Dean’s Message

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Dean of the Graduate School of Medicine and School of Medicine
Kobe University

Kobe University Graduate School of Medicine, and School of Medicine originated from Kobe hospital, which was founded in 1869, approximately 150 years ago. I would like to describe the current status and future challenges of the Graduate School of Medicine, and School of Medicine.

Kobe University is now ranked as the priority support level 3, ‘outstanding university for excellent education and research’ by Ministry of Education, Culture, Sports, Science and Technology. Therefore, Kobe University is expected to achieve the world’s highest level, and Japanese government is eager to support Kobe University. On the other hand, financial autonomy in university management as a national university corporation will be required in the future. In the research of Kobe University Graduate School of Medicine, we launched the “Signal Transduction Medical Research Center”, to link the results of basic medical research to translational research for drugs and medical devices. In addition, we have been conducting research for infectious diseases in Southeast Asian countries, including Indonesia, on the basis of Center for Infectious Diseases with the support of the program J-GRIP since 2015. Increase of neuropsychiatric disorders, such as dementia and mood disorders, has been a major social problem in Japan. We have already started the project of brain science research, the creation of "lifelong health care of the mind", which is conducted by researchers of neurorology and neurological sciences. We are making a great effort on education to produce young scientists and physician scientists who can internationally contribute to the fields of cell signaling research and infectious disease research. Every year we have far more applicants to the PhD course than the capacity, indicating that the research-oriented young doctors are increasing in Kobe University. In the Graduate School of Medicine, Biomedical Science (MSc), we promote the development of medical researchers in the biomedicine and medical fields. In Faculty of Medicine, we aim to educate students to raise good doctors with highly specialized knowledge, skills, and high sense of ethics, who can play important roles in medical society. In addition, we have the special course to produce basic medical researchers. In cooperation with Hyogo prefecture, we provide special admission system "regional frame" of 10 people for each year. We focus on development of community health care workers. In international cooperation, we accelerate the promotion of international exchanges with Southeast Asia in the project, “Education of global medical and health science leaders in the coming generation in cooperation and collaboration with ASEAN countries.”

We also focus on the joint research organization with the University of Washington and expand the activities to Europe in the future. As campus and off-campus cooperation, it is important for us to support the establishment of the translational research center and the postgraduate clinical training education system that is integrated with undergraduate education under the reform activity of clinical specialists. In collaboration with all the departments in Kobe University to promote interdisciplinary research, we also extend the cooperation framework with other universities. We strengthen the joint research with external companies in the entire research department, the Regional Medical Activation Center in close collaboration with Hyogo Prefecture, and Medical Industry Development with Kobe city. As described above, we will continue to constitute members work together to promote education, research and clinical activities to achieve the world’s highest level in Kobe University Graduate School of Medicine, and School of Medicine. I would like to express my gratitude from the bottom of my heart for your support and cooperation.

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1886 Apr. The preparatory section for the Hospital was set in Kobe Foreign Public Office, and the construction of Kobe Hospital started.  
1889 Apr. Kobe Hospital was established. The training center for medical practitioners (called Igaku Densyujo) was attached to Kobe Hospital. The opening ceremony of Kobe Hospital was held.  
1876 Feb. Kobe Hospital was renamed Public Kobe Hospital.  
1877 Nov. The branch hospitals were established in Akashi and Nokomiya.  
1882 Apr. Prefectural Kobe Medical School was established.  
1883 Apr. Medical School affiliated to Prefectural Kobe Hospital was established.  
1888 Mar. Prefectural Medical School and Hyogo Prefectural Pharmaceutical School were both closed.  
1890 Dec. The main building of the Hospital was constructed (s.a. 14,9318).  
1894 Apr. Prefectural Medical School was established.  
1894 Apr. Prefectural Kobe Hospital was renamed Prefectural Medical School Hospital.  
1896 Apr. Prefectural Medical College was approved of its establishment (19 departments; The field number places for the first year students: 180).  
1897 Mar. Prefectural Medical School was closed.  
1900 Feb. Kobe Medical College was approved of its establishment.  
1900 Apr. Kobe Medical College Hospital was renamed Kobe Medical College Hospital.  
1953 Apr. The pre-medical courses of the Hospital was set in Tokyo Agricultural University and the Meiji Institute of Technology. Kobe University became authorized in accreditation of academic degrees (under the old education system).  
1954 Apr. The Department of Pathology (I) and the Department of Orthopedics were established.  
1955 Jan. The pre-medical courses of the Hospital was set in Tokyo Agricultural University and the Meiji Institute of Technology. Kobe University became authorized in accreditation of academic degrees (under the old education system).  
1956 Apr. The Department of Pathology (II) and the Department of Orthopedics were established.  
1957 Apr. The Department of Surgery and Preventive Medicine was closed. Instead, the Department of Hygiene and the Department of Public Health were established.  
1958 Sep. The Institute of Forensic Medicine was established.  
1958 May. The graduate school and its doctoral course (PhD) were approved of their establishments (under the new education system). The University main building, the new medical ward, the food service building, etc. were constructed. (s.a. 8,9328, 2,044 beds)  
1959 May. The Health Science Course was introduced in the Higher School of Nursing affiliated with Kobe Medical College. And, it was subsequently promoted to the Prefectural Women's Institute of Welfare.  
1960 May. The Research Institute was renamed the Research Institute of Growth Mechanisms.  
1961 Mar. Prefectural Medical College and its research course (in the old education system) were closed.  
1962 Apr. The Division of Dermatology and Otolaryngology was closed. Instead, the Division of Dermatology and the Division of Otolaryngology were established.  
1963 Mar. The College Library was constructed (s.a. 14,6028).  
1964 Mar. The Cabinet decided the promotion of Kobe Medical College to national status as of FY 1964.  
1965 Apr. The Faculty of Medicine was established in Kobe University. And, the promotion of Kobe Medical College to national status was started.  
1966 Apr. All programs of the pre-medical course, the first year course, and 10 Divisions in Basic Medical Sciences were transferred.  
1967 Apr. As the steps of the 2nd fiscal year in the promotion to national status, 3 Divisions in Basic Medical Sciences and 5 Divisions in Clinical Sciences were transferred.  
1968 Apr. As the steps of the 3rd fiscal year in the promotion to national status, 5 departments in Clinical Sciences were transferred.  
1969 Apr. The doctoral course was established in the Faculty of Medicine, the Graduate School of Medicine. As the steps of the 4th fiscal year in the promotion to national status, all students of the graduate school, 3 Departments in Clinical Sciences, and the College Library were transferred. In association with the promotion to national status, Kobe Medical College Hospital and the Prefectural Women's School of Welfare were renamed Kobe University Hospital School and the School of Nursing affiliated with the School of Medicine, Kobe University, respectively.  
1970 Mar. The Department of Anesthesiology was established.  
1972 Feb. The School of Medical College and its graduate school were closed after the completion of all transfers. The Division of Neurosurgery was established.  
1973 Mar. The School of Medical College affiliated to Kobe Medical College was closed.  
1974 Apr. The School of Medical College and its graduate school were closed after the completion of all transfers. The Division of Anesthesiology was established.  
1975 Mar. The Central Research Laboratory was constructed in the School of Medicine.  
1976 Oct. The Department of Internal Medicine (II) and the Department of Neurosurgery were established.  
1977 Apr. The School of Medical College affiliated to Kobe Medical College was closed.  
1978 Apr. The School of Medical College and its graduate school were closed after the completion of all transfers. The Division of Anesthesiology was established.  
1979 May. The School of Medical College was closed.  
1980 Apr. The Radiosurgery facility was established.  
1981 Apr. The Medical School was closed.  
1982 Apr. The Medical School was closed.  
1983 Apr. The Medical Information Technology Center was established.  
1984 Apr. The School of Nursing affiliated with Kobe Medical College was closed.  
1985 Apr. The Medical School was closed.  
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1987 Apr. The Medical School was closed.  
1988 Apr. The Medical School was closed.  
1989 Apr. The Medical School was closed.  
1990 Apr. The Medical School was closed.  
1991 Apr. The Administration Department of the School of Medicine and that of the University were united, and reorganized into the Administration Department of the School of Medicine (General Affairs Division, Planning and Administrative Division, Student Affairs Division, Medical Affairs Division). The Division of Geriatrics was established.  
1994 Mar. The Clinical Research Building (Currently, "Research Building A") was constructed.  
1995 Oct. The Faculty of Health Sciences affiliated with the School of Medicine was established. The fixed number of places for the first year students: 160.  
1996 Apr. The Division of Disaster and Emergency Medicine was established.  
1997 Apr. The School of Plastic Surgery was established.  
1998 May. The College of Medical Sciences affiliated with Kobe University was established. The fixed number of places for the first year students of the Faculty of Medicine, the School of Medicine decreased to 95.  
1999 Apr. The Graduate School of Medicine("Daiagakum igaku kenyukai") was renamed "Daiagakum igaku kenyukai".  
2000 Apr. The Division of Synchrotron Radiation Research (Cooperative Programs) was established in the Department of Internal Medicine, Graduate School of Medicine.  
2002 Feb. The University Hospital (clinical divisions) was reorganized as follows:  
Clinical facilities: Development and Aging, General Therapeutics: Obstetrics, Gynecology, Pediatrics, Internal and Geriatric Medicine, Psychiatry and Neurology, Radiology, Anesthesiology.  
Internal Medicine: Department of Infectious Diseases, Cardiovascular Medicine, Respiratory Medicine, Medicine of Neurology, Department of Diabetes and Metabolism, Medicine of Endocrinology, Department of Kidney Diseases, Medicine of Hematology and Oncology, Clinical Immunology.  
The Division of Developmental and Regenerative Medicine (Cooperative Graduate Programs) was established in the Graduate School of Medical Science.  
2004 Apr. Kobe University was transformed into the National University Corporate.  
The system of the Administration Office was reformed.
Membrane Dynamics

Toshiaki Sakisaka, M.D., Ph.D. Professor

The Division of Membrane Dynamics, expressed in the terms “Life is ruled by membrane”, aims to reveal the biochemically varying functions of membrane and thereby understand cellular function as expressed by membrane and the maintenance of its homeostasis.

The building blocks of all diverged lives are cells, which are surrounded by membrane. Each of the cells encompasses various intracellular organelles, nearly all of which are enveloped by membrane. With the harmonized reactions by the groups of membrane proteins localized in each organelle, the organelle membrane is shaped, exerting organelle-specific functions. We hope our investigations can contribute to elucidating a series of membrane mechanisms including the localization of membrane proteins, the functions of membrane proteins, the structures and machineries of organelles, all with the aim of understanding cytopoiesis.

In particular, our laboratory principally targets the endoplasmic reticulum, considered to be most important among the organelles. The endoplasmic reticulum is the organelle forming a reticular network of membrane throughout the cytoplasm. The endoplasmic reticulum plays a central role in the synthesis, sorting, and trafficking of secretory proteins and membrane proteins, quality control of proteins, synthesis of lipids, and restoration of calcium. It also works as a source of membrane, required in the formation of other organelles such as the nucleus, the Golgi apparatus, peroxisomes, and autophagosome. We are currently attempting to elucidate the mechanisms that form the endoplasmic reticulum, applying three research themes as follows:

1. Molecular mechanisms underlying the tubular and sheet structures of the endoplasmic reticulum
2. Machinery for the translocon-independent insertion of membrane proteins into the endoplasmic reticulum
3. Reconstitution of organelles using artificial membrane

Administratively, we are part holders of the chairs of cell biology and biochemistry for the first and second year students of the Faculty of Medicine.

Cell Physiology

Yasuo Minami, M.D., Ph.D. Professor

The Division of Cell Physiology conducts investigations aiming to elucidate “molecular mechanisms underlying morphogenesis and its function” and “relationships between these disruptions and pathologies such as cancer or inflammation” in mammals including humans. As a clue to shed light on these molecular mechanisms, we focus on the analyses of signal transduction pathway elicited by Wnt protein/Ror-family receptor tyrosine kinases (Ror1, Ror2) which are involved in the development and the onset/progression of various diseases.

Our laboratory, in particular, conducts “molecular functional analyses and molecular pathological analyses at tissue, organ, and whole-body levels, using genetically modified mice or disease-model mice” and “molecular functional analyses and molecular pathological analyses at cellular and molecular levels, using various culture cells”. And, through these studies, we expect to elucidate “the nature of flexibility and/or plasticity observed in living organisms”, “operating principles in biological phenomena”, and “pathologies induced by disruptions of biological processes” at genetic and molecular levels. On the basis of these analyses, we expect to gain a solid base for applying in unprecedented, novel diagnoses and therapeutics.

Our ongoing research themes are as follows:
1. Analysis of signal transduction machineries regulating cell migration and polarity during morphogenesis / damage repair (regeneration)
2. Analysis of the relevance between aberrations in signal transduction regulating cell migration and polarity and invasion and/or metastasis of cancer cells
3. Analyses of intracellular signal transduction mechanisms which regulate the development / damage response / inflammation of the central nervous system
4. Analyses of the mechanism of epigenetic gene regulation involved in morphogenesis / damage response / inflammation
5. Pathological analyses of growth, invasion and metastasis of cancers, using disease-model mice
6. Pathological analysis of inflammation using disease-model mice and pathological analyses of morphogenetic abnormalities (congenital anomalies)
7. Elucidation of operating principles in biological phenomena, by employing comprehensive analyses (omics) and biological- mathematical approaches

Molecular and Metabolic Medicine

Susumu Seino, M.D., D.M. Sci. Professor

The Division of Molecular and Metabolic Medicine was established in October, 2012. We aim 1) to elucidate the pathogenesis and pathophysiology of metabolic diseases including diabetes mellitus, 2) to identify novel biomarkers for the diseases; and to develop novel small molecules for treatment, by combined approaches of metabolomics, proteomics, molecular biology, biochemistry, and physiology. We also nurture and train young researchers and students who are expected to be leaders in the field of molecular metabolism and metabolic disorders.

System Neuroscience

Hiroaki Wake, M.D., Ph.D. Professor

Division of System Neuroscience is a new laboratory of Kobe University Graduate School of Medicine, launched in 2016 April. The first aim of our research is to understand the structural and functional principles of neural circuits underlying higher brain functions such as sensorimotor learning and emotion/cognition-based decision making by using two-photon optical imaging methods. Using the two-photon microscopy, we can monitor the activity of neuronal and glial cells (e.g., microglia, astrocyte, oligodendrocyte) and their interactions in task-performing living animals. To establish the causal relationship between the neuronal/glial activities and animal’s behavior, we also apply “optogenetics”, an innovative tool that can allow fast and precise control of genetically targeted brain functions and structures in freely moving animals. The second aim of our research is to elucidate the pathophysiology of neurological, psychiatric, and developmental disorders such as Parkinson’s disease, multiple sclerosis, autism, and schizophrenia. To this end, we develop the transgenic animal disease models and monitor the abnormal information processing in the neural circuits using the two-photon optical imaging. We then try to restore the brain functions by optogenetic and pharmacological manipulation of the targeted neural elements. We believe that these approaches lead to develop new therapeutical drugs and treatments for patients suffering from the neurological/psychiatric disorders. The final goal of our missions is to train outstanding medical doctors/scientists who devote their lives to basic medical research. We would like to make breakthrough discoveries in the field of neuroscience with “enthusiastic” young scientists. Undergraduate/graduate students are always welcome to participate in our laboratory!
Neurophysiology

Masahiro Mori, M.D., Ph.D. Associate Professor

The Division of Neurophysiology was established in 2010. We aim to elucidate brain functions and their mechanisms. To approach this important theme, various research at different levels such as at molecules, neurons, neural circuits, and the behaviors of animals has been conducted worldwide.

Our study focuses on the properties of neural circuits to clarify brain functions and their underlying mechanisms. The primary action of a neuron is to generate electrical signals, and to pass them to another neuron. By recording and analyzing cellular electrical signals (electrophysiology), the information generated or received by a neuron can be decoded. Performing this decoding in all neurons of a neural circuit enables us to clarify its functions and underlying mechanisms. We make efforts to contribute to prevention, diagnosis, and therapies for psychiatric diseases.

Our major research themes are as follows:
1. Information processing mechanisms of the neural circuits in the hippocampus, a brain region associated with learning and memory
2. The mechanisms of the synaptic plasticity, a cellular model for learning and memory
3. Functions and mechanisms of neurotransmitter receptors

For these themes, using cultured or acute brain tissue slices, we record the electrical signals of a single neuron using the patch-clamp technique. We also collaborate with domestic and overseas laboratories. Thus, we hope to contribute to society by providing a basic knowledge of neuroscience, and inform the general public of recent progress through our educational lecture series.

Neuronal Signaling

Naoaki Saito, M.D., Ph.D. Professor

The Division of Neuronal Signaling investigates the elucidation of cellular functions in various tissues inside the human body at the gene and protein levels, expecting to unravel the relevance between signal transduction mechanisms or protein modifications and human diseases. We dedicate our efforts in research to the eventual discovery of novel therapeutics or drugs.

1. Research on the abnormalities of the intracellular signal transduction mechanism in the onset of neurodegenerative diseases (e.g., spinocerebellar ataxia, Parkinson’s disease, etc.)
2. Research on the following issues using genetically modified mice: 1) development and maintenance of inner ear hair cells, 2) development and lamination of cerebellar cortex, 3) functional recovery after brain injury, 4) formation of skin tissues: epidermis and subcutaneous adipose tissue.

Structural Medicine and Anatomy

Ryo Nitta, M.D., Ph.D. Professor

Division of Structural Medicine and Anatomy is a new laboratory of Kobe University Graduate School of Medicine, established in June 2017. Our research is based on the morphological analyses, the studies of shapes or structures of living organisms to elucidate these functions. Historically, morphology was started from the macroscopic anatomy, though we can precisely visualize molecular structures at near-atomic resolution to date. Our laboratory investigates fundamental functions in living cells by elucidating molecular structures or subcellular organelles using X-ray crystallography and cryo-electron microscopy. We currently investigate the key molecules related with a neuronal cell development, neurodegenerative diseases, and cardiomyopathies. Our current topics are listed below. We also welcome to start structural studies of new fundamental molecules in any other research areas you interested in. Let’s enjoy nano-worlds of living organisms that no one has ever seen in the world!

