the spinal dorsal horn cells to physiological stimulation. We also succeeded in visualizing the pain sensation information transmitted to the membrane potential and the intracellular Ca^{2+} using imaging spinal dorsal horn, using a spinal cord slice as shown in the photograph. Recently, we conducted in vivo flavin protein fluorescent imaging to observe the activity of spinal dorsal horn cells and the somatosensory area of the cerebral cortex.

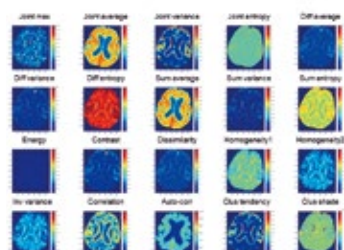


Emergency and Critical Care Medicine

Professor NISHIYAMA Kei

We rise to challenges from digital science to molecular biology and ethics to address acute medical care from multiple perspectives.

We are conducting data science in acute medical care in a wide range of ways from analyzing a cardiopulmonary arrest database of about 1.93 million people to artificial intelligence analysis of head CT images. We are developing and demonstrating digital transformation such as an emergency consultation support application, an information sharing system using SNS for emergency medical helicopters, and a remote ICU. In addition to participating in clinical research, we also provide guidance to other research institutes regarding the planning and implementation of clinical research. Furthermore, in collaboration with the Department of Neuroanatomy, we are working to combine the perspective of molecular biology with knowledge obtained from data science. We also preside over multicenter research to evaluate the current state of advanced care planning in acute care settings and to develop new tools.



Medical Oncology

Professor SAIJO Yasuo

We are researching the pathophysiology of cancer and cancer drug therapy, and lung regeneration using pluripotent stem cells.

Our department conducts cancer drug therapy for solid tumors across organs. We provide drug therapy for cancer patients with complications and provide treatment based on cancer genetic testing. Based on cancer registries and treatment data, we analyze the characteristics of cancer in the elderly and the effects and side effects of cancer drug therapy. We also research focusing on the pathology of thromboembolism in cancer patients. Recently, we are working with other institutions to develop devices that can easily measure the blood concentration of molecular-targeted drugs, which are the mainstay of cancer drug therapy, and to apply them clinically. Pluripotent stem cells can differentiate into various tissues. We are researching jointly with researchers in other fields to proceed with research on lung organ regeneration deriving from pluripotent stem cells using blastocyst complementation in lung-deficient mice.



Clinical Pathology

Professor AJIOKA Yoichi

Our department is engaged in morphological analysis and study of human digestive pathologies using immunohistochemical / molecular biological techniques.

We focus on morphological analysis and conduct research that can be applied to routine diagnosis. We observe a single lesion in detail, find a region that has different morphological changes within the same lesion, and analyze each region. There is a function change in parallel with a morphological change that can be seen with the naked eye and microscopically (tissue and cell levels). Protein expression and gene changes are in the background of the morphological change. In order to clarify the relationship between the morphological

change and the protein expression / gene change, we carry out protein expression analysis using immunohistochemistry and genetic analysis using molecular biological techniques.

Diagnosis (using surgical materials, macroscopic photographs and gross descriptions) of abundant digestive organ disease cases (about 60,000 surgical materials, about 300,000 biopsies and materials for endoscopic examination) are stored in the database of our department, enabling various research on rare diseases and management of large-scale analysis on common diseases.



Neurosurgery

(Brain Research Institute) Professor FUJII Yukihiro

We provide highly advanced neurosurgical treatment merging our proud tradition with advanced technology, and conduct basic research focused on addressing clinical questions.

The Department of Neurosurgery, Brain Research Institute, Niigata University, was established in 1953 as Japan's first independent neurosurgery program by Dr. Mizuho Nakada, who is known as the father of neurosurgery in Japan, and it has been leading Japan in medical care and research. Research is born from questions that arise in clinical practice. Feeding research back to clinical practice has been the concept from the beginning of the establishment of the Brain Research Institute. Current research topics include (1) research to elucidate the optimal

treatment using patient-derived brain tumor cells, (2) development of tumor diagnostic methods using cell-free DNA obtained from body fluids such as cerebrospinal fluid, (3) elucidation of the regeneration and growth mechanisms of human nerve axons, (4) development of surgical support and educational training systems to ensure the success of highly difficult neurosurgical operations, (5) establishment of intraoperative visualization method of nerve activity areas based on flavin protein imaging, (6) analysis of blood flow in cerebral aneurysms using computational fluid dynamics, and (7) research on elucidating the pathogenesis of epilepsy in collaboration with the Epilepsy Center of Nishi Niigata Central Hospital.



Neurology

(Brain Research Institute) Professor ONODERA Osamu

Using clinical information, state-of-the-art analysis methods, and brain tissue, we aim to overcome neurological diseases based on molecular mechanisms.

We have investigated the causes and pathogenesis of various neurological diseases such as Niigata Minamata disease and SMON disease. Many of our predecessors have started their research to understand the causes of neurological disorders in their daily clinical practice. We are studying in collaboration with the Brain Research Institute laboratories; they have been conducting research using genetic, biochemical,

and cell biological techniques. In particular, research with neuropathological tissue samples is a hallmark of our team.

In recent years, cutting-edge research in medical biology has become interdisciplinary. In other words, the categorization of research topics by disease name is now a thing of the past. And a more multifaceted perspective is required. We hope to continue to lead the world in conquering neurological diseases through cutting-edge fusion pathology research.



Cell Biology (Kidney Research Center)

Professor KAWACHI Hiroshi

The Department of Cell Biology, Kidney Research Center conducts basic research to elucidate the pathogenic mechanism of kidney glomerular diseases and to develop novel therapy for nephrotic syndrome, one of the most important disease in nephrology field.

Kidney disease is regarded as a new national disease. In our laboratory in the Basics Division of the Kidney Research Center, medical professionals such as clinicians, veterinarians, and pharmacists as well as basic biologists are working together to elucidate the pathogenesis of kidney disease and to develop new treatment methods. Currently, the most important issue we are working on is the elucidation of the pathogenesis of proteinuria.