Current topics:
1) Molecular mechanisms of a neuronal cell development
2) Molecular mechanisms of the axon guidance / growth cone collapse by microtubule associated protein CRM2
3) Structural basis of microtubule dynamics regulation in cell
4) Cryo-EM structural study of the cytoskeletal organization in cardiomyocytes
5) The systems of tissue stem cell maintenance: mechanisms underlying oncogenesis or aging (using the mouse model)

Undergraduate and graduate students are always welcome to join our research!

Neural Differentiation and Regeneration

Hideki Enomoto, M.D., Ph.D. Professor

We are interested in molecular mechanisms underlying the development of the nervous system. By using mice as a model organism and by functionally combing genetic, biochemical and molecular biological approaches, we investigate the behavior of molecules and cells that regulate neural development. We also investigate pathogenic mechanisms underlying developmental disorders of the nervous system by generating and examining mouse models of such diseases. Our goal is to obtain molecular insights into development and pathology of the nervous system and to apply that knowledge in the development of novel strategies for the treatment of disorders of the nervous system. Our three major ongoing research themes are as follows:

1. To elucidate the physiological function of the GDNF Family Ligands and their receptors. The GDNF Family Ligands and their receptors play essential roles in development of various neuronal populations in the central and peripheral nervous systems. We investigate how signaling mediated by these ligands influences neurons and their progenitors and regulates neural development.

2. To understand the mechanisms underlying the development of the enteric nervous system (ENS). The ENS regulates the motility, secretion and blood flow of the gut, and is vital to the maintenance of animal life. One of the amazing features of the ENS is that it can exert its basic function without input from the brain, for which reason the ENS is often called ‘the second brain’. We investigate the behavior of cells that governs a given step of the ENS development and explore the underlying molecular mechanisms.

3. To unravel the molecular mechanism underlying neurocysticercus

Neural crest cells are multipotent cells that can differentiate into various cell types including cells in the peripheral nervous system, pigment cells, cartilage and bone. Failure in development and differentiation of neural crest cells leads to a wide variety of diseases known in human as neurocysticercosis. Through our research, we seek to gain a better understanding of the pathogenesis of neurocysticercosis and Hirschsprung disease, two major developmental disorders in pediatric and pediatric surgery practices.
Molecular Brain Science

Tatsushi Toda, M.D., Ph.D. Professor

The Division of Molecular Brain Science focuses its studies on neuromuscular diseases and brain functions in the joint frame of basic and clinical medicines with the Division of Neurology of the Department of Internal Medicine. Our research aim is to understand molecular mechanisms of diseases and brain function, and ultimately to develop therapeutic and diagnosis strategies. We take various research approaches including genome analyses, proteomics, cellular biology, glycomics, and genetic engineering.

Muscular dystrophy is a single gene disorder, categorized into over 30 disease types according to the type of responsible gene and its hereditary form. Currently, there is no effective treatment for muscular dystrophies. We are trying to identify the responsible genes, elucidate pathology and pathogenesis, and establish therapeutic ways, by applying state-of-the-art technologies in the various fields such as molecular genetics, biochemistry, cellular biology, and glycomics. Our laboratory has recently elucidated the pathogenesis of Fukuyama congenital muscular dystrophy, and successfully offered quite a new avenue to its effective therapy. We have also engaged in the establishment of novel disease concept, "glycogenation-defective muscular dystrophy".

Most cases of Alzheimer’s disease and Parkinson’s disease are multifactorial disorders caused by combinations of genetic and environmental factors. The identification of a disease susceptibility gene is an important subject for such complex disorders. We are targeting the identification of disease susceptibility genes in neurodegenerative diseases for the establishment of personalized medicine. We also conduct drug discovery studies using disease model iPSC cells and functional genomics.

Humans and chimpanzees have very similar DNA sequences. An intriguing question of interest focus is why only humans utilize higher intelligence and language. Our laboratory investigates this subject by means of gene expression, epigenetic, and genetic polymorphism analyses. We also seek to identify causative genes for human mental retardation as well as genes involved in general cognitive ability (g factor, intelligence). We are hoping to shed light on the interrelationship of environmental/lifestyle factors and genetic factors, which affect human intelligence.

Vascular Biology

Masanori Hirashima, M.D., Ph.D. Associate Professor

The Division of Vascular Biology is devoted to investigating the molecular and cellular mechanisms underlying the development of blood vessels and lymphatic vessels in mammals, using genetically modified mice or in vitro differentiation culture of ES cells.

Blood vessels and lymphatic vessels play pivotal roles in fluid homeostasis, being distributed among almost all tissues across the human body. Both vessels are formed as a minimal tubular structure of single-layered endothelial cells. The blood vascular system includes the closed circulatory system, composed of arteries, veins, and capillaries. The lymphatic vascular system initiates as blind ends in peripheral tissues and connects to veins near the venous angle. We are particularly interested in anatomical distribution and the morphological diversity of these vascular systems.

Our specific research themes are as follows:

1. Mechanisms maintaining the separation between blood vessels and lymphatic vessels
2. Roles of vascular endothelial growth factor (VEGF) receptors in vascular development and fluid homeostasis
3. Regulatory mechanisms of lymphatic endothelial cells by Aspl and its related molecules

We think that elucidating the developmental vascular processes from endothelial cell differentiation/diversification to morphogenesis will contribute to future development in evaluation and regulation of pathological vessels in diseases.

In recent years, ultrasonography is routinely applied during human pregnancy, and various intracranial cases have been observed. As one case among these, nuchal edema (increased Nuchal Translucency) still remains unexplained, and it is now becoming an object of public concern. We hope our studies in mice lead to the development of future therapeutics for human fetuses, through identifying the causative genes in development in genetic studies using mice and elucidating the pathologies and progresses of individual cases.

Comparative Pathophysiology

Masashi Shiono, Ph.D. Associate Professor

Development of prevention or treatment strategies deeply depend on studies using suitable animal models corresponding to the pathophysiology of human disease. One of the primary causes of cardiovascular diseases, which is the leading cause of death in the world, is lipid metabolism disorder. In the metabolism of lipoproteins which transport lipids in blood flow, rabbits have similar metabolic pathways to humans, while mice or rats including genetically modified models are far different from humans. Recently, statins, potent hypcholesterolemic agents, are administered to more than 40 million patients in the world. WHHL rabbits (an animal model of hyperlipidemia and atherosclerosis) developed in Kobe University, not mice nor rats, contributed to the development of statins.

The Division of Comparative Pathophysiology was established in 2012. We investigate into atherosclerosis, acute coronary syndromes (general term of acute myocardial infarction, unstable angina pectoris, and sudden cardiac death), lipid lowering agents, and anti-atherosclerotic compounds, using WHHL rabbits in collaboration with the Institute for Experimental Animals. The WHHL rabbit is an improved strain of the WHHL rabbit, and shows spontaneous hypercholesterolemia, coronary atherosclerosis, and myocardial infarction.

1. Studies on atherosclerosis

We perform research on the serum markers related to destabilization of coronary atheromatous plaques, which affects the onset of acute coronary syndromes, and research into common sites of vulnerable lesions in the coronary arteries.

2. Studies on acute coronary syndromes

Detailed pathogenesis in acute coronary syndromes has not yet been elucidated. We attempt to clarify the mechanism of the onset of acute coronary syndromes by reproducing the disease experimentally.

3. Studies on hyperlipidemic agents and anti-atherosclerotic agents

Since statins were launched, other lipid lowering agents or anti-atherosclerotic agents which outperform statins have not yet been developed. We investigate the hypolipidemic effects and/or anti-atherosclerotic effects of seed compounds using WHHL rabbits.

Developmental Biology

Masahide Furuta, Ph.D. Visiting Professor

Group Director, Biosystem Dynamics Group Team Leader, Genetic Engineering Team RIKEN Center for Life Science Technologies

This division is one of Affiliated Graduate Programs with RIKEN, and the research is carried out at the RIKEN Center for Developmental Biology (CDB) at Kobe. CDB is an international research institute that explores fundamental mechanisms of animal development through a wide variety of approaches, aimed at applying the insights gained from basic developmental biology to regenerative medicine. The following research projects of the affiliated laboratories tackle animal development from wide angles ranging over genome organization, cell differentiation, tissue and organ development, and in vivo genetics.

1. Laboratory for Developmental Epigenetics aims at understanding the mechanism and significance of the changes in higher-order organization of the chromosomes during early embryonic development by applying state-of-the-art technologies, such as Hi-C.

2. Laboratory for Organ Regeneration studies the mechanisms underlying epithelial-mesenchymal interactions, and applies the knowledge to novel technologies for organ bioengineering towards realization of next-generation regenerative therapies.

3. Physiological Genetics Laboratory investigates fundamental mechanisms by which living organisms respond to disruption of homeostasis, such as injury and cancer, using model organisms, fruit fly and zebrafish, amenable to reverse genetics, imaging and optogenetics.

4. Genetic Engineering Team develops a variety of genetically engineered mouse models using cutting-edge reproductive biology and genome editing techniques to investigate the genetic mechanisms of embryonic organ morphogenesis and neural stem cell regulation.
Biochemistry

Shun-ichi Nakamura, M.D., Ph.D.
Professor

In the Division of Biochemistry, we are currently investigating the mechanism of cellular signaling through lipid mediators. We focus on phosphatidic acid as a glycerophospholipid and sphingosine 1-phosphate (S1P) as a sphingolipid for the understanding of physiological mechanisms underlying cell proliferation and differentiation as well as pathogenesis of cancers and neurodegenerative disorders. However, we place greater weight on sphingolipid research these days.

It is well known that S1P plays important roles as a lipid mediator in the regulation of cell proliferation, angiogenesis and immunity. In addition, we have recently reported that S1P causes glutamate release from hippocampal neurons and that S1P regulates maturation of exosomal multivesicular endosomes. We will contribute to the understanding of molecular mechanisms of memory and learning and pathogenesis of incurable diseases such as malignant transformation of cancer and neurodegenerative disorders including Parkinson’s disease by making further advances in sphingolipid research.

As for student education, we give lectures on biochemistry to 2nd year medical students. We emphasize understanding biological phenomena on a molecular basis. We expect the students to understand how chemical energy is obtained from foods through digestion and absorption, and how energy is utilized for biological activities. In addition, we discuss nutrition, vitamins and responses to environmental stress for the maintenance of human health.

Molecular Biology

Tohru Kataoka, M.D., Ph.D.
Professor

The aim of the research in the Division of Molecular Biology is to elucidate the mechanisms of cancer formation and, based on that, develop innovative anti-cancer drugs.

In particular, we focus on the Ras family small G proteins (e.g. Ras, the ras oncogene products, and their homologues such as Rap1, etc.), which constitute intracellular signaling pathways regulating cell proliferation and differentiation, as well as their downstream target proteins (effectors) and upstream regulatory proteins (guanine nucleotide exchange factors).

The characteristic of our research is to use a wide variety of methodologies ranging from those at the atomic level, which are exemplified by three-dimensional structure analyses of proteins by nuclear magnetic resonance (NMR) spectroscopy and X-ray crystallography and in silico drug discovery based on the structural information, to those at the whole-body level, which are exemplified by analyses of higher order functions using genetically modified mice. We also use methodologies at the molecular and cellular level exemplified by drug discovery using high throughput screening.

Our ongoing research themes are as follows:
1. Structural analysis of the molecular mechanism for the conformational dynamics of the GTP-bound form of Ras proteins (Ras-GTP).
2. Discovery of anti-cancer drugs molecularly targeting Ras proteins by applying in silico docking simulation based on the structural information on a novel three-dimensional structure of Ras-GTP.
3. Analyses of the function and the action mechanism of phospholipase Cζ (PLCζ), an effector of Ras and Rap1, in carcinogenesis and inflammation.
5. Analyses of the function and the action mechanism of RA-GEF-1 (Rap2GFr) and BA-GEF-2 (Rap2GFr), guanine nucleotide exchange factors for Rap1, in cerebral cortex formation (differentiation and localization of neural progenitor cells), blood vessel formation and spermatogenesis.

Molecular and Cellular Biology

Akira Suzuki, M.D., Ph.D.
Professor

Cancer, which is still increasing world-wide, is the leading cause of death. Our studies specifically examine molecular mechanisms for the onset and development of cancer using various techniques from the fields of molecular biology, cellular biology, biochemistry, and embryonic engineering. Most oncogenes and cancer suppressor genes are known to be involved not only in the onset of cancer, but also in the onset of various other diseases including development and differentiation abnormalities that critically affect whole-body homeostasis. We have continued in vivo functional analyses of p53, Pten/PDK3, and Hippo signaling pathways by generating knock-out mice. Results show that these mutant mice show various cancers and non-cancerous diseases, such as autoimmune disease, non-alcoholic steatohepatitis, and cardiac failure. These mutant mice have become attractive and powerful tools to analyze the diseases and to develop new therapeutic methods.

Our recent researches are summarized as follows:
1) Functions of Hippo signaling pathway
2) p53 regulation by nuclear stress
3) Functions of Pten/PDK3 pathway in various tissues
4) Molecular target drug discovery for cancer

Recent Major Recent Publications from our lab are as follows

Membrane Biology

Toshiki Itoh, Ph.D.
Professor

Subject 1 "Mechanism of cell motility by phospholipid signaling"
Phospholipids are important biological molecules involved in signal transduction at the plasma membrane, whose metabolic dysfunction can lead to a number of diseases. Among them, the generation of cancer cells characterized by uncontrolled proliferation, invasion, and metastasis are brought about by abnormal signal transduction through cell membranes, and dynamic changes in membrane morphology. Our laboratory studies the molecular mechanisms of cell motility and membrane traffic mediated by phospholipids that make up the cell membrane. We have clarified the mechanisms that control the directionality of cell movement driven by actin polymerization and the plasma membrane. In recent years, we particularly focus on a previously unrecognized parameter, membrane curvature, in order to understand the pathogenesis of severe disease caused by abnormalities in phospholipid signaling. Further, we aim to expand our research to drug discovery based on the regulatory mechanism of membrane morphogenesis.

Subject 2 "Functional analysis of protein kinases"
By focusing on the biochemical processes that involve protein phosphorylation and dephosphorylation, we have been studying the mechanism of intracellular signal transduction. Since our discovery of protein kinase N (PKN) family, we explore the possibility of the drug discovery target through studies on their structure and function. In particular, genetically modified mouse models are our main tools for the functional analysis of protein kinase C (PKC) and PKN at the physiological level. Our research reveals roles of protein kinases in cell motility, cell death, and stress response.

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Ultrastructural Biology
<Cooperative Graduate Program>
Takashi Kumasaka, Ph.D.
Visiting Professor

Director,
Protein Crystal Analysis Division
Japan Synchrotron Radiation Research Institute

SPIRE, the world’s largest third-generation synchrotron radiation facility, provides the most powerful synchrotron radiation currently available. Its ultra-bright X-rays give researchers exciting opportunities for advanced research in broad fields of science and technology. In life science, the research targets and analytical methods are distributed as follows: protein structures (macromolecular crystallography or solution scattering), molecular structure and function of proteins and lipids under physiological conditions, especially in vivo (X-ray scattering), fine structures of lung and bone (high-resolution X-ray computer tomography), imaging of respiraory and circulatory organs (X-ray refraction contrast imaging), and element mapping in cells (X-ray fluorescence). SPIRE 8 is operated and maintained by Japan Synchrotron Radiation Research Institute (JASRI), which has established affiliated graduate program relationship with Kobe University Graduate School of Medicine since April in 2000. Among the subjects, macromolecular crystallography is one of our major interests. It reveals three-dimensional structures of biomolecules at atomic resolution to clarify structure-function relationship of the molecules. We are developing instruments of synchrotron beamlines and analytical methods for this research such as the following: diffraction data collection system for microcrystals, ultra-fast data collection, dynamical analysis of protein structures in crystals, ultra-high resolution using high energy X-ray around 30 keV, microspectrophotometry for crystals, novel computational method to calculate accurate electron density map. We also maintain a laboratory for structural biology research through protein production to crystalization to analyze proteins such as medically important cellular signaling proteins. All these facilities are utilized to support SPIRE 8 users and to conduct collaborative research with groups of Kobe University and others.

Molecular and Cellular Signaling

Takashi Matozaki, M.D., Ph.D.
Professor

The division of Molecular and Cellular Signaling aims to elucidate novel signal transduction mechanisms inside or between cells, which are expected to be essential in many areas of life science. We identify the novel signaling molecules, and conduct analyses on their functions by the use of wide-ranging research methods such as in biochemical, molecular biological, cell biological, or cell technological ways.

In particular, we are interested in intracellular signaling pathways through protein tyrosine-phosphorylation. These signaling pathways are thought to play a pivotal role in the regulation of cellular functions which are the bases of biological phenomena such as cell proliferation, adhesion, movement, and metabolism, and higher biological functions including nerve and immune systems. We have recently found the CTN47-SHRP-2 system, a novel cell-cell communication system, which is related to signaling pathways through protein tyrosine phosphorylation. Further research on physiological functions and pathological significance is currently being explored.

Furthermore, recently we are involved in studies on the regulation system of a cellular life span. It is apparently known that terminally differentiated and mature cells composing various tissues possess a distinct life span. We are investigating how the life span of terminally differentiated cells in tissues is regulated by internal and external factors, how it has a role in the maintenance of tissue homeostasis, and how the disruption of such regulation will be associated with the pathogenesis.

Our laboratory is eventually pursuing the investigations whose results would effectively contribute to the diagnoses and treatments for various diseases such as carcinoma, neurological disorders, metabolic and endocrine disorders, arteriosclerosis, and autoimmune diseases, etc.