Proteinuria is both the most important symptom of renal disease and an aggravating factor that advances renal failure, and is involved in the onset of other organ diseases such as cerebrovascular and cardiovascular disorders. Suppressing proteinuria leads to reducing the number of patients with renal failure, brain stroke, and myocardial infarction. We were the first in the world to identify the site responsible for the onset of proteinuria and to elucidate its molecular structure. We are currently conducting research to develop new therapeutic methods targeting these molecular groups.



Clinical Nephrology and Rheumatology

(Kidney Research Center) Professor NARITA Ichiei

Our task includes clinical practise, research and education in the area of nephrology and rheumatology.

A wide range of basic and clinical investigations and education is in progress to understand pathogenesis and to develop new treatment strategies for kidney diseases and autoimmune diseases. To accomplish these purposes, we apply clinicopathological methods, as well as varieties of experimental techniques, such as molecular and cellular biology, genetic and proteomic analysis, and those with experimental animal models. Particularly, we have performed extensive research and published many papers on the development and progression of IgA nephropathy, one of the most predominant type of primary glomerulonephritis. We have also contributed greatly in the research on the influence and treatment of uremic toxins on complications in patients with end stage kidney disease. Our department belongs to the Kidney Research Center. It is the sole institute in Japan that consists of basic, translational and clinical department. Each department specializes in research about kidney disease covering from basic to clinical science, working in a coordinated fashion.

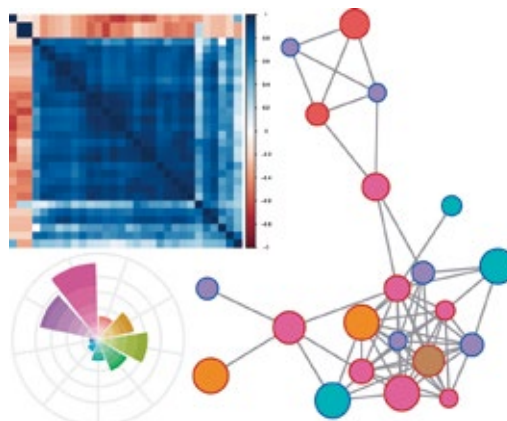


Bioinformatics (Medical AI Center)

Professor OKUDA Shujiro

We research knowledge extraction from omics data and its technology development using computers.

Bioinformatics is a field that conducts medical and biological research using computers. We process DNA and protein sequences on computers to study the genes and genomes of living organisms. Since the intestinal microbiota is closely related to human health, we search for disease-related bacteria from the intestinal environment metagenomic data. In addition, we are developing technology to realize precision medicine that enables each patient to select the optimal treatment method in cancer genomics research that investigates DNA mutations in cancer cells. In recent years, we have developed further and are engaged in developing artificial intelligence for medical use. When using a computer, the data to be handled must be neatly organized. Database construction for that purpose is also a subject of our research and development.



Medical Education Center

Professor SOMEYA Toshiyuki

We are working on promoting medical education, international exchange, and diversity.

In medical education, we are involved in the curriculum for all years of medical school, from the first year's "Introduction to Medicine" and "Early Medical Practicum" to support for clinical training in the final years of medical school. We are also involved in student support. We provide meticulous support for student concerns and offer individual sessions at the Asahi-machi Campus Medical Student Support Counseling Room.

In terms of international exchange, students from Japan, Russia and China participate in the Summer

Medical Student Exchange Program during the summer holidays. We have also accepted students from Sri Lanka since 2017. For students who are dispatched to Russia for medical research training and clinical training, briefing sessions and individual consultations are held as in the summer program in cooperation with the academic affairs section so that they can stay Russia with peace of mind.

We also engage in diversity activities. We run an association called Hitohiro no Kai that regularly holds the Hitohiro Cafe where people with various positions can discuss problems and worries, including issues for female doctors in their work. A wide range of people from professors to students participate.



Disaster Medical Education Center

Specially Appointed Prof. TAKAHASHI Masashi

This organization specializes in disaster medicine and humanitarian medical support activities in Japan and overseas. The center director is Medical School Dean Toshiyuki Someya.

Our Center is one of the few organizations in Japan that specializes in disaster medicine and medical treatment. We implement disaster response, humanitarian support activities, and research activities in Japan and overseas in collaboration with the department of Disaster Medicine and Medical Personnel Development in the Graduate School of Medical and Dental Sciences and the Research Institute for Natural Hazards and Disaster Recovery, Niigata University as well as human resource training for undergraduate students and interprofessional workers. We also play a leading role in Japan DMAT (Disaster Medical Assistance Team) personnel training and the international disaster relief team's medical training of JICA (Japan International Cooperation Agency). The disaster medical education model promoted by our Center has been selected as one of the best initiatives (GP: Good Practice) among the education reforms promoted by the Ministry of Education, Culture, Sports, Science and Technology for two consecutive terms, from 2014 to 2018 and from 2018 to 2022. We play a central role in disaster medicine and medical treatment in Japan. In response to COVID-19, we have set up a patient admission coordination center at the medical coordination headquarters in Niigata Prefecture to contribute toward streamlining the medical system from the perspective of disaster medicine and social medicine.



Myanmar Infectious Disease Research Center

Professor SAITO Reiko

We will explain the actual situation of infectious diseases in Myanmar, which is said to be a blank area, and contribute to controlling infectious diseases and cultivating young human resources in both Japan and Myanmar.

Niigata University established a research base (office and virus laboratory) at the National Institute of Health in Yangon, the largest city in the Republic of the Union of Myanmar, in 2015 as one of the overseas infectious disease research sites of the Japan Agency for Medical Research and Development (AMED). We also conducted molecular epidemiological studies on influenza and other respiratory infections including the novel coronavirus (SARS-CoV-2), severe pediatric pneumonia, pediatric diarrhea, and pediatric meningoencephalitis, and monitored the risk of their spreading into Japan. Myanmar, like other Southeast Asian countries, experienced an explosion of several waves of SARS-CoV-2 from April 2020, making it impossible for Japanese to travel to Myanmar. Furthermore, due to the political change in February 2021, its medical environment fell to a lower level. Even under such circumstances, we have maintained our investigation and research on respiratory diseases by making use of web conferences and cooperating with local medical institutions, counterparts, and local staff. The current SARS-CoV-2 pandemic has made it clear to the world that infectious diseases know no borders. It has long been pointed out that the medical system in Myanmar is vulnerable, making it a blank area for infectious diseases. Since 2018, we have been implementing a short-term summer training program in which medical students from Japan and Myanmar can interact using this base. We are working to foster doctors and researchers with a global perspective on infectious diseases.