Pathogenetic Signaling
<Endowed Chair>

Yoshimi Takai M.D., Ph.D.
Professor

The cellular signaling pathways and their crosstalk, which are crucial for cell movement, proliferation, adhesion, and polarization, strictly regulate normal ontogeny and organogenesis. Dysfunction of the signaling pathways results in a variety of pathological conditions, such as oncogenic transformation of cells, invasion and metastasis of cancer cells, neural disorders, and atherosclerosis. The goals of our laboratory are to identify key molecular events underlying pathogenesis of these disorders and to develop new therapies for them. Towards these ends, we deal with the following research themes: 1) roles of receptors and their related molecules on growth factor signaling, 2) molecular mechanisms to establish neural circuits and synapses, 3) pathogenesis of neuropsychiatric disorders such as dementia and schizophrenia, and 4) molecular mechanisms of dysfunction of cells by aging. To achieve the goals, we perform unique fundamental researches by thinking outside the box. Immediately after getting innovative results, we aim to apply them to translational research, clinical research, and moreover to drug development. Our laboratory locates at Kobe Biotechnology Research and Human Resource Development (BT) center on the corner of KOBE Biomedical Innovation Cluster (KIBC), a complex of research institutes, corporations, and organizations, in Port Island. Taking advantage of this location, we actively comminicate with the researchers in the pharmaceutical companies as well as the public research institutes in KBC and carry out collaborative studies with them to make outstanding discoveries. Through these research activities, we simultaneously make every effort to train young scientists and obtain patents in order to contribute to society.

Signal Transduction

Shun-ichi Nakamura, M.D., Ph.D.
Professor

The Division of Signal Transduction was founded in 2009. We are engaged in basic research on abnormalities in signal transduction in human diseases, such as cancer, lifestyle-related diseases including atherosclerosis, and dementia.

It is notable that the human body is composed of around 37 trillion cells. Differentially cells sense respective environmental changes in surroundings and external stimuli. The cells respond to these stimuli to exert their specific functions. Through the receptors receiving the signals from outside of the cells, the signals are transmitted to intracellular molecules. Signal transduction pathways in cells are thus activated.
Pharmacology

Tomoyuki Furuyashiki, M.D., Ph.D. Professor

‘Pharmacology’ is a discipline to elucidate the interactions between drugs and our bodies as well as molecular mechanisms underlining pathophysiology of diseases, contributing towards the developments of novel drugs and therapeutic strategies. Using multidisciplinary approaches, our laboratory aims to identify molecular, cellular and neural circuit mechanisms which regulate cognitive and emotional functions as well as their deficits related to psychiatric disorders.

Based on clinical studies, it is established that physical and psychological stress in addition to genetic susceptibility plays a critical role in the onset and progressions of psychiatric disorders. However, therapeutic strategy targeting stress has not been established, since its mechanism of action remains unclear. Using a rodent model of stress, we discovered that social stress induces structural and functional changes in the prefrontal cortex through dopaminergic projection and neuron-glial crosstalk, leading to emotional changes. We are currently pursuing molecular and cellular correlates of stress in the brain as well as functional alteration of a broader neural network underlying stress-related pathophysiology.

To be hypothesis-driven, our research employs multidisciplinary techniques from molecular, cellular, systems and behavioral neuroscience. Besides conventional techniques, we have introduced and developed cutting-edge technologies, such as fluorescent visualization of specific neuronal circuits, optogenetic and pharmacogenetic manipulation of neural activity, and molecular manipulation and transcriptome analysis with high-spatial-temporal precision. In parallel, we attempt to establish cell-based assays with primary cultures exploitable for efficient drug discovery for psychiatric disorders.

In addition to the research activities, our division devotes every effort in our graduate programs to fostering advanced pharmacologists who wish to pursue basic and translational research, and in our undergraduate programs to fostering physicians and clinical scientists who can comprehend and think logically of pathophysiology and drug behaviors at molecular, cellular and system levels.

Pharmacokinetics

Tomoyuki Furuyashiki, M.D., Ph.D. Professor

Divisions of Pharmacokinetics and Pharmacodynamics deal with the research field tightly linked to the activities of the Department of Pharmacy, Kobe University Hospital. Our mission is to provide education and to conduct researches for the appropriate use of medication. We render our programs not only to the medical students, but also to the students of the Faculty of Health Science and outside pharmacy school students. Educating the significance and risks in pharmacotherapy as well as the appropriate use of medication for the medical professional students is important, because they will soon get involved in clinical practice of highly advanced and innovative services.

Pharmacokinetics is a science to elucidate drug behaviors from drug’s entry into the body through its having effect on us. We are engaged in the appropriate use of anti-cancer agents, and coordinate the basic research for individualized therapy. Molecular targeting drugs have achieved numerous successful clinical outcomes as a novel therapeutic strategy in the cancer chemotherapy, while adverse drug reactions are still induced, and impede effectiveness. The management of adverse drug reactions is crucially important when concerning patient’s continuous therapy without impairing their QOLs.

Genetic differences are important factors for inter-individual variability in the pharmacokinetics and pharmacodynamics. We investigate the relationships between genetic information and pharmacological effects or adverse drug reactions for individualized pharmacotherapy. In addition, we have established the ‘Japan Society of Pharmacogenomics’ to promote the highly sophisticated pharmacists’ activities.

Pharmacokinetic and pharmacodynamic information for the dosage adjustment is limited for the special population, such as pediatric or aged patients, and patients with liver or renal dysfunction. Therefore, we conduct population pharmacokinetic/pharmacodynamic analysis using drug concentrations and/or drug response data in the clinical settings, as well as modeling and simulation approach, in order to feed back scientific optimal dosage regimens to these patients.

Pathology

Hiroshi Yokozaki, M.D., Ph.D. Professor

A disease causes a given morphological alteration to the human organ, tissue and cells through various molecular changes. Pathologists catch the “change of shape” with naked eye as well as under microscope and provide the final diagnosis of disease at clinical practice. We are trying to conduct our research to elucidate the mechanisms of the “change of shape” and to apply the results to diagnosis and treatment of alimentary tract cancers at Division of Pathology. We have reported the significance of cancer- stromal interactions between gastric or colorectal cancer and fibroblast or mesenchymal stem cells on the characteristic morphogenesis and acquisition or maintenance of cancer stem cells. We are now accumulating new scientific findings of the interaction of cancer cells and tumor associated macrophages on the carcinogenesis and progression of human esophageal squamous cell carcinomas.

We are in charge for the education of Pathology for 2nd to 3rd grade, and case presentation of autopsy cases at Union Lecture of 6th grade (upon request) of Medical Students. In addition, we are committed to the early research education throughout the course of Medical School with the students willing to work with us.

We are responsible for the conduction of Pathological Autopsy in the Kobe University Hospital with about 50 cases per year. We arrange Clinico-Pathological Conference (CPC) for every case and report the final diagnosis at least half a year after autopsy. We are also in charge for the instruction and evaluation of CPC Reports for the Early Phase Residents of the Hospital. We hold the additional post at the Division of Diagnostic Pathology in the University Hospital conducting the histopathological diagnosis of endoscopically resected alimentary tract cancers with the instruction of Residents at Diagnostic Pathology.

Diagnostic Pathology

Tomoo Itoh, M.D., Ph.D. Professor

The Division of Diagnostic Pathology is specialized in surgical pathology, providing diagnostic pathology in Kobe University Hospital. Our division is consisted of many expertise pathologists from various areas, such as malignant lymphoma, liver, renal glomerular diseases, respiratory system, and bone marrow. All staffs perform highly advanced diagnoses and researches in each expertise area. We might be one of the most competitive laboratories in Japan, with a large number of pathologists and the state-of-the-art facility, offering pathological training programs in such favorable environment. The concerted conferences are routinely held in collaboration with other clinical departments.

We aggressively conduct researches of medical technology such as immunostaining, and gained a reputation as a central core of this area in Japan. Particularly, our research on the development of practical therapy with multiplex immunohistochemistry has recently come to receive attention. Currently, we also focus on implementing digital pathology. Through connecting the network to pathologists in other hospitals with applying this technology, we are going to deliver telediagnoses and foster human resources in distant places. For a domestic audience, we actively hold seminars, etc. We also introduced molecular techniques for diagnostic purposes, such as mass spectrometer as well as FISH and PCR.
Pathology Network
<Endowed Chair>

Yoh Zen, M.D., Ph.D., FRCPath
Professor

The Section of Pathology Network was newly established in 2014. In addition to pathological diagnosis at the clinical site of Kobe University Hospital, we are also engaged in research activities and provide education to faculty students and residents. We devote every effort toward three of our principal destinations as follows:

1. Establishment of Pathology Network: We strive to connect Kobe University Hospital and the surrounding local hospitals with an IT network to establish a diagnosis support system. We are dedicated to the development of network technologies for high-quality pathological diagnosis, the education for younger clinician pathologists using IT networks, and the offering of technical assistance in advanced pathological diagnosis.

2. Pathological Research: Research from the perspective of clinical pathology and of molecular biology using tissue samples are our areas of expertise. In particular, investigations of hepatobiliary and pancreatic disorders and IgG4-related disease have delivered many excellent results. We further develop our research with a translational perspective, aiming at the acquisition of perceptions applicable to clinical practice.

3. Fostering Younger Pathologists: The number of pathologists is critically short. Therefore, fostering younger pathologists has come to be a major issue. Fortunately, our chair has worked as a diagnostic pathologist in England. With the benefit of his experience, we now organize programs not only for fostering ordinary pathologists but also for highly-specialized diagnostic pathologists who are highly competent at global standards.

Molecular Medicine and Medical Genetics

Yoshitake Hayashi, M.D., Ph.D.
Professor

The Division of Molecular Medicine and Medical Genetics of the Department of Pathology, the Graduate School of Medicine, the Kobe University conducts studies based on human pathology, emphasizing on basic medicine of pathomorphology on infectious diseases and carcinoma.

Pathology is a science to study the bedrock to and to ascertain the nature of disease, and a diversified, profound domain, marvelously combined both dimensions of clinical and basic medicine. Although it is the field of basic medicine, we can deal with pathological diagnosis as biopsy every day in the Hospital, and can observe anytime how the clinical practice works. We can receive the joy of contribution directly in our clinical site through the pathological diagnosis. Pathology is an elegant rewarding science.

As concerns clinical pathology, our laboratory is mainly involved in hepatic diseases (comparative analysis of pathomorphologic presentation and clinical manifestation of hepatitis diseases, epidemiology on prognostic factors and therapeutics), hematologic diseases (hematopoietic, comparative analysis of pathomorphologic presentation and clinical manifestation of lymphatic and reticuloendothelial system disease, epidemiology on prognostic factors and therapeutics).

As for basic medicine, many achievements have been obtained on the function and pathology of liver. Liver cells function as an operation center for metabolism and play the capital role of regulating eating behaviors and energy metabolism, cooperated with central nervous system. Most cases in adult diseases such as metabolic syndrome, obesity, or circulatory disorders induced by arteriosclerosis are considered to be due to the imbalance in these regulations.

Our Division of Molecular Medicine and Medical Genetics, taking advantages of traditional techniques and knowledge of pathology also with applying cutting-edge advanced procedures, currently investigate into elucidating the above pathologies from the views on aberrations in hepatic cells, skeletal muscle, fat cells, and central nervous system. We, further, make progress in gaining concrete results which actually contribute to the prevention, diagnoses, and treatments for diseases.

Clinical Virology

Yasuko Mori, M.D., Ph.D.
Professor

The Division of Clinical Virology is devoted to studies related to viral infectious diseases, especially in those caused by human herpes viruses. We have been focusing on the analysis of viral gene functions, the viral life cycle and viral-host interaction. The final goal of these studies is to elucidate the mechanism of viral diseases and finally, contribute to developing methods for the prevention and treatment of these diseases. We are also developing vaccines based on the Varicella vaccine, the only licensed live vaccine for the prevention of human herpes virus diseases. We have inserted alien antigen genes into the viral genome to construct a polyvalent varicella vaccine, as a result, the vaccine can protect people from pathogens, in addition to the varicella zoster virus.

Besides viral research, we also focus on education. Both medical students and graduate students are studying in our division. Those students are not only trained in experimental skills, but also in how to design those experiments. We hope they will become skilled and knowledgeable young researchers or medical doctors enthusiastic about medical research.

We have been collaborating with laboratories from the around the world and foreign students and researchers are studying in our laboratory. We hope these activities will contribute not only to the progress of research, but also to cross-cultural communication.

Vaccine Development

Masanori Kameoka, Ph.D.
Associate Professor

Division of Vaccinology, Center for Infectious Diseases

Despite recent progress in medical technology, infectious diseases are the leading cause of death worldwide. In particular, they remain major causes of death as well as public health problems in developing countries in tropical and subtropical regions. In addition, there are many imported cases of infectious diseases that are currently not prevalent in Japan every year. We perform basic studies on dengue virus type 1-4, which are causative agents of dengue fever (DF), dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), as well as on human immunodeficiency virus type 1 (HIV-1), the major causative agent of acquired immunodeficiency syndrome (AIDS), in order reveal the detailed replication mechanism as well as to accumulate information required to develop novel antiviral compounds, vaccines and rapid diagnostic methods. In addition, we perform sero- and molecular epidemiological studies to monitor currently circulating HIV-1 and dengue virus strains in several provinces in Indonesia as a collaboration with the Indonesian research collaboration center of Kobe University established in the Institute of Tropical Disease (ITD), Airlangga University in Surabaya, Indonesia. Through such collaborative research projects, we aim to publish scientific information on dengue viruses and HIV prevalent in Indonesia as well as to accumulate information that may contribute to the implementation of dengue and HIV/AIDS countermeasures in the country. In addition, through conducting research projects on pathogenic viruses, we aim to nurture young Japanese and Indonesian researchers in the field of virology.
Infectious Disease Control

Ikuo Shoji, M.D., Ph.D.  
Professor

The Division of Infectious Disease Control focuses on the research on viral infection and pathogenesis. Although viruses cannot proliferate by themselves, they utilize the host machinery, such as membranes, proteins, and nucleic acids, to efficiently proliferate in infected cells. The viruses often hijack host factors to avoid host immune system, establish persistent infection, and result in causing cancer. Our research aim is to understand molecular mechanisms of viral infection and pathogenesis caused by hepatitis C virus (HCV), hepatitis B virus (HBV), and human papillomavirus (HPV). We also conduct molecular epidemiology of Norovirus and Rotavirus in Indonesia. Our major ongoing research themes are as follows:

1. Molecular biology of HCV and HBV: HCV is a positive-sense single-stranded RNA virus belonging to Flaviviridae family. HBV is a double stranded DNA virus belonging to Hepadnaviridae family. HCV and HBV infection often cause chronic hepatitis and liver cirrhosis, and finally develop hepatocellular carcinoma. We aim to elucidate molecular mechanisms of viral replication and pathogenesis caused by HCV and HBV.

2. Molecular biology of HPV: Several specific types of HPV are associated with human cervical cancer. The high risk group HPV encode two oncoproteins E6 and E7, which target the tumor suppressor gene proteins p53 and pRB, respectively. The E6-promoted ubiquitylation of p53 is mediated by the E6-AP ubiquitin ligase E6AP in conjunction with E6. We are interested in a role of E6AP in carcinogenesis.

3. Development of novel small molecules for targeting ubiquitin-proteasome pathway: We are trying to develop novel small molecule inhibitors for ubiquitin ligases and deubiquitylating enzymes.

4. Molecular epidemiology of viral gastroenteritis caused by Norovirus and Rotavirus in Indonesia: We are currently investigating molecular epidemiology of Norovirus and Rotavirus in Indonesia in collaboration with Institute of Tropical Disease, Universitas Airlangga, Surabaya, and National Institute of Infectious Diseases, Tokyo.

Infectious Disease Pathology

Yoshitake Hayashi, M.D., Ph.D.  
Professor

Division of Infectious Disease Pathology, Graduate School of Medicine, Kobe University has executed excellent and significant collaborations and co-operations with many overseas countries, through the studies and education programs on infectious diseases, especially on viral hepatitis. We have yielded superior contributions to the diplomacy in science and technology, and continue our quiet dedication through researches on infectious diseases from a global perspective.

Infectious Diseases Therapeutics

Kentaro Iwata, M.D., Ph.D., M.Sc., FACCP, FIDSA  
Professor

Division of Infectious Diseases Therapeutics was founded in 2008 and it has devoted to clinical studies related to various infectious diseases. These studies include but not limited to randomized controlled trials, retrospective case-control studies, case reports/series, descriptive qualitative studies, and theory building related to diagnosis/management of infectious diseases. Our area of interest in infectious diseases are very broad, which include avian/swine novel influenza, HIV/AIDS, tuberculosis, dengue fever, malaria and others.

Medical education is another area we are very interested in and we developed various educational tools and textbooks. We invented an educational program called HeatApp, which is a hybrid program of both problem based learning (PBL) and team based learning (TBL).

Our activities go beyond domestic and we work in various area in the world, including but not limited to Cam- bodia, Thailand, Kenya, the United States, and Peru, having cooperation with many institutions regarding clinical management, medical education, and research activities.

Virus Infection  
<Cooperative Graduate Program>

Jun Kunisawa, Ph.D.  
Visiting Professor

Head, Laboratory of Vaccine Materials, National Institute of Biomedical Innovation, Health and Nutrition (NIBIOHN)

The Section of Virus Infection under the Division of Infection and Immunology is one of the Cooperative Graduate Programs, and is coordinated by the Laboratory of Vaccine Materials belonging to the National Institute of Biomedical Innovation, Health and Nutrition, located in Sato in the north Osaka area. The main aim of our laboratory is to investigate viral immunology and develop novel mucosal vaccines for infectious diseases including viral infection. Mucosal vaccination through swallowing or drink- ing of an antigen is intended to induce incipient immunosurveil- lance at the surface of respiratory, digestive, or genital organs which might be initial infection sites for various pathogens.
**Genetic Medicine**
*<Cooperative Graduate Program>*

**Kenji Kawabata, Ph.D.**
Visiting Associate Professor

National Institutes of Biomedical Innovation, Health and Nutrition Laboratory of Stem Cell Regulation Project Leader

Stem cells, such as embryonic stem (ES) cells and induced pluripotent stem (iPS) cells, show the characteristics of self-renewal and pluripotency. They are expected to apply for the regenerative medicine and the drug development. To do this, stem cells could be efficiently differentiated into functional cells. In our laboratory, functional cells, such as hematopoietic cells, immune cells, and vascular endothelial cells, are efficiently differentiated from stem cells. Our objectives are to use these differentiated cells for the development of novel systems of drug safety test, drug screening systems, and in vitro disease models.