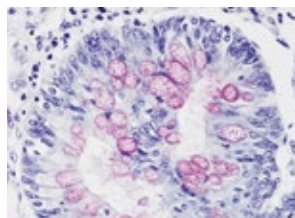


Histopathology Core Facility

Professor AJIOKA Yoichi

As a joint facility of a medical department, we prepare tissue specimens, support research and education related to the specimens, and store and manage materials for research and education.

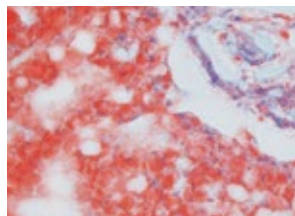
This facility was established in September 2015 for contract preparations of histopathological specimens (experimental animals and plants included) for research, research and education support related thereto, and preserving and managing research and educational materials. Our main business lineups are preparing formalin-fixed paraffin sections and frozen sections, preparing histopathological specimens (prepared specimens) for microscopes such as HE staining of tissue specimens, cultured cell samples, histochemistry and immunohistochemistry, pathologists evaluating pathological tissue, photographing on a macro-micro level, making virtual slides and paraffin block storage. We hope to go beyond contributing to medicine, dentistry and drug research, to also conduct research, product development promotion, and educational support in all experimental and research fields including agriculture and food relationships, science and industrial product development. We offer free consultations and hope you will come to us for one.



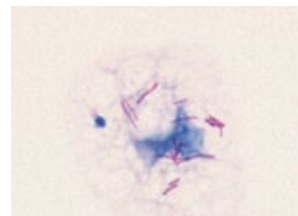
PAS stain (mucin stain)
Photomicrograph: Mucus in human colon cancer is highlighted as a magenta color in PAS stained specimen.



Berlin blue stain (iron stain)
Photomicrograph: Asbestos found in human sputum



Oil red O stain (lipid stain)
Specimen: Human fatty liver



Ziehl-Neelsen stain (used for staining tubercle bacilli)
Photomicrograph: *Mycobacterium tuberculosis* bacilli phagocytosed by human macrophage are highlighted as a magenta color in Ziehl-Neelsen stained specimen.

Niigata Regional Medical Support Center Medical Branch Office

Specially Appointed Assistant Professor MIZUSAWA Takeshi

We provide training and career development support for doctors who shoulder regional medical care, cooperating with the Niigata Prefectural Health and Welfare Department and the Niigata Medical Association.

Our Center holds community medicine summer training every August for students who receive the Niigata Prefecture Doctor Training Fund and students who are interested in community medicine. In addition to being able to actually experience the atmosphere of the local medical field, they can form a resource network that can be used even after graduation

because medical students from other universities gather together to inspire each other and build relationships. We also regularly hold a "Learn about Niigata Medicine" seminar to deepen understanding of the current state of community medicine in Niigata Prefecture in collaboration with the Niigata Medical Association and the Niigata Prefecture Welfare and Health Department. We will implement activities based on the opinions and wishes of participating students. Please feel free to contact us. We will continue working so that more students will participate and convey the appeal of community medicine.



Cause of Death Education Center

Professor TAKATSUKA Hisakazu

We are conducting advanced studies on the causes of death and fostering professionals participating in the studies with the goal of building a safe and secure society.

The center was established in July 2017 as one base to solve social problems such as increasing deaths due to aging, overlooking crimes and responding to large-scale disasters. Accurate investigation into the cause of death is important for protecting the dignity and rights of individuals. However, the investigation system of the cause of death in Japan is not perfect and is severely suffering from a personnel shortage. The center consists of five departments: the Forensic Pathology Department

that performs medical examinations, and pathological diagnoses, the Imaging Diagnosis Department that performs postmortem image diagnoses by CT, the Medicinal Toxicant Biochemistry Department that analyzes alcohol and medicinal toxicants, the Dental Jurisprudence Department that confirms the body identification through dental exams and the Social Forensic Department that responds to abuse. The center is fostering personnel as they implement more advanced investigations into the cause of death in cooperation with related organizations inside and outside the university. Strengthening the investigation system of cause of death and improving its quality are extremely important. The center is working to contribute to the local community as a core facility on the Sea of Japan coast and in Japan in the investigation of the cause of death.



Center for Research Promotion

Professor SOMEYA Toshiyuki

We promote vitalization of medical research at the Niigata University School of Medicine through common equipment management and technology provision.

The Center for Research Promotion, School of Medicine, Niigata University (Research Promotion Center) was established on the third floor of the Faculty of Medicine Joint Research Building to further promote medical research at the Niigata University School of Medicine. Full-time staff (one faculty member, two technical staff members) provide support for a wide range of medical research. In addition to maintenance and management of common equipment ranging from general-purpose equipment to large equipment (electron microscopes, mass spectrometers, cell sorters, fluorescence microscopes, etc.), we provide research support services using equipment that requires specialized skills. Seminars and training on research methods are also scheduled to be held.



General Medicine

Specially Appointed Prof. KAMIMURA Kenya

We train doctors who have comprehensive medical skills and can handle the multiple diseases and life challenges of all patients.

We promote a General Practitioner Training Program that trains doctors to acquire a wide range of medical knowledge to examine the whole body and to provide holistic medical care considering patient feelings. In the clinical participation training of medical students, technical skills such as specialized knowledge and clinical techniques are taught in cooperation with medical institutions in Niigata Prefecture. We are also providing opportunities to learn human skills such as leadership, management, and communication using online and on-demand learning. Using this education system, the Niigata Method, we would like to provide the skills necessary for team medical care and leadership, and continue to develop general practitioners who protect the community in collaboration with multi-professionals.

The major goal of our lab is to train general practitioners in Niigata who emphasize the stance of clinical examination, community protection, and patient consideration; and to work with various people gathering from all over Japan.

Please be sure to visit our website.

Our Web



Collaborative Research Laboratory

Applied Molecular Medicine

Specially Appointed Prof. SAITO Akihiko

Biofluid Biomarker Center

Specially Appointed Assoc Prof. YAMAMOTO Keiko

Clinical Nutrition Science

Specially Appointed Assoc Prof. HOSIJIMA Michihiro

Donated Fund Laboratory

Community Medicine

Division of Human Resource Development for Community Medicine

Community Medicine

Division of Community Medicine

Specially Appointed Prof. IGUCHI Seitaro

Community Medicine

Division of Disaster Medicine and Medical Professionals Development

Specially Appointed Prof. TAKAHASHI Masashi

Health Promotion Medicine

Specially Appointed Assoc Prof. ITO Yumi

Laboratory Medicine and Clinical Epidemiology for Prevention of Non-communicable Diseases

Specially Appointed Prof. KATO Kiminori

Advanced Cardiopulmonary Vascular Therapeutics

Specially Appointed Assoc Prof. KASHIMURA Takeshi

Community Psychiatric Medicine

Specially Appointed Assoc Prof. SUGIMOTO Atsunori

Health Sciences for Prevention and Management of Non-communicable Diseases

Specially Appointed Assoc Prof. FUJIHARA Kazuya

Inter-Organ Communication Research

Specially Appointed Assoc Prof. WAKASUGI Minako

Familial and Hereditary Oncology

Specially Appointed Assoc Prof. NISHINO Koji

Preemptive Medicine for Digestive Diseases and Healthy Active Life

Specially Appointed Assoc Prof. YOKOO Takeshi

Community Medicine and Clinical Data Analysis

Specially Appointed Assoc Prof. KITAZAWA Masaru

Advanced Treatment and Prevention for Vascular Disease and Embolism

Specially Appointed Prof. HANZAWA Kazuhiko

Musculoskeletal Science for Frailty

Specially Appointed Assoc Prof. KOGA Hiroshi

Department of Network Medicine for Digestive Diseases

Specially Appointed Assoc Prof. KAMIMURA Hiroteru

Department of Preventive and Minimally Invasive Medicine for Digestive Diseases, School of Medicine, Niigata University

Specially Appointed Assoc Prof. HAYASHI Kazunao

Division of Comprehensive Musculoskeletal Medicine, Niigata University Graduate School of Medical and Dental Sciences

Specially Appointed Prof. IMAI Norio

Department of Active Ageing (donated by Tokamachi city, Niigata Japan)

Specially Appointed Prof. SHOBUGAWA Yugo

Next-generation care medicine for Information and communication technology (ICT)

Specially Appointed Assoc Prof. OSAWA Taeko

INTERNATIONAL EXCHANGE

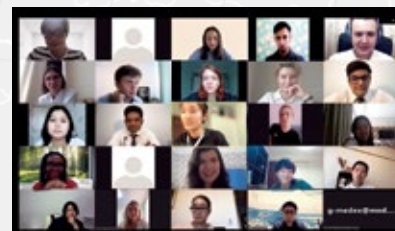
Niigata University is located near the Port of Niigata which was one of the first five ports (Niigata, Hakodate, Kanagawa, Hyogo, and Nagasaki) opened its doors to the world from an early age in Japan under the Treaty of Amity and Commerce between the United States and Japan (1858). Niigata University actively promotes international exchange in education and research with a lot of universities around the world.

Undergraduate and graduate students are provided with a variety of opportunities to study abroad. We also welcome international students from a wide variety of countries all over the world every year.

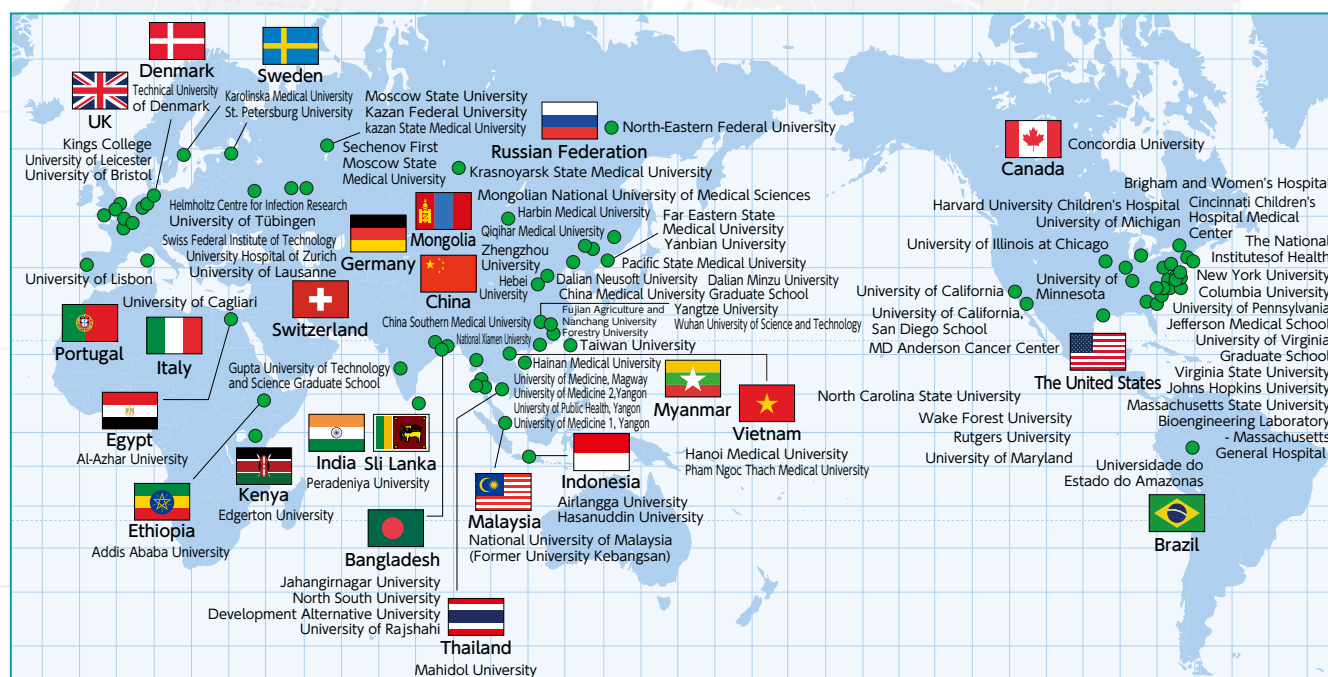
One of the main features of international exchange in Niigata University is that we have strong connection not only with Western countries, but also with neighboring countries, using Niigata's

geographical and historical advantages. Even during the COVID-19 pandemic, when face-to-face exchanges were stagnant, online exchanges among students were actively conducted with many universities abroad.