Drug allergy is an important side effect in developing new medicines. Mast cells play a critical role in the allergy responses. However, mast cells are difficult to collect from the body, because they reside in the peripheral tissues but not in the circulation. So, we derive mast cell-like cells from human iPS cells and apply them for development of a novel system of drug allergy test.

The blood brain barrier (BBB) is a bottleneck in development of the central nervous system drugs. BBB is formed by brain vascular endothelial cells and excludes drugs from the brain. In vitro BBB model can help us for the evaluation of drug disposition in the brain. Our interest is that brain vascular endothelial cells are differentiated from iPS cells to construct the in vitro BBB model. Using this model, safety and availability of the central nervous system drugs will be monitored to accelerate drug development.

**Medical Education**

**Seiji Kawano, M.D., Ph.D.**
Professor

The primary mission of the Division of Medical Education, founded in April 2014, is to function as a base for shaping the future medical education programs of the School of Medicine at Kobe University, and to expand plans into practical activities. We are to conduct the curriculum reform of the medical courses, focusing firstly on SEFMG certification and accreditation issues, effective in 2023.

Secondly, as a fascinating dimension of our work, we act together with the Integrated Clinical Education Center of the University Hospital and the Clinical Training and Simulation Center, which was organized for executing and simulating clinical training programs on clinical medicine for students before and after graduation. One of our aims is, therefore, to create versatile simulated education programs for the improvement of students’ comprehension, skills, and patients’ safety.

We initiated “clinical care”, where we can carefully take up students’ research questions obtained through their actual experiences in clinical sites. What is the best way of fostering students’ ability to be competitive professionals in today’s fast-evolving society? For the first time, a ubiquitous, and elusive question, we try to make our research activity itself capable of finding the answer, by weaving the steps - plan, do, and analysis - of our medical education research into the down-to-earth practices in clinical medicine.

Thirdly, as another attractive point, we act in concert with another Section of our Division of Medical Education, which was founded together with us. That Section of Community Medicine takes charge of the research and educational activities to foster human resources who will serve as leading roles in future community medicine. The Division of Medical Education aims to function as an intersection of these two axes, and concurrently, to visualize and theorize of this crossing itself as our research target.

Fourthly, as for our laboratory’s educational responsibility, we are engaged in coordinating education programs for fostering inquisitive medical students and supporting programs for those pursuing basic medicine. By promoting the students-organized periodical workshops and their interactions with younger researchers, we multi-directionally encourage the students aspiring to be basic scientists or clinician scientists.

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**Community Medicine and Medical Education**
*<Endowed Chair>*

**Masanobu Okayama, M.D., Ph.D.**
Professor

The Section of Community Medicine and Medical Education was founded in 2014. In the expectation of improved and qualified community medicine, we now devote our effort to developing effective education on community medicine, researching how to manage common health problems, recommending efficient delivery system of community medicine based on the analyses of medical resources, and validating the efficacy of genetic testing for preventing lifestyle-related diseases.

As for education on community medicine, we have shown that clinical training is a key to strengthening students’ motivation for providing community medicine or general practice. We further proved that healthcare training, especially experiencing home medical care plays an efficient role in accelerating students’ sense of responsibility to community medicine.

Regarding the management of common health problems, we assessed the need of the need to bathe while having a cold, and verified that patients with a cold are only slightly affected by bathing. And, as for the primary care delivery system, we mapped the distribution of clinics across Japan, using a geographical information system. Furthermore, we clarified some problems in utilizing genetic testing results, by indicating that providing test results of genetic assays to patients is not always effective for improving their lifestyles or preventing diseases.

Concerning education, we provide novel and challenging approaches, aiming at promoting students’ motivation, rewarding experience and cultivating their sense of responsibility in community medicine. We developed our method by performing local activities and involving people. We also planned our new program, the lectures on healthcare in collaboration with diverse professionals.

Furthermore, our laboratory cooperates with the leading section in the public health service of Hyogo Prefecture, participating in the government’s policy-making on community medicine. By this means, as a think-tank, we reflect the beneficial outcomes from our research/education activities back on to community medicine and into the medical policies of our community.

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**Community Medicine and Career Development**
*<Endowed Chair>*

**Tsuneki Kenzaka, M.D., Ph.D.**
Professor

This division was established in 2015. Based in the Community Medicine Education Center of Hyogo Prefectural Kaibara Hospital, we mainly engage in the following activities while providing hospitals such as the Toyooka Public Hospital with support in medical care, education, and research:

1. Provision of medical care in the Tamba Medical Service Area and Tajima Medical Service Area
2. Support of lifelong training and education for healthcare providers in the Tamba Medical Service Area and Tajima Medical Service Area
3. Development of training programs for general internists and primary care general physicians
4. Clinical research concerning quality improvement of community medical care and general medical care

We particularly focus on education, clinical guidance, and research support for physicians participating in the physician development program of Hyogo Prefecture, students and physicians intending to become general internists or general physicians.

In the model core curriculum of medical education, “community medicine” and “community-based medical clinical training” are compulsory subjects that medical students must take or take part in. As to postgraduate education, community medical care training in the clinical training system for junior residents. As to postgraduate education, community medical care training in the clinical training system for junior residents. We are currently developing these curricula and programs as well as the specialized training program for general medical care in the new specialist physician system.

Ever since the collapse of community medical care became a social issue, the “development of healthcare providers that communities need” has been strongly called for. That is, communities need healthcare providers who listen to various health-related concerns and problems of people in the community, respond to their needs and concerns appropriately, and provide attention broadly to their daily lives, while watching over and supporting these community-dwelling individuals.

The present status and issues in community medicine cannot be learned without experience gained on the front line. Our goal is to establish pre- and postgraduate education for community medicine, based in the Community Medicine Education Center of Hyogo Prefectural Kaibara Hospital, a national model. We also strive to cultivate healthcare providers who can provide people in the community with medical care while considering their daily lives and regional characteristics.
Regulatory Science
<Cooperative Graduate Program>

Mami Ho, M.D., Ph.D.
Visiting Professor
Pharmaceuticals and Medical Devices Agency (PMDA)
Senior Scientist for Clinical Medicine
Office of Medical Devices

Development of innovative medical supplies and medical device is indispensable to Japan which aims at the leader in the world in biomedical industry. And various policies for promotion of a life innovation and industrial development are adapted. In such a background, it is required that medical university should tackle “regulatory science” aiming at investigating about regulations including the Pharmaceutical Affairs Act in the viewpoint of “harmony with progress of technology” and “international standardization”. This division cooperates with Pharmaceuticals and Medical Devices Agency (PMDA), and perform the research and practice of regulatory science for accelerating a translational research. And it trains the specialist in regulatory science.

1) Knowledge acquisition about regulation required in order to promote the research and development in medical supplies, medical devices, and health science industry.

2) Research which contributes to optimization of test method required for regulatory approval of new medical supplies, medical devices, etc.

3) Research which contributes to standardization of the criterion of judgment of approval reviews for new medical supplies and medical devices, etc.

4) Research which contributes to construction of more effective safety measures for medical supplies, medical devices, etc.

Translational Science

Yoji Nagai, M.D., Ph.D.
Professor

“Translational Science” is the field of investigation focused on understanding the scientific and operational principles underlying each step of the translational process. Translation is the process of turning observations in the laboratory, clinic and community into interventions that can improve the health of individuals and public. Thus, it includes not only the processes to apply basic research findings to humans, but also the processes to execute clinical trials, to extend the achievements in clinic and to transfer clinical observation to the population health. Each process must be implemented through ethically, legally and socially righteous methodologies, which are realized, for instance, by animal experiments, clinical trials and observational studies. Division of Translational Science is dedicated to the cultivation of scientific principles underpinning such translational processes, as well as to the facilitation of respective processes that lead to the improvement of medicine and public welfare.

Food and Drug Evaluation Science

Norihiro Sakamoto,
M.D., Ph.D. (Medical Science),
Ph.D. (Information Science)
Professor

In the field of medical research, investigations have been executed traditionally and mostly targeting certain diseases, their mechanisms, or treatment methods. In recent years, people are facing a super-aging society, and heightened attention to health span is increasing. Novel health management methods, functional food, and dietary supplements for preventing diseases or promoting good health, are all strongly recommended in addition to prior and existing therapeutics. However, these health management methods, functional foods, and dietary supplements are rather mild in their effects in comparison with existing therapies or medical drugs. Due to this fact, long-term data collection from large-scaled groups is often needed, though satisfactory evaluation methods have not yet been developed. The Division of Food and Drug Evaluation Science explores the issues regarding such frameworks for implementing scientific evaluation and assessment strategies.

Epidemiology

Hisahide Nishio, M.D., Ph.D.
Professor

Our laboratory (the Division of Epidemiology, the Department of Social/Community Medicine and Health Science) is engaged in the research on neurological disorders in children, namely spinal muscular atrophy (SMA). Recently, mass spectrometry-based comprehensive analysis of small metabolites, metabolome analysis, was introduced in collaboration with the Integrated Center for Mass Spectrometry. Investigation of hydrophilic and hydrophobic small molecule metabolites gives us promising opportunities to understand a variety of pathophysiology in human diseases.

SMA is a common autosomal recessive disorder. SMA is caused by loss of anterior horn cells in the spinal cord, leading to progressive muscle atrophy and weakness. The SMN1 gene is a well-known SMA-causing gene. Since 1996, we have continued the research on SMN1 gene. We have already conducted genetic diagnosis of more than 100 SMA patients to date, and identified gene mutations in each patient. According to our molecular epidemiological study, the complete (or homologous) loss of SMN1 gene is found in 90% of the SMA patients. We are now developing the new therapeutic approach of SMA with the investigation of disease specific intracellular hydrophilic and hydrophobic metabolome pathways, as well as offering genetic diagnosis.

Among endogenous small molecule metabolites, specific lipid-derived metabolites with distinct bioactivity are called “lipid mediators”, and have drawn the attention of researchers worldwide. These lipid mediators have been investigated with the relation of acute inflammation and its regulation, however recently it is reported that they might regulate chronic inflammation, tissue repair, and regeneration, neuronal signal transduction, and brain functions. We are now investigating critical roles of lipid mediators in physiology and pathophysiology of various human diseases.
Legal Medicine

Yasuhiro Ueno, M.D., Ph.D. Professor

The Division of Legal Medicine executes the research and education on human death. We mainly investigate into forensic pathology and forensic toxicology related to various causes of death (COD). Precisely, we are involved in the instrumental analyses on a variety of toxic agents or alcohol, the application of those methods to the COD diagnoses, and the pathological research on cardiac sudden death and death in abnormal environment, with immunohistochemical staining and laboratory markers, etc. Previously, we have achieved results in the discovery of pathological indicator of death from cold and the establishment of rapid analytical method for mushroom toxins and agricultural chemicals sampled from human body, etc. We also submit actively the case reports of death from various causes, collecting the knowledge on human death.

Forensic autopsy cannot be separated from education and research in legal medicine. Forensic doctors and technicians are specially trained with accumulating knowledge and experiences in forensic autopsy, and improve themselves in autopsy skills and evaluation ability. Those benefits will improve the education and research in legal medicine. Furthermore, we are entrusted with executing forensic autopsy in unnatural death cases in Hyogo Prefecture. Developing our evaluation ability in forensic autopsy, we contribute to the society by clarifying COD in the spirit of “Quest for truth, based on the facts substantiated”.

As for education, our division holds the chair of Legal Medicine in the programs of basic medicine. According to the system of inquiries into the COD in Japan, and due to the insufficiency in number of expertise physician in legal medicine, postmortem examinations of deaths without any suspicious point are carried by general clinicians. The validation about suspiciousness in legal medicine is then to be delivered. Therefore, clinicians are required to possess adequate knowledge of legal medicine. Our laboratory thus provides education in legal medicine to the students, aiming at their acquisition of essential knowledge needed at postmortem examination of dead body.

Pathology for Regional Communication <Endowed Chair>

Tomoo Itoh, M.D., Ph.D. Professor

The Division of Pathology for Regional Communication was established in the Department of Social/Community Medicine and Health Sciences, the Graduate School of Medicine, Kobe University on April 1st, 2013 as an endowed chair by Hyogo Prefecture. The installation was purposed to promote the research on regional communication in pathology, to familiarize those research results to the society, and to contribute our services to the improvement in pathological diagnoses of Hyogo prefectural hospitals.

1. Pathological diagnoses in Hyogo Prefecture

(1) Department of Diagnostic Pathology, Hyogo Cancer Center
Inside the Hyogo Cancer Center, the research institute of pathology for regional communication was established. It succeeded partially the responsible work of the Department of Diagnostic Pathology of the Center, and drives business improvements.

(2) Department of Diagnostic Pathology, Kobe University Hospital
Our laboratory members review the pathology of brain tumor and bone and soft tissue tumor together with pathologists of the Hospital, and improve diagnostic accuracy.

2. Fostering of surgical pathologists in Hyogo Prefecture

The number of surgical pathologists is remarkably insufficient in this country including Hyogo Prefecture. The Department of Diagnostic Pathology of the Hyogo Cancer Center, where our research team belongs, widely accept faculty students and residents on their practical trainings. We further provide educational opportunities of pathological diagnoses to younger pathologists, mainly in both departments of the Hyogo Cancer Center and the University Hospital.

3. Consultation service on pathological diagnoses in Hyogo Prefecture

In the Institute of Pathology for Regional Communication, we deliver a consultation service on pathological diagnoses, mainly regarding bone and soft tissue tumor and brain tumor, to the pathological divisions of many hospitals in Hyogo Prefecture. We devote every effort to the accurate and appropriate care for these scarce cancers being conducted.

Cardiovascular Medicine

Ken-ichi Hirata, M.D., Ph.D. Professor

The Division of Cardiovascular Medicine devotes to introduce leading-edge diagnoses and therapies for cardiovascular diseases. Concurrently, we strive for research, education, and clinical practice, aiming to unravel the causes of diseases and to develop novel diagnoses/therapies.

1. Cardiovascular Medicine: Research for clinical applications of molecular imaging and stem cell therapy

In basic research, we carry out ingenious investigations into the causes of atheromatous plaques in the coronary artery. Using molecular imaging techniques, we aim at stable and vulnerable coronary plaques and their development, and disclose molecular mechanisms of acute coronary syndromes.

2. Clinical applications of molecular imaging and stem cell therapy

Using molecular imaging techniques, we introduce leading-edge imaging and therapeutic modalities, such as optical imaging, PET/CT, and MRI, for diagnosis and treatment of cardiovascular diseases.

Arrhythmia

Ken-ichi Hirata, M.D., Ph.D. Professor

The Section of Arrhythmia was founded in the Division of Cardiovascular Medicine, the Department of Internal Medicine, Kobe University, for the purpose of establishing the base site in fostering arrhythmia-specialized clinicians and other healthcare professionals, and in providing medical cares for arrhythmia. The said chair functions as a development center to introduce highly advanced arrhythmia therapies into clinical sites rapidly and widely. We foster arrhythmia-specialized clinicians expertized in catheter ablation and implantations of cardiovascular-defibrillator or pacemaker, and their supporting healthcare professionals. Our works are growing steadily. The numbers of catheter ablation and cardiovascular device implantation carried have been dramatically increasing since the said chair was established. Our laboratory has become one of leading facilities for arrhythmia treatment in our nation, not simply under Hyogo Prefecture.

1. Arrhythmia: Clinical applications of catheter ablation for arrhythmias

Using highly advanced imaging technique of cardiac CT/IVR/750kHz US, we can perform highly accurate and safe procedures such as mapping and ablation for atrial fibrillation, atrioventricular nodal re-entrant tachycardia, and other arrhythmias. Our department has been one of the leading sites in Japan for catheter ablation for atrial fibrillation.

2. Arrhythmia: Clinical applications of cardiac resynchronization therapy

Using highly advanced imaging technique of cardiac CT/IVR/750kHz US, we can perform highly accurate and safe procedures such as mapping and ablation for atrial fibrillation, atrioventricular nodal re-entrant tachycardia, and other arrhythmias. Our department has been one of the leading sites in Japan for catheter ablation for atrial fibrillation.
**Exploratory and advanced search in cardiology**  
*<Cooperative Graduate Program>*

**Vice President,**  
**Hiyogo Brain and Heart Center at Himeji**

The Section of Exploratory and Advanced Search in Cardiology in the Kobe University Graduate School of Medicine was founded in 2015. The Section shares in the academic mission to achieve excellence in patient care, research and teaching. The Section provides its clinical cardiology and cardiovascular research and training program which is based on the site of the Hiyogo Brain and Heart Center in Himeji. Graduate students will develop their basic and clinical knowledge, procedural skills, clinical judgment, professionalism, and interpersonal skills required as a specialist in cardiovascular diseases and academic cardiologist who will become a next generation leader.

Hiyogo Brain and Heart Center at Himeji is located in the Himeji city which is at the south western part of Hyogo and the second largest city in Hyogo. The center encompasses the diverse research and clinical activities of Kobe University Graduate School of Medicine and provides graduate students with a full spectrum of clinical cardiovascular care and great opportunities for research and training. The patients in the center represent a wide variety of common and rare cardiovascular diseases and provide graduate students with important experiences to all areas of clinical cardiology.

**Gastroenterology**

**Shinichi Nishi, M.D., Ph.D.**  
**Professor**

The Division of Gastroenterology, as the Department of the University Hospital, devote to offering diagnoses and treatments for various gastrointestinal diseases in esophageal, stomach, duodenal, small intestine, large intestine, bile duct, pancreas, and liver. Cancer is our primary target. We perform exams on esophageal cancer, gastric cancer, colon cancer, biliary tract cancer, pancreatic cancer, and liver cancer, etc. in various ways such as endoscopy, ultrasonography, or endoscopic therapy, and strive for multimodal inspections/treatments, cooperated with the Department of Radiology or Surgical Departments. Our second target is intractable diseases. We deliver leading-edge diagnoses/treatments for ulcerative colitis, the Crohn’s disease, primary biliary cirrhosis, fulminant hepatitis, and severe acute pancreatitis, etc. We further work on functional dyspepsia and irritable bowel syndrome, the diseases recently increasing in the stressful society.