Through our international exchange activities, we place the utmost importance on fostering global medical professionals and researchers who can play active roles on the world stage.



Exchange partner schools of the Faculty of Medicine



[Characteristic activities]

(1) Europe and America

We are implementing exchange programs for studying abroad with multiple universities, including the University of Leicester in the UK, in which we mutually exchange students for the clinical training. In medical research training, more than ten students participate in cutting-edge basic research for about two months at various European and American universities.

The School of Medicine has been vigorously working to improve practical English skills by offering English conversation classes taught by native speakers specializing in medical English since 2014. In order to support students who intend to work as doctors overseas, we actively provide information on preparation for the United States Medical Licensing Examination



(USMLE). As a result, 17 students have passed the USMLE in the past few years, including three 2021 graduates. In addition, we invite top physicians and researchers who are active in Japan and abroad to give lectures on the current state of the world's top level medical care and diverse career paths.

(2) Southeast and Southwest Asia

We are participating in educational and research exchanges in the field of infectious diseases and global health, focusing on influenza, and severe pneumonia and diarrhea in children. In Myanmar, we collaborate with top-level institutions such as the National Institute of Health, University of Medicine 2, Yangon, and Mandalay University etc. In 2015, we were selected to participate in the Japan Initiative for Global Research Network on Infectious Diseases (J-GRID) program of the Japan Agency for Medical Research and Development (AMED), and we established an overseas research base in Yangon. In 2020, we were also selected as one of the projects on the Emerging and Re-Emerging Infectious Diseases at Overseas centers (Global

Research Infrastructure, Collaborative Research via Overseas Research Centers), and are continuing to work on infectious disease research in Myanmar. In 2019, short-term summer training program started in Myanmar for undergraduate students. Niigata University has accepted a number of students from Myanmar in cooperation with other universities in Japan. Furthermore, with the cooperation of the Universiti Kebangsaan Malaysia (National University of Malaysia), we are conducting interactive exchanges between Malaysian and Niigata University's faculties, graduate students, and undergraduate students. We also provide short-term dispatch training for undergraduate students both in Malaysia and in Japan. In Myanmar and Malaysia, we conduct social epidemiological surveys on the health of the elderly and conduct international comparative research with Japan where the aging population is increasing.

International Priority Graduate Programs for advanced graduate course support for international students sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japanese government. In 2018, Developmental Psychiatry program started to foster the leaders from the Southeast Asian (ASEAN) region. In 2021, a program to foster medical and biological specialists in neuroscience

and system medicine was adopted, targeting ASEAN and Southwest Asia. Together with a lot of international students from many countries, we are actively engaged in mutual exchange programs in the clinical and research fields.

(3) China and Russia

The coastline of Niigata Prefecture facing the Sea of Japan reaches 330 km on the mainland coastline, excluding remote islands such as Sado Island. Niigata Port, located in the center of the coastline, has a long history of exchanges with countries on the opposite coastline, such as China, South Korea, and Russia. Niigata University has also become a gateway for international exchanges between universities in these countries. Taking advantage of this location, we have long history of activated medical education and medical care exchanges with various universities in China such as Harbin Medical University as well as medical universities in the Far East and Siberia. To date, approximately 400 students have mutually visited, and more than 70 Chinese and Russian doctors and nurses have studied medicine at our faculty.

Number of international students (2011 - 2021)

| Country | University/Facility | Undergraduates | | Graduates | |
|-------------------|------------------------------------------------------------|----------------|----------|------------|----------|
| | | Dispatched | Accepted | Dispatched | Accepted |
| The United States | University of Illinois at Chicago | 3 | | | |
| | Wake Forest University | 2 | | | |
| | MD Anderson Cancer Center | | | 1 | |
| | University of California | 4 | | | |
| | University of California, San Diego School | 4 | | | |
| | Columbia University | 2 | | | |
| | Jefferson Medical School | 1 | | | |
| | Johns Hopkins University | 1 | | | |
| | Cincinnati Children's Hospital Medical Center | 6 | | | |
| | New York University | 1 | | | |
| | North Carolina State University | 1 | | | |
| | Harvard University Children's Hospital | 8 | | | |
| | Virginia State University | | | 1 | |
| | University of Virginia Graduate School | | | 1 | |
| | Brigham and Women's Hospital | 7 | | | |
| | The National Institutes of Health | 4 | | | |
| | University of Pennsylvania | 1 | | | |
| | Bioengineering Laboratory - Massachusetts General Hospital | | | 1 | |
| | Massachusetts State University | 1 | | | |
| | University of Michigan | 7 | | 2 | |
| | University of Minnesota | 10 | | | |
| | University of Maryland | 1 | | | |
| | Rutgers University | 8 | | | |
| Canada | Concordia University | | | | 1 |
| Brazil | Universidade do Estado do Amazonas | | | | 1 |
| United Kingdom | Kings College | 1 | | | |
| | University of Bristol | 2 | | | |
| | University of Leicester | 12 | 5 | | |
| Portugal | University of Lisbon | 1 | | | |
| Italy | University of Cagliari | 1 | | | |
| Germany | University of Tübingen | 2 | | | |
| | Helmholtz Centre for Infection Research | 1 | | | |
| Switzerland | Swiss Federal Institute of Technology | 5 | | | |
| | University Hospital of Zurich | 3 | | | |
| | University of Lausanne | 2 | | | |
| Denmark | Technical University of Denmark | 1 | | | |
| Sweden | Karolinska Medical University | 1 | | | |
| Myanmar | University of Medicine 1, Yangon | | | | 2 |
| | University of Medicine 2, Yangon | 7 | | | 1 |
| | University of Public Health, Yangon | | | | 1 |

| Country | University/Facility | Undergraduates | | Graduates | |
|--------------------|----------------------------------------------------------------|----------------|----------|------------|----------|
| | | Dispatched | Accepted | Dispatched | Accepted |
| Myanmar | University of Medicine, Magway | | | | 2 |
| Malaysia | National University of Malaysia (Former University Kebangsaan) | 33 | | | 7 |
| India | Gupta University of Technology and Science Graduate School | | | | 1 |
| Bangladesh | Jahangirnagar University | | | | 1 |
| | Development Alternative University | | | | 1 |
| | University of Rajshahi | 1 | | | |
| Sri Lanka | Peradeniya University | | 3 | | |
| Thailand | Mahidol University | | | | 2 |
| Indonesia | Airlangga University | | 2 | | 2 |
| | Hasanuddin University | | | | 7 |
| Vietnam | Hanoi Medical University | | | | 1 |
| | Pham Ngoc Thach Medical University | | | | 1 |
| China | National Xiamen University | | 1 | | |
| | Taiwan University | 1 | | | |
| | Qiqihar Medical University | | | | 1 |
| | China Medical University Graduate School | | | | 2 |
| | China Southern Medical University | | | | 1 |
| | Harbin Medical University | 18 | 32 | | 10 |
| | Yangtze University | | | | 2 |
| | Wuhan University of Science and Technology | | | | 1 |
| | Fujian Agriculture and Forestry University | | | | 1 |
| | Dalian Neusoft University | | 1 | | 1 |
| | Dalian Minzu University | | 1 | | |
| | Yanbian University | | | | 1 |
| | Zhengzhou University | | 1 | | |
| | Hebei University | | | | 1 |
| | Hainan Medical University | | | | 1 |
| | Nanchang University | | | | 1 |
| Russian Federation | Far Eastern State Medical University | 33 | 30 | 2 | 10 |
| | Krasnoyarsk State Medical University | 36 | 26 | 5 | 14 |
| | Pacific State Medical University | 21 | 28 | 2 | 9 |
| | Kazan State Medical University | | 4 | 2 | 5 |
| | Kazan Federal University | | 5 | | |
| | St. Petersburg University | | 6 | | |
| | North-Eastern Federal University | 3 | 5 | | |
| | Moscow State University | | 4 | | 2 |
| Egypt | Sechenov First Moscow State Medical University | | 2 | | |
| | Al-Azhar University | | | | 1 |
| Ethiopia | Addis Ababa University | | | | 1 |
| Kenya | Edgerton University | | | | 1 |

PROJECTS

"COVID-19 Vaccine Development Using Recombinant BCG (rBCG) Technology" AMED Drug Discovery Support Promotion Project (2020-2021)

MATSUMOTO Sokichi
Professor
Principal Investigator
Department of Bacteriology,
Niigata University Graduate
School of Medical and Dental
Sciences,

Amid the pandemic caused by the new coronavirus infection (COVID-19), an inverse correlation between BCG vaccination and the incidence and mortality of COVID-19 was indicated. As the results of large-scale epidemiological studies and the effects of BCG vaccination against viral infections and SARS-CoV-2 infections by double-blind tests were later reported several times, there is growing momentum to use the BCG as a countermeasure against COVID-19.

The BCG is an attenuated strain of mycobacterium tuberculosis and is a live tuberculosis vaccine. Since it survives in the body for several years after inoculation, it can provide long-term immune stimulation and has a strong adjuvant activity necessary for vaccines. It is also highly safe and can be manufactured at a low cost, as evidenced by the record of having been administered to the greatest number of people so far.

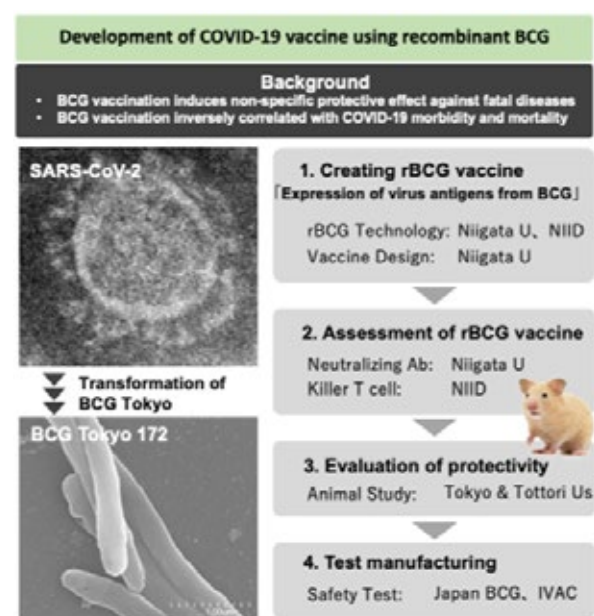
Niigata University possesses this BCG and virus recombination technology, and has bioinformatics know-how to track virus mutations. In cooperation with the Institute of Medical Science, the University of Tokyo, the National Institute of Infectious Diseases, Japan BCG Laboratory, and Tottori University, we have developed a plan to express the SARS-CoV-2 spike protein from BCG and create a COVID-19 vaccine. This project was implemented from 2020 with the support of the Japan Agency for Medical Research and Development.

Previously, rBCG used drug resistance markers for genetic engineering. Since it is not appropriate for human application, we aimed to create marker-free rBCG. Also, although BCG substrains exist, we proceeded with preparation based on Japanese BCG (Tokyo strain), which has a reputation for stability and antigenicity and is an international reference product of the WHO. Therefore, we analyzed the gene expression pattern of the BCG Tokyo strain and tested the design that maximizes the efficiency of expression and secretion of the foreign antigen. As a result, we established a marker-free recombinant BCG, rBCG-70C2, that

secretes the receptor binding domain (RBD) of the spike protein. A patent application has been filed for the preparation method of this rBCG.

rBCG-70C2 boosted antibody responses to the RBD and maintained them for a long period of time upon inoculation of spike protein RBD-immunized animals. Also, in a vaccine booster test in hamsters, it was confirmed that the hamsters tended to recover quickly after viral infection. We created a non-clinical formulation of rBCG-70C2 and conducted toxicity tests to confirm its safety. Furthermore, through international joint research, the Institute of Vaccines and Medical Biologicals (IVAC) in Vietnam, which produces Japanese BCG, has manufactured a clinical trial formulation of rBCG-70C2.