**Performances in 2015:**

- Number of Outpatient: 29,960, Inpatient (admission): 1,130
- Chemotherapy (esophageal cancer, stomach cancer, colorectal cancer, pancreatic cancer) 68

As for research activities, the aim of our division is to promote frontier medical sciences and bring up excellent physician-scientists who can lead the worldwide activities in the field of gastroenterology. Our focus is to investigate pathophysiology of intractable diseases in gastroenterology, such as cancer, inflammatory bowel diseases, and functional gastrointestinal diseases. In addition, we are developing novel medical devices for gastrointestinal endoscopic diagnosis and treatment. We are actively engaged in following research subjects in the basic, clinical, and translational sciences.

1. Tailor-made medicine in gastrointestinal cancers
2. Inflammation and cancer
3. Metabolome analyses of gastrointestinal diseases
4. Mucosal immunology
5. Functional gastrointestinal diseases

**Advanced Medical Technology for Gastroenterology**

**Hiromu Kutsumi, M.D., Ph.D.**  
**Visiting Professor**

The application of our research results to society requires workflow with these steps: Basic research → Clinical application → Productionization → Industrialization. Constructing the flow system: Translational Research through Regulatory Science (RS) is a key subject.

Our section is developing gastroenterological medical devices, considering the pharmaceutical regulation from the early stage of development. We also carry out clinical trial promotion of novel medical devices. To fulfill these tasks, not merely inside the Graduate School of Medicine, but in cooperation with other Graduate Schools such as Engineering, we make all efforts in implementing Regulatory Science including improved medical devices and newly labelled items for which we expect broadened application, as well as innovative medical devices and treatment techniques, through the following subjects:

1. Fostering of human resources in Regulatory Science
2. Constructing a validation system for effectiveness and safety in non-clinical and clinical trials
3. Constructing a reliability-assured registry

**Ongoing research projects:**

1. Research and development of the MR (Magnetic Resonance) endoscope
2. Research and development of laser therapy
3. Research and development of a biodegradable stent for benign stenosis of the gastrointestinal tract, bile duct, and pancreatic duct
4. Establishment of a treatment method of Oddi dysfunction for the sphincter
5. Robotic endoscope

**Advanced Therapeutic Target discovery**  
*<Cooperative Graduate Program>*

**Tosio Imai, Ph.D.**  
**Visiting Professor**

President & CEO,  
Chief Scientific Officer, KAN Research Institute, Inc.

In Advanced Therapeutic Target discovery<Cooperative Graduate Program>, a collaboration research is actively ongoing with KAN Research Institute, Inc. to discover new therapeutic concepts and seeds of novel drugs. Organelles and cells consist of protein that are translated from DNA—the blueprint of life—and function as the cornerstone of life. Based on the knowledge of homeostatic mechanisms in organisms, we focus on living cells to reveal the mechanisms about disturbance of homeostasis, a key factor in disease development and pathologic conditions. This unique “Integrative Cell Biology for Medicine” research is conducted by integrating the knowledge of key fundamental sciences such as immunology, neurobiology, and oncology, which is our most competitive advantage in that it enables us to apply the knowledge and technologies of one area to others and to observe one pathological condition from different disciplinary perspectives.

As one of our initiatives to seek more innovative research approaches, we visualize and quantitatively analyze functions in organisms using in vivo imaging, 3D tissue analysis and method for rendering tissue transparent. At the same time in the field of regenerative medicine, we pursue development for application in transplantation therapy of our original method of directional differentiation and cell selection using specific cell surface markers.

We deeply leverage academic-industry partnerships to create an interactive network for sharing the latest knowledge and technologies for drug discovery. We will also continue to create opportunities to connect people of diverse ideas and backgrounds to search the nature of life phenomenon and of diseases to realize better medical care.
Respiratory Medicine

Yoshihiro Nishimura, M.D., Ph.D.
Professor

The Division of Respiratory Medicine is devoted to the wide-ranged clinical practices and investigations into various respiratory diseases. We continue to explore respiratory tract inflammation and airway remodeling. We mainly target bronchial asthma, and recently focus on phospholipase C C.¢ and sphingosine-1-phosphate. And, based on these study results, we have started to develop the novel treatment method for respiratory tract inflammation. As for clinical studies, we conduct epidemiological research on bronchial asthma and COPD.

In recent years, the number of persons with lung cancer has been increasing, and it has become one of the major causes of death in Japan. To this end, we have launched the basic research on lung cancer in molecular and biological approach. In clinical research, we participate in multicenter collaborative studies to develop the treatment procedures in the area of clinical oncology for lung carcinoma.

Diabetes and Endocrinology

Wataru Ogawa, M.D., Ph.D.
Professor

The Section of Diabetes and Endocrinology is engaged in research and education on diabetes mellitus and endocrine diseases. In the area of diabetes mellitus, aiming to develop the improved therapy for type 2 diabetes mellitus, we have devoted our efforts to studies into the molecular mechanisms of insulin resistance and beta-cell dysfunction. We also expect to develop some approaches to novel treatment procedures for obesity or obesity-related diseases through research on functions of adipocytes and research on energy metabolic regulation. As for our clinical research, we devote our efforts to the in-depth understanding of the pathophysiology of type 2 diabetes mellitus with the use of a variety of techniques including glucose clamp or MRI spectroscopy, and to research on continuous subcutaneous insulin infusion and continuous glucose monitoring, based on the wealth of experience of our country’s top-level clinicians.

In the field of endocrinology, pathoetiology, pathological analysis, and drug discovery for hypothalamic and pituitary diseases are investigated as our major research targets, applying case-oriented and disease-oriented approaches. We are aiming to give our research benefits back to patients. We are currently involved in these themes: elucidation of the cause and pathology of pituitary tumor and its drug discovery, elucidation of the pathology in pituitary autonomy and proposal for a novel clinical entity, elucidations of pathogenesis and pathology in hypoglycemia, and the identification and functional analyses of novel hormones.

Concerning medical education, we offer a variety of instructions on common endocrine diseases such as thyroid diseases, osteoporosis, secondary hypertension, or adrenal tumor, and also, on comparatively rare conditions such as pituitary diseases or gonadal disorders. All are useful instruction for daily clinical practice as well as the comprehension of the significance and concept of the endocrine system, which are necessary for maintaining systemic homostasis.

General Internal Medicine

Wataru Ogawa, M.D., Ph.D.
Professor

The Section of General Internal Medicine provides “whole person care” throughout the outpatient and inpatient services, in support of every organ-specific clinical department.

Under our discipline, “To serve good medical care is the best way to educate people about medicine”, we dedicate our efforts to educating younger physicians including medical students and residents at bedside. In such a favorable environment, we conduct both the clinical research and the medical educational research. Our themes are as follows: glucose fluctuation and its control in several medical situation, educationally informative case reports, new methodology of medical education targeting medical students and younger physicians, etc.

In basic research, we are engaged in the elucidation of pathogenic mechanism of type 1 diabetes mellitus, which is an organ-specific autoimmune disease, to develop the immunotherapy for preventing onset or as a treatment. Our laboratory also participates in the nationwide research survey on Japanese patients with type 1 diabetes mellitus, which is projected by the Japan Diabetes Society and the National Center for Global Health and Medicine. Furthermore, revealing the relationship between dementia and lifestyle-related diseases, we research the age-related transition in body composition and chronic inflammation.

Nephrology

Shinichi Nishi, M.D., Ph.D.
Professor

The Section of Nephrology investigates glomerulonephritis, tubulointerstitial nephritis, complications of chronic kidney disease, and complications of dialysis as our major education and research targets.

As for our education for residents, we train them as members of our clinical service team. And, for the faculty students, we coordinate and execute programs of skill practice in the manner of “bed side teaching” through seminars and conferences.

Our laboratory conducts clinical research and basic research in parallel. We have recently discovered abnormal generation of glycosaminoglycan, which occurs in the background of collagen fibril glomerulopathy, an infrequent hereditary nephritis, and explore the elucidation of its enhancing mechanism in generation and research to clarify pathologies such as analyses on genetic abnormality in collagen or glycosaminoglycan. With regard to tubulointerstitial nephritis, basic studies on the progressing mechanisms of renal interstitial ischemia and fibrosis are conducted, applying a unilateral urinary tract obstruction (UUO) model.

Concerning our investigation into complications of chronic kidney diseases, we are engaged in the elucidation of blood vessel calcification, heart valve calcification, and myocardial damage, targeting the suppression of onset in the cardiovascular system disorders which appear in association with chronic kidney disease-bone mineral disease disorder.

In clinical research, we examine the protective effectiveness of cardiovascular disturbance induced by uremic toxin absorbent or phosphorus absorbent. In basic research, we carry out research on elucidating the mechanisms in the protective effectiveness of blood vessels by vitamin D or the renin-angiotensin system inhibitor. We further enhance our research on bone metabolic disorder accompanied by chronic kidney diseases, and unravel the pathology of bone remodeling abnormalities along with the diabetes mellitus models.
Rheumatology and Clinical Immunology

Akio Morinobu, M.D., Ph.D.
Associate Professor

The Section of Rheumatology and Clinical Immunology is engaged in both basic and clinical research on rheumatic diseases.

In our basic research, we mainly investigate the pathological analyses of rheumatic diseases, aiming to develop new treatment methods and discover novel markers. We analyze pathological findings in animal models or patients’ specimens from the immunological perspective. We currently carry forward the following projects:

1. Research on immune cell dynamics in arthritis-model mice
2. Research on novel treatment methods with arthritis-model mice or fibrosis-model mice
3. Research on metabolism in immune cells in patients with rheumatic diseases through metabolic analyses
4. Research on cytokines and alarmins in inflammatory conditions

At the University Hospital, we devote our services as experts in the Department of Rheumatology and Clinical Immunology. In clinical research, we perform retrospective studies of our patients, and present the results to the public. We have reported on issues on lupus nephritis, giant cell arthritis, osteoporosis, myositis, Behçet’s disease, and IgG4-related diseases in academic journals and conferences. Based on these retrospective studies, we are now planning to execute further prospective studies. We have just launched our cohort study of the patients with rheumatoid arthritis in 2014. We will accumulate the cases and cooperate with other medical institutions to promote clinical research.

Neurology

Tatsushi Toda, M.D., Ph.D.
Professor

The Division of Neurology investigates pathomechanisms to establish treatment methods regarding all diseases in the brain, spinal cord, peripheral nerve, and muscles, and provides medical care at our clinical site. Methodologically, we make full use of the sciences of molecular genetics, molecular cellular biology, and pharmacology, and research on pathomechanisms in cerebrovascular dementia, using ischemia-modelled mice, have previously been conducted.

1. Dementia-related diseases
We are the principal member of the Center for Memory and Behavioral Disorders, and are engaged in the diagnosis and treatment of dementia. We expect to construct a database of patients to realize personalized medicine which links to individual and suitable medical care for patients. Clinical trials concerning disease-modifying therapy and the elucidation of pathomechanism in cerebrovascular dementia, using ischemia-modelled mice, have previously been conducted.

2. Neurophysiology
As for the numerous cases of immune interstitial neuropathy, including Guillain-Barre syndrome (GBS), electrically evoked studies in neuromuscular diseases mainly as a neural conduction test are thoroughly performed to elucidate individual pathological conditions. We are developing novel cell therapy, in the aim of establishing non-invasive early detection for motor neuron diseases such as Amyotrophic Lateral Sclerosis (ALS).

3. Neurodegenerative diseases (Neuromaging study, Genome scanning)
With the full use of image inspections such as MRI, SPECT, and PET, we evaluate intracerebral degeneration and atrophy such as sporadic cerebral degeneration or Parkinson’s disease, in qualitative and quantitative ways. We also conduct identification of pathogenic genome factors of sporadic Parkinson’s disease and the responsible gene of familial neurological disease of unknown origin, applying advanced genomics (i.e. next-generation sequencing or genome-wide association study).

4. Neuroimmunology
In order to elucidate the pathology of multiple sclerosis or neuromyelitis optica, we carry out analyses of lymphocytes using flow cytometry and analyses of the relevance between therapies and clinical conditions.

Oncology / Hematology

Hironobu Minami, M.D., Ph.D.
Professor

Elucidating the mechanisms of action and resistance in molecular target drugs

Medical research delivers its significance only by application to the clinic. The Division of Medical Oncology / Hematology consciously conducts clinical application-oriented investigations at all times. In clinical practice, we provide drug therapies for all types of cancers, whether hematological or solid. We extract the clinical questions out of our clinical sites and perform both clinical research and basic research to solve those questions.

Molecular target drugs developed recently can bring remarkably large effects on some patients. However, such effects do not appear in all patients. Thus, personalized treatment with molecular target drugs which are selected to suit to the type of individual patients’ cancer is required. Our division is engaged in basic research on the discovery of biomarkers required for personalized medicine, through elucidating the mechanisms of drug sensitivity and resistance. In addition, regarding hematologic malignancies, we are devoted to elucidating the molecular bases in the interaction between hematopoietic stem cells and their niche, and executing basic studies to develop novel treatment methods targeting those bases.

The fruit obtained from basic research must be evaluated appropriately in clinical trials before being launched in clinical sites. We develop translational research for linking to clinical trials, and furthermore, execute early-stage clinical studies including first-in-human studies for patients with solid cancers or hematological malignancies. We also perform, in our basic studies, “back translational research”, through which the questions found in these developmental therapeutic research can be solved. As for the drug therapies already launched in clinical applications, we actively strive to advance pharmacokinetic/pharmacodynamic studies, clinical pharmacology research, and clinical trials on the transplantation of hematopoietic stem cells for patients with hematologic malignancies, to further develop novel scientific treatment methods, where effectiveness is increased and adverse effects are alleviated.

We are a very unique laboratory which contributes to both basic and clinical research on various solid cancers and hematologic malignancies, in close conjunction with the Department of Medical Oncology / Hematology at Kobe University Hospital, where many expert professionals in the methodologies of clinical trials are assembled.

Diagnostic Radiology

Ryohei Sasaki, M.D., Ph.D.
Professor

The division of Diagnostic Radiology is mainly engaged in the research on diagnostic imaging and Interventional Radiology (IR).

Since we have mainly conducted clinical researches on diagnostic imaging, intimate cooperation with related clinical divisions is vital. Our research teams are, therefore, subdivided into organ-specific topics; such as neuro, cardiovascular, thoracic, gastrointestinal, genitourinary, musculoskeletal imaging. Substantial number of world-leading state-of-art imaging scanners are installed in the department of Radiology, Kobe university hospital. For example, we have four state-of-art CT scanners in CT suit, including dual-source, dual-energy CT and area-detector CT, while in MRI suit, we have three state-of-art 3.0-T scanners and two 1.5-T scanners. Furthermore, in our 3D-laboratory, several types of workstations are installed and we can provide cutting-edge image processing and three-dimensional imaging reconstruction, as well as 3D-printing. Accordingly, we conduct the researches not only on morphological imaging, but also on world-leading diagnostics and therapy-assist functional imaging with CT & or MRI. In the RI suit, many cutting-edge unique systems are installed; such as SSD-based cardiac-SPECT, SPECT/CT, PET/CT, and MR/PET system. We perform studies on diagnostic imaging, as well as investigation for new drugs. In addition, as a cyclotron is installed in our hospital, we have planned to conduct more clinical trials and reviews on new diagnostic agents, under Good Manufaturing Practice (GMP) guidance.

Regarding our investigations applying the IPR, we principally carry out basic and clinical researches, mainly developing novel therapies for various malignant tumors and exploring novel endovascular repair methods for aortic and peripheral vessels. Currently, clinical researches regarding endovascular treatment for aortic aneurysm, aortic dissection, and critical limb ischemia are in progress. Simultaneously, our department conducts some basic researches for endovascular treatment including development of new endovascular devices and efficacy and safety of various new embolic materials. One of our missions is to develop a new less invasive and safer treatment using basic technology efficiently transferred to clinical field. 
Functional and Diagnostic Imaging Research/Advanced Biomedical Imaging Research Center

Yoshiharu Ohno, M.D., Ph.D. Professor

The Division of Functional and Diagnostic Imaging Research was founded in the Department of Radiology in 2008, for the purpose of executing various collaborative researches on radiological medicine in academic-industrial alliance. The main research topics in this division are as follows:
1) Basic and clinical applications of medical imaging engineering and related fields such as Computer-Aided Diagnosis and Detection (CAD) and its related software development with medical imaging industries, etc.
2) Basic and clinical applications of quantitative methods on Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) for diagnosis and functional evaluation in patients with chest and abdominal diseases
3) Development of novel diagnostic imaging methods by means of CT and MRI, which can assess a variety of biogenic information having not evaluated yet in traditional diagnostic methods
4) Translational research, multi-center study with domestic and international institutes

Education is one of the important and our high interest fields. To the graduate students as well as the faculty ones, we offer the educational programs on basic in radiology, medicine, medical imaging engineering, chest and abdominal diagnostic imaging, and fundamental and principles of CT and MRI. We also educate domestic and overseas physicians for understanding newly developed functional and diagnostic methods using CAD, CT, and MRI. According to education and research training in our division, we hope the physicians who can proactively promote and execute medical imaging technology and novel radiological methods that truly contribute to not only radiology, but also patients’ care and other medical fields in both academic and clinical sites.

Furthermore, our division is promoting many collaborations of collaborative works with not only domestic other universities, centers for pulmonology, or cancer centers, but also those in USA (e.g. Harvard University, the University of Pennsylvania, the University of Texas, etc.), Germany (e.g. Heidelberg University, German Cancer Research Center, etc.), UK (e.g. the University of Edinburgh, etc.), and Korea (e.g. Seoul National University, Samsung Medical Center, and Asan Medical Center, etc.) in educational and research activities.