This project is implemented with the support of Niigata University's Clinical and Translational Research Center, URA, and the Institute for Research Promotion. We hope that the outstanding technology and know-how of Japan, including the technology and know-how of our university, will contribute to controlling intractable diseases, including COVID-19.



Niigata Training Method: General Practitioner Training Program

KAMIMURA Kenya
Specially Appointed
Professor
Department of General
Medicine, Niigata University
School of Medicine

The aim of this project is to develop the human resources who can take care the multiple diseases and life-related issues of individual patients and protect the community (life and lifestyle) through collaboration with multi-professionals. The human resources include the general practitioner and the project is called "Niigata Training Methods for Generalist", and is supported by the Japanese Ministry of Health, Labor and Welfare.

In order to promote this program, we opened our lab and started the classes in January, 2021 collaborating with Niigata Prefecture, Niigata prefectural Medical Associations, and medical institutions in Niigata prefecture.

In clinical training, the core of this project, the medical students learn how to build up the skill of examining the whole body and how to consider patients. To teach comprehensive medical technical skills, we are cooperating with physicians in Niigata prefecture.



Echo practice using a simulator

In addition to providing technical skills (professional medical knowledge and skills), this class also provides programs for learning human skills. "Human Skills" include communication skills, leaderships, presentation skills, development of cooperation and team spirit, etc.

By promoting the project, we believe that the General Practitioner will contribute to securing and improving medical care in Niigata Prefecture.



Summary of practical training that connects inside and outside the university online

Number of Students (Undergraduate)

(As of May 1, 2022)

| Year | | 1st | 2nd | 3rd | 4th | 5th | 6th | Total |
|--------------------|-----------------|------|------|------|------|------|------|-------|
| School of Medicine | Admission Quota | 133 | 127 | 127 | 127 | 127 | 127 | 768 |
| | Enrollment | 136 | 135 | 124 | 133 | 121 | 131 | 780 |
| | | (29) | (26) | (32) | (35) | (24) | (41) | (187) |

() indicates female students

Number of Students (Graduate)

(As of May 1, 2022)

| Year | | | 1st | 2nd | Total |
|----------------------------------------------------------------|--------------------------------|-----------------|-----|-----|-------|
| Graduate School of Medical and Dental Sciences (Master Course) | Course for Biomedical Sciences | Admission Quota | 20 | 20 | 40 |
| | | Enrollment | 11 | 15 | 26 |
| | | | (5) | (7) | (12) |

(As of May 1, 2022)

| Year | | | 1st | 2nd | 3rd | 4th | Total |
|----------------------------------------------------------------|-----------------------------------------------------|-----------------|------|------|------|------|-------|
| Graduate School of Medical and Dental Sciences (Doctor Course) | Course for Molecular and Cellular Medicine | Admission Quota | 22 | 22 | 22 | 22 | 88 |
| | | Enrollment | 18 | 36 | 24 | 50 | 128 |
| | | | (6) | (11) | (9) | (12) | (38) |
| | Course for Biological Functions and Medical Control | Admission Quota | 37 | 37 | 37 | 37 | 148 |
| | | Enrollment | 36 | 52 | 36 | 60 | 184 |
| | | | (9) | (18) | (6) | (16) | (49) |
| | Course for Community Disease Control | Admission Quota | 14 | 14 | 14 | 14 | 56 |
| | | Enrollment | 8 | 4 | 5 | 10 | 27 |
| | | | (2) | (3) | (1) | (3) | (9) |
| | Total | Admission Quota | 72 | 72 | 73 | 73 | 292 |
| | | Enrollment | 62 | 92 | 65 | 120 | 339 |
| | | | (17) | (32) | (16) | (31) | (96) |

() indicates female students

Number of Foreign Students

(As of May 1, 2022)

| Year | | 1st | 2nd | Total |
|----------------------------------------------------------------|--------------------------------|-----|-----|-------|
| Graduate School of Medical and Dental Sciences (Master Course) | Course for Biomedical Sciences | 0 | 0 | 0 |

(As of May 1, 2022)

| Year | | 1st | 2nd | 3rd | 4th | Total |
|----------------------------------------------------------------|-----------------------------------------------------|-----|-----|-----|-----|-------|
| Graduate School of Medical and Dental Sciences (Doctor Course) | Course for Molecular and Cellular Medicine | 2 | 1 | 0 | 1 | 4 |
| | Course for Biological Functions and Medical Control | 6 | 7 | 4 | 1 | 18 |
| | Course for Community Disease Control | 5 | 0 | 1 | 5 | 11 |
| | Total | 13 | 8 | 5 | 7 | 33 |

Number of Graduates

| Period | Number of Graduates |
|------------------------------------------------------------------------|---------------------|
| College of Medicine (Old Educational System)(Nov., 1914 - March, 1924) | 964 (0) |
| Medical College (March, 1926 - March, 1954) | 1,974 (3) |
| Attached Medical Special Course (Sept., 1942 - March, 1952) | 661 (15) |
| University (New Educational System) (March, 1955 - March, 2022) | 7,014 (1,198) |
| Total | 10,613 (1,216) |

() indicates female students

Number of Degrees Conferred (Master of Biomedical Science)

| Period | Graduates |
|---------------------------|-----------|
| March, 2004 - March, 2022 | 263 |

Number of Degrees Conferred Doctor of Philosophy (Medical Science), Doctor of Philosophy

| Period | The Whole Course Completed | Thesis Presented | Total |
|-------------------------------------------------------------|----------------------------|------------------|-------|
| Doctors(Old Educational System) (Dec., 1923 - March, 1960) | 1,888 | | 1,888 |
| Doctors(New Educational System) (March, 1959 - March, 2022) | 2,267 | 1,822 | 4,089 |
| Total | 4,155 | 1,822 | 5,977 |

Successful Candidates of the National Medical Practitioners Qualifying Examination