Radiation Oncology

Ryohei Sasaki, M.D., Ph.D. Professor

Division of Radiation Oncology proactively implements the translational research with clinical, medical, physical, and basic biological ones. We investigate into high-precision radiotherapy, brachytherapy, and particle beam therapy, etc. in cooperated with neighboring cutting-edge treatment facilities, and deliver these clinical services.

Recent years, the technologies in radiotherapy have become sophisticated in its accuracy, and the therapeutic methods have developed into less-invasive and robust. Two treatment technologies: Stereotactic Radiotherapy (SRT) and Intensity Modulated Radiotherapy (IMRT) are much known. At our institution, an advanced radiotherapy with positional accuracy is provided using the linear accelerators featured an image-guidance system. We further exercise our ingenuity in minimizing set-up errors caused by a slight movement of organs inside the body, with a respiratory synchronization system or implantable fiducial markers. For operating properly SRT or IMRT, the techniques in adjusting and keeping the positional accuracy are prerequisite.

SRT is a radiotherapy requiring a high dose radiation in a brief time with converging beams in multi-angles. It is employed mainly for isolated or a few lesions in lungs, liver, or brain. With IMRT, dose intensity can be adapted intracranially according to the shape of focal area. It is capable to decrease the dose level for the neighboring organs of focal area to suppress adverse effects, and to increase the dose level for focal area. We have achieved good results with this method especially on prostate carcinoma and head and neck carcinoma. Concerning uterine cervix carcinoma treatment, we investigate into developing image-guided brachytherapy using magnetic resonance imaging. And, we also develop therapies with corpuscular ray for intractable carcinoma.

Cancer therapy must be conducted and cooperated by three major treatment modalities: surgical therapy, chemotherapy, and radiotherapy, we believe. We address clinical practice and researches in giving high priority in fostering radiation oncologist, who will practice a team medicine over the border of departments and expertise in oncology.

Ion Beam Therapy <Cooperative Graduate Program>

Tomoaki Okimoto, M.D., Ph.D. Visiting Professor

Director, Hyogo Ion Beam Medical Center

Hyogo Ion Beam Medical Center (HIBM) was established on April 1, 2001, with the goal of eradicating cancer, which is an ardent wish of humanity. Our weapon in fighting this tough enemy is charged particle radiotherapy featuring two types of charged particles (proton and carbon-ion). HIBM was the world’s first institution that offers both of these two types of therapy, and there are only four of such institutions in the world (as of the end of March 2016). The number of cases to which we applied charged particle radiotherapy at HIBM exceeds 7,000; we have world-class clinical experience. We have actively published our achievements through presentations and lectures in (academic) conferences, and peer-reviewed academic journals.

There are three major approaches to cancer treatment: surgery, chemotherapy and radiotherapy. In addition to these, immunotherapy is gathering attention as a fourth approach. Under this situation, what can people expect from particle radiotherapy? The answer is improved treatment results for intractable cancers which cannot be cured with other therapies. HIBM has been actively working on the cases that were incurable at other institutions and achieving results. The tumors we have handled include bone and soft tissue sarcoma, tumors in the head and neck, pancreas cancer, biliary tract cancer, liver cancer, lung cancer and others. To bring satisfaction to intractable cancer patients and their families, we pledge we will continue to exert every effort to further improve our treatment outcomes.

Pediatrics

Kazumoto Iijima, M.D., Ph.D. Professor

The Division of Pediatrics at the Kobe University Graduate School of Medicine is engaged in a variety of investigations into diseases of children and newborn infants. Major targets of our laboratory are kidney diseases, newborn infant diseases, nervous and muscular diseases, metabolic and endocrine diseases, hematological tumors, malformation syndromes, and infectious diseases. A wide range of research activities are performed, principally as an investigation into the development of new therapies for refractory diseases, or molecular genetic research unraveling etiology and pathology. Our laboratory actively transmits those results not only in Japan, but also throughout the world.

As one of our recent topics, an investigator-initiated clinical trial of Rituximab treatment for childhood-onset refractory nephrotic syndrome has achieved significant results. The full study report has been published in The Lancet, and our study has yielded big rewards, in that the application of Rituximab has increased and spread as a therapy for refractory nephrotic syndrome. Beyond that, much other research and development in novel therapies including another investigator-initiated clinical trial of molecular target therapy for Duchenne muscular dystrophy are in progress. These studies are originally patient-oriented, developed from clinical questions which arose during our medical care for patients. Therefore, those results possess unique characteristics which can directly lead to the clarification of pathogenesis and pathological conditions or to the development of novel therapies for refractory diseases.
General Pediatrics

Ichiro Moriya, M.D., Ph.D. Professor

Medical care in pediatrics mostly focuses on children with acute fever, vomiting, rashes or coughs. In clinical sites though such children present common symptoms, they need to be accurately evaluated even as their medical conditions are changing moment to moment, and appropriate diagnoses and treatments are required. In this field of medicine, therapies based upon rules of thumb have been widely offered, and scientific methods have been poorly employed in previous investigations.

The mission of our laboratory is to disseminate leading-edge knowledge and research technologies into everyday clinical sites of pediatrics, to perform advanced education, research, and therapy on children’s acute diseases, and to return successful results back to community medicine. Spreading these new insights nationwide, we can contribute to the improvement of emergency pediatrics across the country.

In December 2010, the Kobe Children’s Primary Emergency Medical Center was established in the HAT area of Kobe. The research laboratory of our Section of General Pediatrics under the Graduate School of Medicine opened inside the center in conjunction with its opening. We develop clinical and basic research on newborn infant and child with acute common diseases in various areas, such as infectious diseases, allergic diseases, metabolic disorder, nervous diseases, hemotologic diseases, kidney diseases, and respiratory/circulatory diseases, etc., integrating the clinical practice which has been cultivated in the clinical sites of acute diseases treatments and the advanced techniques of research inside the University. Furthermore, we promote the training programs on emergency pediatrics for medical students and younger clinicians, aiming to foster the human resources expected to bear emergency pediatrics in the future.

Developmental Pediatrics

Noriyuki Nishimura, M.D., Ph.D Professor

In the Section of Developmental Pediatrics, we focus on the issues related to child development, especially a deviation from typical development. Although neonatal mortality rate is dramatically improved due to a progress in perinatal care in Japan, infants with high-risk delivery are rapidly increased in association with advancing of late marriage and reproductive technique, and its long-term sequelae such as cerebral palsy (CP) and intellectual disability (ID) become a pressing issue. In infants without perinatal abnormalities, patients with developmental disorders (DD) such as ES, autism spectrum disorder (ASD), and attention-deficit/hyperactivity disorder (ADHD) are also progressively increased. At present, curative therapy for these disorders is unavailable, and clinical practices are mainly based on previous experiences, not scientific evidences. Our laboratory aimed to conduct the systematic research, generate the scientific evidences, and contribute the better diagnosis, treatment, and rehabilitation for CP, ID, ASD, and ADHD. The Section of Developmental Pediatrics was founded in the Division of Pediatrics in April, 2015 and executed various basic and clinical researches on CP, ID, ASD, and ADHD in a tight collaboration with Kobe University Hospital and Kobe City Rehabilitation Center. To foster physicians engaging in developmental pediatrics, we are trying to develop our educational and training programs for medical students and clinical residents. We make every effort to systematically examine patients with CP, ID, ASD, and ADHD, and generate scientific evidences for basic pathophysiology, diagnosis, and rehabilitation for these disorders constituting the current pediatric field with most increased number of patients.

We expect to further scientifically examine the diagnoses and therapies for child acute diseases, and construct evidence-based systems of clinical practice and therapies.

Dermatology

Chikako Nishigori, M.D., Ph.D. Professor

The skin is the largest organ in the human body. The mission of our Division is to explore a variety of organ phenomena around the skin and their disruptions resulting in skin diseases. Dermatology has grown to be a mature interdisciplinary system covering molecular biology and genetics. Skin diseases are expressed over a fairly expanded range, and in varied ways as induced or modified forms: inflammatory diseases such as allergy, skin neoplasms, and skin diseases caused by environmental factors including the sunlight.

Capturing a correlation between clinical findings in front of our eyes and histopathological diagnosis, we can carefully pursue which molecules of the skin cells are targeted, and why particular symptoms have been induced. It is an attractive feature of our science that we can make a diagnosis and select an appropriate therapy through understanding these molecular pathogeneses based on skin manifestations and histological findings perceived with our own naked eyes. We provide services for 120 clinical outpatients and care for 28 inpatients per day. Therefore, for students, we can prepare a favorable environment for raising their ability to gain full-spectrum clinical skills through a wide variety of case analyses.

Since research activities are absolutely pivotal in comprehending pathogenesis, we currently investigate skin malignant tumors, skin allergy diseases and photobiology. In particular, in order to view all life phenomena from the molecular level, we proactively push forward collaborative studies with other divisions in basic medicine of our University, which has already delivered numerous excellent results. This has been well-known as our traditional strong point in many years, especially regarding signal transduction. Thus, we enhance our approach at the molecular biological level, and focus on developing therapies based on pathogenesis.

In the field of therapeutic research, we focus on translational research through the cross talk of basic research and clinical science: translational research on skin malignant tumors, including malignant melanoma, which is under investigation. As a “mecca of photo-medicine”, we strive for basic and clinical research on photobiology, expecting our activities to bring benefits to patients.

To all energetic young doctors who aspire to be “Physician Scientists”, we welcome you! Why don’t you experience the secrets of “the Skin” with us?

Psychiatry

Ichiro Sora, M.D., Ph.D. Professor

The Division of Psychiatry consists of four specialized groups: Molecular Psychiatry, Child and Adolescent Psychiatry, Geriatric Psychiatry, and General Clinical Research.

The Molecular Psychiatry Group studies the molecular pathophysiology of mental disorders. Methodologies of molecular genetics are used for our research on schizophrenia or suicidal behavior. Recently, stem cell technologies have also come to be applied to our biological models of mental disorders.

The Child and Adolescent Psychiatry Group studies diagnoses and therapies for developmental disorders such as autism spectrum disorder (PTSD) in children. Many children developed the disorder after they were exposed to the Great Hanshin Awaji Earthquake disaster that devastated our community.

The Geriatric Psychiatry Group mainly studies dementia, such as Alzheimer’s disease. Many clinical trials for the development of new therapeutics of dementia have been conducted in our department. Recently we are studying dementia using the latest equipment such as Positron emission tomography (PET).

The Clinical Research Group conducts research on the effectiveness of rehabilitation in the acute phase of schizophrenia in accordance with clinical cases. Clinical training of residents and medical students is emphasized in our Division. Special training programs of psychiatry are arranged to teach biological and psychological aspects of mental disorders in the aim of offering suitable medical care to patients.
Laboratory Medicine

Yoshihiro Nishimura, M.D., Ph.D. Professor

Laboratory Medicine is applied to a variety of purposes including multiphasic screening and epidemiological studies, as well as clinical services from routine practice through advanced medical treatment. The employed laboratory tests corresponding to changing times and progress in medicine have been rapidly transformed. The role of our science is to analyze and integrate examinations scientifically to follow their respective objectives, and to further develop novel screening tests. Our research activities are carried forward with these two perspectives in mind.

Our Division contributes to surveys conducted with the data obtained in our field, the Department of Clinical Laboratory at Kobe University Hospital, as well as to basic research for developing novel screening tests. In our Hospital, a diverse range of disease cases have accumulated, and patients come here seeking consultations, and high-quality medical aid. The staff of our Division pursues intense studies in close collaboration with the professionals of each clinical department for updated and optimal screenings, provided in the Department of Clinical Laboratory at our Hospital. Thus far, we have delivered significant achievements through many collaborative studies with the Departments of Rheumatology and Clinical Immunology, Cardiovascular Medicine, Gastroenterology, Diabetes and Endocrinology, Nephrology, Pediatrics, Obstetrics and Gynecology, Dermatology, Medical Oncology/Hematology, Neurosurgery, Orthopaedic Surgery, and Breast Surgery.

Recently, we are focusing on gene-related testing, and considerable achievements have been obtained in genetic diagnosis for congenital thrombosis and in molecular diagnosis for hematopoietic tumors. On another front, the development of novel screenings, we strive for pathological diagnosis with microRNA for rheumatoid arthritis, a rapid test with mass spectrophotograph for drug-resistant bacteria, metabolome pathological analysis for collagen diseases, genetic diagnosis for myeloid muscular atrophy, and the discovery of molecular markers for malignant melanoma. Our Division further advances the development of tests, contributing to active investigations into drug discovery with microRNA for Rheumatoid Arthritis. Our division also pushes forward the basic research in collaboration with NIH to establish newly developed therapy for autoimmune diseases and arteriosclerosis.

Evidence-based Laboratory Medicine (Sysmex) <Endowed Chair>

Ken-ichi Hirata, M.D., Ph.D. Professor
Ryuki Toh, M.D., Ph.D. Associate Professor

The Division of Evidence-based Laboratory Medicine was established in 2004, under the mission to collaboratively develop novel assessment methods which are of practical use, and to elucidate scientifically the effectiveness of assessment.

For the development of medicine, improvements in clinical assessment are requisite. And today, in our society where high-priority, personalized medicine is also required, the establishment of assessment methods and the identification of biomarkers, through which the risks of diseases can be detected rapidly and easily stratified, are the highlighted issues, much needed not only for disease control but also from the viewpoint of medical economy.

Our laboratory strives for the discovery of novel biomarkers and the development of clinical assessments, targeting cancer and lifestyle-related diseases which account for the majority of causes of death in Japan. Recently, we have discovered a novel cancer marker for cardiac failure through the analysis of blood metabolite profiles using gas chromatography mass spectrometry. To seek its diagnostic meaning, we are validating which pathological conditions are reflected there, turning back from bedside to bench.

In clinical practice regarding high-density lipoprotein (HDL), the measurement of contained cholesterol is the only existing effective method to evaluate HDL. We are trying to develop novel functional assessments from a perspective of lipoprotein particles. Furthermore, we verify the clinical significance of the existing assessment methods through collecting data from prospective clinical trials and in clinical epidemiology. We explore the suitable methods for use, concerning the medical economic effects, and novel indexes which further clarify risks by combining the existing methods with other emerging ones.

Metabolomics Research

Masaru Yoshida, M.D., Ph.D. Associate Professor

Division of Metabolomics Research was founded in April, 2010, for the purpose of establishment of Metabolomics technology, which is to analyze a variety of metabolites comprehensively, and furthermore application of Metabolomics technology to human research. Metabolomics, which is one of omics technol- ogy, is new ‘-ome science’ positioned as one of the post-genomic sciences, and is considered as potent technology to elucidate the functions of unknown genes and so on, and application of metabolomics to life science, medical science and clinical practice is expected.

In Division of Metabolomics Research, we work in research and development for practical application of metabolomics involved in life science, organic chemistry, analytical chemistry and information science in collaboration with researchers of various research fields such as faculty of agriculture, engineering, nutrition, pharmaceutical sciences. We advance the metabolite profiling evaluation and the high-resolution character analysis by collecting and integrating the metabolome information in food, cell, experimental animal and human samples, and also step up efforts on the novel biomarker discovery study for ultra-early disease diagnosis, toxicity prediction and therapeutic effect prediction and the other studies, leading to application of our findings to the clinical practice.

Omnics is the technology to investigate the alterations in biological molecules for evaluation of life phenomenon totally, and genomics, which is the comprehensive analysis of genes, and proteomics, which the comprehensive analysis of proteins, are widely known as omics. Metabolomics targets the metabolome that is entire metabolites existed in the body. By using metabolomics, we probably can understand the invisible and close life phenomenon, and metabolomics must be applicable to investigation of the pathological conditions, the side effects of medicines and so on.

In the research, we do research activities for improving IOD of patients and their families such as, 1) Multi-center, large-scale observational study on symptom relief in end-of-life care, 2) study on the establishment of the provision system of effective palliative care, 3) research on Advance Care Planning, 4) study on the establishment of evaluation methods of the various distressing symptoms including pain, 5) study of decision-making in end-of-life care and life sustaining treatment. In the education of graduate school, we educate the student who can contribute to cancer care in the community as a specialist in palliative medicine. We required at least 2 years on the job training for specialist palliative care including inpatient consultation of the university hospital, inpatient hospice palliative care units and palliative home care clinic (more than 6 months training is recommended in each setting).

Palliative Medicine

Hironobu Minami, M.D., Ph.D. Professor

Palliative medicine is a multidisciplinary approach to specialized medical care for people with serious illnesses. It focuses on providing patients with relief from the symptoms, pain, physical stress, and mental stress of a serious illness—whatever the diagnosis. In short, The specialty of palliative care is the "manage- ment of suffering" and "Death and Dying" for the patient and families who faced life threatening illness/condition.

In Kobe university, the department of Palliative Medicine was established in 2012. We provided palliative care mainly for cancer patients and their families from the time of diagnosis, not only for in the terminal stage but also in any place and at any stage of diseases depends on their suffering. In addition, not only in cancer care, heart disease, is also actively involved in palliative care of the respiratory disease, non-cancer diseases including neuromuscular disease.
Pharmaceutics

Yoshihiro Nishimura, M.D., Ph.D.
Professor

Divisions of Pharmacokinetics and Pharmaceutics deal with the research field tightly linked to the activities of Department of Pharmacy, Kobe University Hospital. Our mission is to provide education and to conduct research for the appropriate use of medication. We render our programs not only to the medical students, but also to the students of the Faculty of Health Science and outside pharmacy school students. Educating the significance and risks in pharmacotherapy as well as the appropriate use of medication for the medical professional students is important, because they will soon get involved in clinical practice of highly advanced and innovative services.

Pharmacokinetics is a science to elucidate drug behaviors from drug’s entry into the body through its having effect on. We are engaged in the appropriate use of anti-cancer agents, and coordinate the basic research for individualized therapy. Molecular targeting drugs has achieved numerous successful clinical outcomes as a novel therapeutic strategies in the cancer chemotherapy, while adverse drug reactions are still induced, and impede effectiveness. The management of adverse drug reactions is crucially important when concerning patient’s continuous therapy without impairing their QOLs.

Genetic differences are important factors for inter-individual variability in the pharmacokinetics and pharmacodynamics. We investigate the relationships between genetic information and pharmacological effects or adverse drug reactions for individualized pharmacotherapy. In addition, we have established the “Japan Society of Pharmacogenomics” to promote the highly sophisticated pharmacists’ activities.

Pharmacokinetic and pharmacodynamic information for the dosage adjustment is limited for the special population, such as pediatric or aged patients, and patients with liver or renal dysfunction. Therefore, we conduct population pharmacokinetic/pharmacodynamic analysis using drug concentrations and/or drug response data in the clinical settings, as well as modeling and simulation approach, in order to feed back scientific optimal dosage regimen to these patients.

Yoshihiro Kakeji, M.D., Ph.D.
Professor

Gastrointestinal Surgery

The Division of Gastrointestinal Surgery conducts clinical and basic research on all gastrointestinal tracts, mainly in the esophagus, stomach, and the large intestine.

Since 2005, we have treated approx. 300 cases of esophageal carcinoma, approx. 500 of gastric carcinoma, and approx. 500 of colorectal carcinoma. From the vast amounts of data accumulated thereby, we extract new clinical questions and work to solve them.

We actively employ laparoscopic least-invasive surgery and robot-assisted surgery, and are working on verifying their utility. To extend the possibilities of our leading edge therapies, we are developing new image analyzing technology and a surgery supporting system using Computer Assisted Surgery (CAS).

As for multimodal therapy, we closely collaborate with the Department of Radiology and the Department of Medical Oncology and Hematology, and proactively use chemotheraphy for rectal carcinoma and preoperative chemotheraphy for gastric carcinoma. We are now verifying the results and developing a more effective treatment. We also participate in many nationwide research groups and multivariable collaborations.

In basic research, we deal with gastrointestinal surgery and related areas: research on iPS cells, development of tumor immunotherapy, and induction of cancer stem cells, with varied approaches, on our own or with other basic research divisions.

As for education of students and residents, we offer an environment where they can study with interest, designing integrated programs from systematic lectures, and bedside observation through actual practice. We aim to encourage them to be individuals who autonomously learn and mature.

We work with other departments of surgery, coordinating hands-on seminars and workshops to train in basic surgical skills. Through seminars, participants’ questions and levels of proficiency are clarified and linked to create more sophisticated programs. We also welcome overseas students, which gives significant chances to laboratory members and residents to cultivate their global awareness.

Translational Research for Biologics

Toshiro Shirakawa, M.D., Ph.D.
Professor

In healthcare and medical field, one of growth areas towards the next generation, the development of innovative pharmaceuti- cals and medical devices is a pressing and pivotal subject which is requisite to our nation’s vitalization. And, in recent advanced medicine, the significance of biopharmaceutical (biologics) applied with bio-technology and the necessity of translational research serving as a bridge between various biologies and clinical cares have been increasing. Currently, academia still precedes industry in the field of molecular biology, where novel biologies are created. In the society, it is also needed that the research institutes including university laboratories will actively work for executing translational studies bridging their original biological formulation to their medical products. Upon these background situations, our division has been working to promote the development of translational research from bench to bed, and to develop novel biologics.

Our division advances developing drug discovery with a variety of biologics including viruses, probiotics, and human cells. We are now running the development of novel oral vaccines for cancer and infectious diseases with oral vaccine platform using bifidobacterium, which is a representative probiotics, in collabor- ation with pharmaceutical companies and other universities. We also execute collaborative research and developments on combined cancer therapy of gene therapy drugs with immune cells, together with overseas several research institutes. In these ways, we proactively devote to academia-industry cooperation and overseas operations through research and developments in novel biologics.

The Division of iPS Cell Applications was established in April 2013. Induced Pluripotent Stem (iPS) cells signifies a cell line obtained through induction after introduction of a small number of factors into somatic cells under a specified environment. It is felt that iPS cells can become a powerful tool in many medical fields, such as drug discovery, pathogenesis research, and regenerative medicine among others, due to their capability of infinite prolif- eration inside the laboratory and differentiation into all the various kinds of cells needed for constructing a human body. There- fore, Kobe University initiated our Division of iPS Cell Applications as a base site for promoting research and development into iPS cell applied medicine in April 2013.

Our laboratory aims to truly utilize iPS cells for clinical medicine. To accomplish this mission, we promote an approach for integral development of two main pillars: Improving infrastructure in research and development and foster- ing human resources. The basic arrangement of the study environment and the measures for regulations, with which the iPS cell establishment or induc- tion to various cell differentiation can be conducted, have already reached completion, and further improvements are con- tinuously executed.

Our laboratory has started collaborative research with other clinical divisions, aiming at further comprehension of novel disease mechanisms and drug discovery based on this under- standing. They are executed and controlled under two teaching expert staff members with wide experience in iPS cells research. Graduate students from various division fields and younger researchers pursue this research, acquiring the methodology themselves in parallel.

We currently target the diseases in digestive organs, respiratory organs, nerves, and skin. And, we plan to construct a wide range of technological infrastructure, corresponding to the research needs obtained from various clinical fields. Furthermore, we enhance investigations linked to innovative devel- opment in cancer therapy, by capturing iPS cell induced technologies in an expanded application and preparing cancer stem cells in artifical ways.

Takashi Aoi, M.D., Ph.D.
Professor
Hepato-Biliary-Pancreatic Surgery

Takumi Fukumoto, M.D., Ph.D.
Professor

After the restructing of department of Surgery, the division of Hepato-Biliary-Pancreatic Surgery was established in 2007. Our division performs more than 400 surgical operations per year including organ transplantsations, surgical resections for hepato-biliary-pancreatic cancers and original treatments for advanced cancer using unique techniques.

1. Kobe treatment strategy for hepato-biliary-pancreatic diseases

We have offered highly sophisticated and original surgical care, in the hepato-biliary-pancreatic diseases. We have proposed innovative strategies for advanced hepatocellular carcinoma in combination with currently existing and our original modalities, such as percutaneous isolated hepatic perfusion (PIHP) and space modulated particle radiotherapy (SMPR). Our strategy yielded much longer survival for patients who were deemed to have unresectable diseases. We also introduce laparoscopic surgeries proactively in hepato-biliary-pancreatic field, including complex hepatotomies and pancreatoctomies. A number of clinical trials are carried out to establish future standard in the field of hepato-biliary-pancreatic surgery.

2. Transplantation

We have performed 78 living donor and 12 deceased donor liver transplantations, and 10 deceased donor pancreas transplants. We are one of the institutions with excellent postoperative clinical course. In addition, our basic research on islet transplantation in mouse model facilitates advances in the outcome in human islet transplantation with type 1 diabetes.

3. Innovative medical equipment and technology

Our division have spent the past two decade developing innovative medical equipment and technologies in the field of surgery, oncology, and transplantation. SMPR with surgical spacer placement and particle therapy are developed to treat primarily intractable malignant tumor in abdominal and pelvic cavities. PIHP are developed for unresectable hepatocellular carcinoma. Until now, more than 400 patients with refractory cancers were treated by either SMPR or PIHP. In addition, our division develops many surgical instruments and technologies such as absorbable magnesium alloy clip for operation, absorbable spacer for SMPR and real-time biliary navigation technique to contribute to safer and higher quality of hepato-biliary-pancreatic surgery.

Breast and Endocrine Surgery

Shintaro Takao, M.D., Ph.D.
Visiting Professor

The Division of Breast Surgery was newly established in the Department of surgery in April 2008. We are devoted to providing diagnoses and therapies for patients with mammary diseases, mainly breast cancer, and implementing translational research in those diseases.

For clinical practice, we are engaged in the evaluation of mammary minimal lesions using the Tomosynthesis system in cooperation with radiologic technologies. Our Division has obtained the accreditation as a facility conducting breast re-construction expanders and a facility conducting implants, and is actively involved in breast construction in cooperation with the Division of Plastic Surgery. Concerning basic research, we deal with investigations applying subcutaneums of human breast cancer tissues using Xenograft mice and the research/development of micro-wave mammography in collaboration with the Graduate School of Science at Kobe University.

Breast cancer is not considered to be homogeneous, and is categorized into various subgroups according to gene expression pattern. Therapies based on molecular markers indicating respective tumor expression-s have come to be aggressively performed. In recent years, technologies of polygene assay have greatly developed. The recurrence risk of breast cancer in patients with endocrine-sensitive breast cancer and the effect of chemotherapy addition have become more predictable by applying assays such as OncotypeDX, Cure Best 95GG breast. We are aspiring to offer Precision Medicine by actively utilizing this provided informa-tion.

The Division of Breast and Endocrine Surgery is currently preparing for the construction of a new system, through which patients with hereditary breast cancer, including hereditary breast and ovarian cancer syndrome can be identified and investigated during genetic counseling through BRCAl/2 gene mutation screening, and through which gene mutation carriers can be treated with prophylactic mastectomy or prophylactic salpingooophorectomy. Furthermore, we are striving to foster and edu-cate younger physicians through participating in investigator-initiated clinical trials and multicenter collaborative clinical trials organized by the NPO, called KBCOG: Kobe Breast Cancer Oncol-ogy Group which promotes clinical trials in Kobe.

Cardiovascular Surgery

Yutaka Okita, M.D., Ph.D.
Professor

The history of cardiovascular surgery goes back only about 50 years. The passion and effort of our predecessors’ earnest hopes to cure the sick patients have continued over half a century, and they have brought us stable surgical outcomes in the present day. Their aspirations at that time must be the same level of passion as that of the pioneers who had dreamed of landing rockets on the moon.

Cardiac surgery, which entailed many risks in the past, has improved greatly through support from a variety of developments in the field of technology. The establishment of cardiopulmonary bypass, the development of cardiology which can stop the heart safely, improvements of organ safety including cerebral protection, the establishment of heart transplantation, the development of cardiopulmonary bypass, and the establishment of the method of cardiac surgery for premature infants -- these technical advances are all remarkable.

Our Division of Cardiovascular Surgery is devoted to investigations which can be rapidly reflected in practical clinical results, thereby contributing to society. We aim to elucidate unclear pathologies in clinical sites and to develop cutting-edge medical technologies such as medical engineering, tissue-engineering, and organ/tissue transplantation. We hope to improve our surgical outcomes, and that this will lead to higher QOL for patients in the long term.

In our Division, it is necessary to keep our clinical results stable, to perform highly qualified surgeries considering the patient’s prognosis over the long-term, and to develop perioperative management. To this end, the passion of young people is a vital and necessary addition to a team of seasoned experts. We welcome the young, who have the faith to pursue a career in the field of cardiovascular surgery.

Our ongoing research themes:
1. Research on aortic aneurysm
   - Brain ischemia at aortic dissection
   - Spinal cord ischemia during surgery of thoracoab-
     dominal aortic aneurysm
   - Research on aorta base dynamics
2. Basic research using sustained-release gel
   - Sclerosis at reinforcing walls, Anti-infectivity, Artificialization of vein
3. Development of small-caliber vascular graft
   - Long term patency of the vascular graft with a diameter of 2 mm has been confirmed
4. Basic research on cardiopulmonary bypass
   - Development of minimally invasive cardiopulmonary bypass

Advanced Research for Cardiovascular Surgery

<Cooperative Graduate Program>

President,
Hyogo Brain and Heart Center at Himeji

Nobuhiko Mukohara, M.D., Ph.D.
Visiting Professor

Advanced medical field in cardiovascular surgery was founded in 2015. It covers endovascular therapy and less invasive surgery. The trend in surgical treatment is less invasive and this stimulates the development of both modality. Endovascular device development contains aortic stenting for thoracic and abdominal stenting, balloonizing and stent implantation for peripheral vascular disease and transcatheter aortic valve implantation. The surgery for thoracic descending aneurysm has almost been replaced by stenting. Aortic arch aneurysm was used to be operated with use of cardiopulmonary bypass and there was no indication for aged patients. However using cervical arterial bypass, stenting for the arch aneurysm has been possible without cardiopulmonary bypass. Even for aged patients the treatment became possible. Owing to stenting indications for surgical intervention have been expanded. TAVI(transcatheter aortic valve implantation) has brought hope to aged frail patients with aortic stenosis. Good results and safety of the treatment has been shifting the indication to lower risk patients.

Minimal invasive valve replacement and replacement has met to reduce the risk of postoperative infection and induce early recovery. Introduction of endoscope or other new techniques will extend the therapy for variety of patients.

Together with evolution of catheter intervention, surgical device and technique is developing. The evolution spreads the indica-
tion of treatment and increase candidates. In this field catching up with the progress is mandatory.
Thoracic Surgery

Yoshimasa Maniwa, M.D., Ph.D., FCCP
Professor

The Division of Thoracic Surgery was established on December 1st, 2012. The chair was assigned, and started with the aim of progressing both in basic/clinical research and in clinical practice.

Concerning clinical practice, the number of surgeries under general anesthesia is constantly increasing. The degree of increase in cases with primary lung cancer is especially remarkable. Reflecting the acceleration of aging in society, such an increase will surely escalate in the future. Our Division also is engaged in thoracoscopic surgery for various respiratory diseases. For instance, the proportion of patients with primary lung cancer suitable for thoracoscopic surgery for complete resection among all patients who have surgery has been increasing toward 90%. It shows a rise of therapeutic use. In this way, we take advantage of the development and introduction of minimally invasive operations, which will decrease the burden on patients. This is one of the pillars of our clinical practice and research activities. As well as improving minimally invasive operations, establishing multi-modal therapy for malignant diseases is also an important mission. We are seeking the best medicine for patients, based on accurate pathological observations, by combining anticancer agents, radiotherapy, and surgery, and through initiating conferences on pulmonary medicine over the years.

Our Division develops research based on clinical insights. Particularly, with the aim of solving the problems of lung cancer therapy, we carry out studies using clinical data and samples. In patients with early lung cancer, a number of relapses have been observed after complete resection. We expect to discover a molecular biological index which will sort the groups at high risk of relapse, and link it to the discovery of a molecular target for postoperative adjunctive therapy to prevent relapse. Currently, we are focusing on several oncogenic genes and proteins from the viewpoint of the formation of wetting and/or metastasis in early cancer. Although immediate feedback to the clinical sites cannot be expected, we are willingly contributing our efforts to the future of lung cancer therapy.

Pediatric Surgery

Kosaku Maeda, M.D., Ph. D.
Visiting Professor

The Division of Pediatric Surgery was established in April 2007. Since then, we contribute to providing pediatric surgical care, adopting widely varying viewpoints. Our Division aims to make progress in both basic/clinical research and clinical practice.

As for clinical practice, the number of pediatric surgeries performed under general anesthesia has been gradually increasing. Our Division is engaged in neonatal surgery and pediatric thoracic surgery, especially that of the airway and esophagus. We also develop novel operative procedures in these areas, presenting our successful results at many international conferences.

In our Division, it is necessary to maintain stable performance in clinical results, providing highly-qualified surgical techniques, and considering child patients’ growth and development over the long-term. To this end, the passion of young surgeons plays a vital and indispensable role in our team, consisting of experienced specialists. We welcome young people with the faith to pursue a career in our field of Pediatric Surgery.

Concerning research activities, we are involved in basic and clinical research, in our respective areas of expertise in Pediatrics.

Our ongoing studies are focused on the following subjects:
1. Pathophysiology of surgical diseases in infants and neonates
2. Novel surgical treatment of congenital airway anomalies
3. Development of novel surgical treatment for neonates and infants
4. Basic research on tracheal transplantation and small intestine transplantation

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Minimally Invasive Surgery

<Endowed Chair>

Yoshihiro Kakeji, M.D., Ph.D.
Professor

The division of Minimally Invasive Surgery was founded in 2015. We aim to conduct the clinical research and to develop the new medical devices in the minimal invasive surgery, and to standerize the minimal invasive surgery to local medical institutions. In gastroenterological surgery, the introduction of laparoscopic surgery is widespread with the rise of medical devices. We are actively involved in the spread of safety education of laparoscopic surgery by holding the training seminars several times a year with the division of gastrointestinal surgery and the division of hepatobilialy-pancreatic surgery. We are also actively engaged in the development of new devices in laparoscopic surgery.

In cardiovascular and thoracic surgery, we actively introduce thoracoscopic minimum invasive surgery, endovascular aortic aneurysm and peripheral vascular repair, and hybrid procedures, and are working on verifying their utilities. To extend the possibility of our leading-edge therapies, we are searching the criteria of patients selection for treatment options to obtain the best outcomes. In basic research, we deal with cardiovascular and thoracic surgery and related areas: Researches with physiology of aortic root, development of valve prosthesis material, and induction of small caliber vascular conduits, with varied approaches, in our own accord or with other basic research divisions.

Four staff members are deployed in this division. We are going to strengthen the skill and improve the quality of the minimally invasive surgery, and spread the information to the world from Kobe.
Department of Surgery, Division of International Clinical Cancer Research and Promotion

This division was newly opened at April, 2017. The division consists of 4 sections (International Clinical Cancer Research and Promotion Section, Development and Application of Advanced Medical Technology Section, Advanced Cancer Research and Treatment Section, and International Medical Cooperation and Promotion Section). The main mission of the division is to develop the advanced surgical technology, including new laparoscopic surgical procedures or robotic surgical technology, and to promote research of new diagnostic markers and innovative surgical treatment strategy for variable cancers. These researches will be done at newly opened International Clinical Cancer Research Center (ICCRC) at Port Island at Kobe city. We will also do researches regarding practice of international medical cooperation with KOBE Biomedical Innovation Cluster (KBIC).

International Medical Cooperation and Promotion

Tetsuo Ajiki, M.D., Ph.D. Professor

Development and Application of Advanced Medical Technology

Raizo Yamaguchi, M.D., Ph.D. Professor

Advanced Cancer Research and Treatment

Yasuo Sumi, M.D., Ph.D. Professor

Orthopaedics

Ryosuke Kuroda, M.D., Ph.D. Professor

The Department of Orthopaedic Surgery of Kobe University was founded in 1954. Hence, we provide medical cares in various viewpoints. Our division consists of many physicians, each expertise in diseases such as Spine, Sports Medicine/Joint preservation, Joint reconstruction/Arthroplasty, Upper extremity, Musculoskeletal tumor, Trauma, and Rheumatism. All are proactively engaged in clinical practice, education, and research in their areas.