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|------|------|------|------|------|
| Applicants | 127 | 110 | 135 | 129 | 133 |
| Passed | 120 | 106 | 129 | 118 | 129 |
| Pass ratio (%) | 94.5 | 96.4 | 95.6 | 91.5 | 97.0 |

Staff

(As of May 1, 2022)

| Divisions | Teaching Staff | | | | | Office Personnel | | | |
|--------------------|----------------|----------------------|-----------|----------------------|-------|--------------------|---------------------|-------------------------|-------|
| | Professors | Associate Professors | Lecturers | Assistant Professors | Total | Clerical Officials | Technical Officials | Medical Technical Staff | Total |
| School of Medicine | 38 | 33 | 10 | 55 | 136 | 18 | 13 | 0 | 31 |
| (Female) | (2) | (3) | (0) | (18) | (23) | (2) | (4) | (0) | (6) |
| (From Abroad) | (0) | (0) | (0) | (4) | (41) | (0) | (0) | (0) | (0) |

External Funding

| Category | | 2018 | 2019 | 2020 | 2021 |
|------------------------------------------|-------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|
| | | Items | Items | Items | Items |
| Grant-in-Aid for Scientific Research | Grant-in-Aid for Scientific Research on Innovative Areas | 8 | 8 | 4 | 4 |
| | Grant-in-Aid for Scientific Research(A) | 3 | 4 | 6 | 4 |
| | Grant-in-Aid for Scientific Research(B) | 20 | 19 | 24 | 34 |
| | Grant-in-Aid for Scientific Research(C) | 68 | 78 | 48 | 62 |
| | Grant-in-Aid for challenging Exploratory Research | 6 | 9 | 11 | 12 |
| | Grant-in-Aid for Young Scientists(A) | 3 | 1 | — | — |
| | Grant-in-Aid for Young Scientists(B) | 20 | 10 | 1 | — |
| | Grant-in-Aid for Young Scientists | 12 | 34 | 30 | 35 |
| | Grant-in-Aid for Transformative Research Areas(A) | 0 | 0 | 1 | 2 |
| | Grant-in-Aid for Research Activity start-up | 0 | 2 | 2 | 4 |
| | Fund for the Promotion of Joint International Research (Fostering Joint International Research) | 0 | 0 | 1 | 5 |
| | Grant-in-Aid for JSPS Fellows | 6 | 5 | 2 | 0 |
| | Subtotal | 146 | 170 | 130 | 162 |
| Health and Labor Sciences Research Grant | | 11 | 16 | 14 | 12 |
| Joint research | | 24 | 33 | 24 | 16 |
| Commissioned research | | 59 | 63 | 72 | 65 |
| Donations | | 490 | 564 | 469 | 404 |
| Total | | 730 | 846 | 709 | 659 |
| Total Amount (Unit: ¥1,000) | | 1,717,561 | 1,877,471 | 2,261,877 | 1,865,756 |

Number of Autopsies and Body Donors

| Divisions | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------|------|------|------|------|------|------|------|------|------|------|
| Systematical | 55 | 45 | 64 | 59 | 55 | 54 | 56 | 50 | 43 | 48 |
| Pathological | 33 | 22 | 41 | 31 | 25 | 25 | 42 | 33 | 14 | 18 |
| Total | 88 | 67 | 105 | 90 | 80 | 79 | 98 | 83 | 57 | 66 |

International Exchange

| Countries | Foreign University | Date Concluded |
|----------------------------------|---------------------------------------------------|--------------------|
| United Kingdom | University of Leicester | February 28, 2017 |
| People's Republic of China | Harbin Medical University | April 6, 1998 |
| Russian Federation | Far Eastern State Medical University | August 26, 1998 |
| | Pacific State Medical University | July 23, 1993 |
| | Krasnoyarsk State Medical University | September 11, 1998 |
| | kazan State Medical University | November 16, 2017 |
| | Kazan Federal University | November 17, 2017 |
| | North-Eastern Federal University | November 3, 2017 |
| | Moscow State University | December 21, 2017 |
| Malaysia | National University of Malaysia | December 31, 2019 |
| Republic of the Union of Myanmar | The Myanmar Ministry of Health | September 16, 2005 |
| | University of Medicine 2, Yangon | October 22, 2013 |
| | University of Medicine, Mandalay | June 27, 2018 |
| | University of Medicine 1, Yangon | July 27, 2020 |
| Mongolia | Mongolian National University of Medical Sciences | July 14, 2014 |
| Canada | Concordia University | December 12, 2013 |
| Bangladesh | Jahangirnagar University | December 16, 2016 |
| | North South University | April 11, 2018 |
| Indonesia | Airlangga University | May 1, 2017 |
| | Hasanuddin University | July 25, 2018 |

BUILDING LAYOUT



School of Medicine, Faculty of Medicine

- 1** East Wing Building
- 2** West Wing Building
- 3** North Wing Building
- 4** East Lecture Building
- 5** West Lecture Building
- 6** Auditorium
- 7** Student Practicum Building
- 8** Joint Research Building
- 9** Niigata Medical Professionals Development Center
- 10** Kidney Research Center



The Hippocrates Tree



How to reach the School of Medicine from Niigata Station

【Bus】

Take the Bandai Exit from Niigata Station (JR East Japan Railway Company)

Take one of the following Niigata Kotsu buses at the bus terminal in front of Niigata Station

▶ C2 Hamaura-cho Line: Get off at Asahimachi-dori Ni-bancho (15 – 20 minutes)

Walk about 3 minutes south from the bus stop.

▶ C3 Shinano-machi Line: Get off at Shiyakusho-mae (City Hall)(15 – 20 minutes)

Walk about 8 minutes north from the bus stop.

▶ C8 Shindai Byoin Line: Get off at Niigata Daigaku Byoin (Niigata University Medical & Dental Hospital)(15 – 20 minutes)

Walk about 5 minutes north from the bus stop.

【Taxi】

10 – 15 minutes from Bandai Exit at Niigata Station (JR East Japan Railway Company)

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Graduate School of Medical and Dental Sciences (Medicine)

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Medical and Dental Programs

757 Ichibancho, Asahimachi-dori, Chuo Ward, Niigata City 951-8510

Phone: +81-(0)25-223-6161 (Main number)

URL <https://www.med.niigata-u.ac.jp>