In clinical practice, the expert physicians offer the medical cares with the highest standards in their areas. We expect to improve our treatments with applying state-of-the-art diagnostic devices and therapeutic instruments.

Regarding research, we are involved in basic and clinical researches of the expertise area. We put our strength into establishing novel therapy in orthopaedic field and regenerative medicine using cells, growth factors, scaffolds and others. As part of our translational research, we conduct clinical studies/trials upon our basic research results and with foregoing cells to establish novel effective therapy. We present our results and new perception through academic conferences and journals not only inside Japan but also over the world.

Recently, the effectiveness of therapy with pseudo-arthrosis for bone fracture with peripheral blood stem cells and of the cartilage regenerative medicine applying autologous chondrocyte (cartilage cells) implantation are validated through the multi-center studies with the Institute of Biomedical Research Innovation (IBRI). Further, we explore basic researches towards novel drug discovery for each disease, elucidate characteristic pathologies of those, and develop diagnostic science and novel surgical technique.

In education, we make efforts to foster the physicians who provide the best cares for the patients. For faculty students, we give the programs targeting students’ comprehension of each pathology of disease through to therapy at actual clinical site, instructed by expertise physicians of each area. For graduate students, we train them to become experts who expand the activities in international communities. We implement the study-abroad program through which the graduates receive good opportunities in developing their research abroad such as the United States and European countries.

Rehabilitation Science <Cooperative Graduate Program>

Yasushi Hashimoto, M.D., Ph.D. Visiting Professor

Hyogo Prefectural Central Rehabilitation Hospital, Director

Division of Rehabilitation Science has carried out various clinical practice and research towards the end of improvement and compensation of function for elderly and people with disabilities. We are currently conducting the research focusing on Robotics in the rehabilitation field. Leading examples are, micro-processor controlled prosthesis for lower limb amputee, myoelectric prostheses (hand) for upper limb amputee, Robot suit HAL™ for spinal cord injury patients with incomplete paralysis, and Robotic Stride Assistance System for patient undergoing total hip arthroplasty. These are all new and innovative challenge in Japan.

Additionally, we are collaborating with Robot Rehabilitation Center affiliated with the Hyogo Institute of Assistive Technology located next to hospital to develop and create useful assistive technology (AT) and assistive products (AP). These AT and AP will be a promising tool to improve QOL of elderly and people with disabilities and will play a vital role in their own life. This work can not be done without consisting the team approach system with multiple professions. Our goal is provide a platform for the rehabilitation method and new technology (including Robotics) to be the partner of human being who needs its benefits.
Rehabilitation Medicine

Endowed Chair

Ryosuke Kuroda, M.D., Ph.D. Professor

The Division of Rehabilitation Medicine was founded in 2012. The rehabilitation medicine we specialize in is wide-ranging. We devote effort to the clinical researches on rehabilitations for musculoskeletal disorder, sports injury, cerebrovascular accident (CVA), neuro muscular disease, cardiac macroangiopathy, and carcinoma. We actively work for the rehabilitation for cancer patients, which has recently come to be focused along with the remarkable increasing of the affected and publish our results in many reports.

In basic research, we investigate into the influences of the transcutaneous application of carbon dioxide, a sort of physical medi- cines, and its effects on muscle, nerve, and bone. We started to collaborate with the Section of Orthopaedics in clinical trials for post poliomylitis syndrome and lower limb fracture. We further collaborate with the Faculty of Engineering of our University and the School of Engineering, the University of Hyogo for the Researches on rehabilitation evaluation and therapeutic instruments. We also collaborate with some pedi- atric medical and welfare institutions and some recovery-phase rehabilitation hospitals.

Neurosurgery

Eiji Kohmura, M.D., Ph.D. Professor

The Division of Neurosurgery is engaged widely in surgical therapy through to basic research in central nervous system diseases such as cerebrovascular disease, brain tumor, head injury, functional disorder, and spine/spinal cord diseases.

In order to improve patient’s QOL, we try in the clinical field to establish diagnostic imaging techniques, multimodal therapy for malignant brain tumor, to improve treatment techniques of ne- rovascular intervention, and of deep brain stimulation. Algo- rithm of the optimum treatment procedure of patients with carotid stenosis were currently developed in our laboratory through cineangiographic combining carotid echo, MRA, and cere- bral blood flow measurement. Expecting the development of method to surgical education, we are also developing the method of con- structing 3-dimensional real model head with brain and vascula- ture from precise MRI data.

In the University Hospital, 3OT (super-high-magnetic-field) surgical MRI system was intro- duced in 2015, and the pioneering clinical research on minimally invasive surgery is ongoing to preserve brain function while removing tumor completely.

Further developments are expected in the continuous study with this intracranial MRI on drawing of neural pathways with tractography and the research on tumor-specific tracers. We also enhance basic research towards the discovery of novel biomark- ers and the developments of new therapy, through mass spectrometry or molecular analyses of clinical samples from the patients with malignant brain tumor or ischemic cardiovascular disease or animal models. Our laboratory has achieved many results in the researches of molecular targeting therapy for malignant brain tumor, analysis on microRNA, and the analysis on interleukin of malignant lymphoma.

Grounded in our fundamental policy “Bedside to bench, bench to bedside”, we dedicate effort to connect the integration of the research with the clinical information and samples obtained from our clinical sites and the studies using cultured cells or animal models to the improve- ments in diagnoses and therapies for nervous system diseases and to the resolution of various problems emerged in our clinical sites.

Ophthalmology

Makoto Nakamura, M.D., Ph.D. Professor

The Division of Ophthalmology provides a leading-edge medical service. As one example, we have utilized optical coherence tomography for glaucoma staging. We have also developed an objective perimetry using multifocal visual evoked potential, which is of great help in the objective evaluation of optic nerve diseases. In addition, we have actively performed trabeculec- tomy combined with amniotic membrane transplantation for intractable glaucoma, and achieved satisfactory treatment results. Concerning age-related macular degeneration (AMD), we have used the genetic approach and investigated the relation- ship between genetic information and the risk of AMD development or response to treatment in order to put personal- ized medicine into practice.

Otolaryngology-Head and Neck Surgery

Ken-ichi Nibu, M.D., Ph.D. Professor

The Division of Otolaryngology-Head and Neck Surgery covers various areas and diseases such as neuro-otology diseases including sensorineural hearing loss, vestibular disorder, and facial paralysis, as well as inflammatory or functional disorders of the middle ear, nose/paranasal sinus, oral cavity, pharynx, or larynx, and head and neck tumors.

Our laboratory is involved in a fairly extensive range of areas from primary care for the common cold, otitis media, epistaxis, allergic rhinitis, and dizziness and vertigo, all of which most ordi- nary people often experience, through highly-specific care such as hearing improvement surgery, endoscopic surgery for nose/paranasal sinus disease, voice improvement surgery, and treatment of head and neck carcinoma.

Another attractive feature of our divi- sion is that we treat the diseases which directly influence the patient’s quality of life. Concerning existing and future aging of society on a global scale, the functions of the sensory organs and lomotorium, mastication/swallowing, and voice/language functions are indispensable for quality lives. We deal with three of the five senses which link to each sensory function, that is, hearing (audition), smell (olfaction), and taste (gustation), and the sense of balance (equilibrium) which is essential for walking. We provide medical care for disorders in the swallowing function, which is necessary to appreciate fine food, and care for disorders in voice/language functions, which enable us to enjoy conversation with family and friends. There- fore, the Division of Otolaryngology-Head and Neck Surgery can be said to be a clinical department which plays a pivotal role in assuring patients’ quality of life.

As for our research activities, we are devoted to research consid- ering clinical practices, such as the development of head and neck carcinoma therapy with a patient’s quality of life fully con- sidered, and the development of diagnosis and therapy for dysphagia. Further, we make efforts in studies on the genes of head and neck carcinoma, regeneration of olfactory epithelium, mechanism of olfactory perception, and sen- sonineural hearing loss among others.
**Urology**

Masato Fujisawa, M.D., Ph.D.
Professor

The Division of Urology is devoted to medical care for diseases of the urinary tract and the male reproductive system, mainly applying surgical techniques. Our Division was established in 1962, spinning off from the Division of Dermatology and Urology, and has satisfactorily developed to the present under Prof. Jokichi Ito, Prof. Ichigami, Prof. Kamidono, and the present chair, Prof. Fujisawa.

In clinical practice, we have achieved many excellent results in a wide variety of areas, including neobladder creation after radical cystectomy, various approaches of laparoscopic surgeries, and kidney transplantation, through our great efforts in developing and popularizing highly sophisticated advanced surgeries. Our latest venture assembles our entire team to develop robot-assisted surgery, and we were promoted to a position as a top-leading educational institution of this field in Japan. Beyond surgeries, we offer advanced medical care such as drug therapy for malignant tumors, and male infertility and urinary tract infection, based on a background of one of the largest numbers of clinical cases in Japan. Our efforts and results are now held in the highest regard.

In research activities, our laboratory mainly targets malignant tumors, andrology, renal transplantation, and infectious diseases, but also focuses on most areas of urology, including voiding function, sexual function and clinical anatomy. Recently, we achieved an effective design of an anti-sense oligonucleotide treatment for malignant tumors, the elucidation of acquiring machineries of resistance against various molecular-targeted drugs, and the clarification of molecular chaperone activities in testicular dysfunctions. We have actively presented the findings on our research in many interna- tional conferences and published these findings in top scientific journals.

Concerning our educational programs, we carefully coordinate programs in a make-to-order manner to suit faculty students, residents, graduate students, and younger physicians, aiming to find and foster fully qualified human resources as urologists and people.

**Advanced Medical Technology and Development for Urology**

<Endowed Chair>

Masato Fujisawa, M.D., Ph.D.
Professor

The mission of the Section of Advanced Medical Technology and Development for Urology is firstly, to function as a research core focusing on research, developments, applications of various state-of-the-art medical devices, such as surgery-assisting robots, laparoscopes, urinary tract endoscopes, lower urinary tract laser therapy and other leading-edge medical techniques. Secondly, we seek to improve the techniques of minimally invasive surgical therapy, such as robot-assisted surgery for urologic diseases, and finally, to cultivate and educate human resources.

The principal theme we energetically address is robot-assisted surgery. Kobe University introduced the surgical robot “da Vinci” in August 2010. Japan was not a leader in the field of robot-assisted surgery until being approved by the Pharmaceutical Affairs Act in November 2009. But after that approval, the number of surgical robots in Japan has overtaken that of European countries and South Korea, and is second only to the United States in the world.

We have been actively striving for the clinical practice/research on this issue from early stage, experienced many cases of robot-assisted partial nephrectomy, and published our clinical studies in academic journals in English. This has brought us to the leading position in Japan. Furthermore, Kobe University plays a pivotal role in controlling universities across the country in implementing the Study & in Advanced Medical Technology (ca. cellular robot-assisted partial nephrectomy. Our aim is to develop this surgery to be part of the framework of National Health Insurance in the future, a driving force of the Japanese Society of Endourology. Our Section assumes an important role in this movement.

Educating on the role of minimally invasive surgery is also our key theme. In April 2014, the Center for Advancement of Community Medicine at our University was founded by Kobe University and Nippon Medical School. The Training Center for Advanced Surgery and Endoscopy was opened here, where training in laparoscopy procedures is possible using pigs. We are now planning educational programs on skill practice of minimally invasive surgery utilizing this institution.

**Obstetrics and Gynecology**

Hideto Yamada, M.D., Ph.D.
Professor

Our motto is “Brightly, joyfully, consistently, and definitely toward a goal”. The Department of Obstetrics & Gynecology supports women throughout their life journey from puberty through childbearing age to menopause and beyond. We are committed to educating health care providers and investigators and conducting research to advance knowledge in our field in addition to providing quality health care services. Our objective is to discover and develop groundbreaking medicine for the treatment-resistant diseases in obstetrics and gynecology by linking the findings from clinical and basic research. Our Program combines exceptional clinical training in reproductive immunology, high-risk obstetrics, gynecologic oncology, and women’s health with a wide array of opportunities in basic science, clinical and translational research. We collaborate and cooperate with overseas (Stanford university, Pittsburgh university) and domestic (Molecular and Cellular Signalling, Clinical Virology, System Neuroscience, Immunology Frontier Research Center) laboratories.

Our ongoing research themes are as follows:
- Prevention/therapy for fets-maternal infection caused by Cyto-megalovirus or Toxoplasma
- Pathophysiological mechanisms of recurrent pregnancy loss and quest for the cures
- Natural immunity during conception and fetal development
- Lipid dynamics in placenta and vili
- Pathophysiological mechanisms of antiphospholipid syndrome and the management of pregnancy with antiphospholipid syndrome
- Development of novel diagnostic methods for autoimmune diseases by using measurements of autoantibodies against MHC class I/II and self-melanocyte complex
- Creating a novel scoring system for Prediction of adherent placenta with placenta previa
- Management responsible for excessive trophoblast invasion into the myometrium in adherent placenta
- Fertility preservation in women with gynecological cancer
- Quest for a novel tumor suppressor in endometrial cancer
- Coagulation and hemostasis in peri-natal and peri-operative periods
- A novel therapy for congenital abnormality of the genitalia
- Clinical efficacy of effusion cytology and histology for gynecologic malignancies

**Plastic Surgery**

Hiroto Terashi, M.D., Ph.D.
Professor

The Division of Plastic Surgery was established in 1997. Subsequently, the section handling cosmetic surgery was established in 2007, as the first clinical department in a Japanese national university. Our Division is engaged in clinical/basic research in the areas of reconstructive surgery, wound healing, and regenerative medicine. In the field of reconstructive surgery, we investigate the physiology of blood vessels and blood circulation in the flap, and consider how to prevent complications from microsurgery. In wound healing, we investigate widely from the basic mechanism of wound healing at the molecular level through to the development of biomaterials for regenerative medicine.

As for clinical practice, we surgically reconstruct many cases of tissue deficiency after the resection of malignant tumors or trauma. This supports reconstructive surgery enables the oncologist to resect the cancer completely, which is very much related to improving patients’ vital prognosis and Quality of Life. Therefore, in our research studies, we are devoted to developing cellular blood vessel and nerve tissue as biomaterials for reconstructive surgery.

In the surgical wound care field, we treat not only the acute traumatic wound, but also the chronic wound which shows slow and poor healing. For example, in the treatment of chronic wounds associated with lifestyle-related diseases such as diabetes foot ulcer, how to prevent amputation of the lower limb or how to minimize the part to be amputated is not only an issue of patients’ whole-body image, but also directly related to the preservation of their walking function and their subsequent exercise therapy and therefore linked to the patients’ vital prognosis.

For future cases such as this, we expand our education programs across the barriers of divisions or professions for the formation of proper team medical care. We educate not only related physicians, but also healthcare professionals, through our research and clinical practice. We aim to contribute to regional medicine and human society by fostering human resources.
Anesthesiology

Satoshi Mizobuchi, M.D., Ph.D. Professor

The aim of anesthesia is to protect organ systems from surgical stress. Since such stress induces physiological changes in various organs of the patient, our research targets all organs and their bio transformations.

While an anesthetized body loses homeostasis, there is limited stimulus except for surgical stress. While providing anesthesia, we can find the dynamic influence of surgical stress on the human body in real time, so we can observe patients’ physiological changes and the consequences of treatment in a very short period.

One of our objectives is to elucidate the mechanisms of such bio transformations through basic research and clinical research.

Our intention is to elucidate the impact of surgical stress on the living organism from the viewpoint of both clinical and basic research, in the expectation of improving perioperative management. We further investigate intensive care medicine, and pain medicine. We expect to assess the pathology of these patients in both cellular and clinical aspects.

In particular, we are engaged in research on the influence of intraoperative fluid administration on postoperative organ failure, perioperative glycemic control in diabetes mellitus patients, and research to assess the factors associated with the risk of postoperative delirium and acute kidney injury. Regarding intensive care medicine, we are involved in research on per-nasal high-volume oxygenation and research on anti-coagulants during continuous hemofiltration. Furthermore, in pain medicine, we are progressing in research on gene therapy for refractory pain and epidemiological research on the cognitive function of patients with refractory pain.

Oral and Maxillofacial Surgery

Takahide Komori, D.D.S., Ph.D. Professor

The Division of Oral and Maxillofacial Surgery is located in a boundary domain between medical science and dentistry. Our division investigates diagnosis and therapies for diseases developed in the jaw and oral regions, such as tumors, cysts, inflammation, congenital defects, growth abnormality, and dysplasia. We specifically target oral carcinoma, jaw deformity, jaw fracture, dental infection, and other diseases developed in the temporomandibular joint or salivary gland.

Concurrently, we are taking into account research on new operative procedures, therapies using implants/lasers, studies on the mechanism of postoperative mastication/swallowing functions, and research for developing advanced medical treatment. We emphasize basic research, maintaining our primary position in conducting research as the foundation, to constantly feed these results back into clinical practice.

At the University Hospital, under the name Department of Oral and Maxillofacial Surgery, we mainly provide medical care for oral and maxillofacial surgery, such as treatment for tumors of the jaw/oral cavity region including reconstructive surgery, orthognathic surgery for jaw deformity, treatment for infectious diseases in the jaw/oral region, treatment with implants, and laser therapy. We additionally offer dental general practice including orthodontic treatment and dental treatment for medically compromised patients. Furthermore, we recently started and actively work forward periprosthetic oral management as a supporting care for cancer patients or patients due to have cardiovascula surgery or organ transplantation, in collaboration with the Oral Management Center established in May 2014.

Disaster Medicine/ Emergency Medicine

Takashi Nishiyama, M.D., Ph.D. Professor

The Division of Disaster and Emergency Medicine was founded as Japan’s first research base of disaster medicine in the wake of the Great Hanshin Awaji Earthquake which struck on January 17, 1995. Concerning medical care after a large-scale accident with numerous injured/sick people needing care simultaneously or in a natural disaster like the predicted Nankai Trough earthquake, our responsibility is vital for emergency medicine. We are designated DMAT (Disaster Medical Assistance Team) by the Ministry of Welfare and Labor of Japan.

Recently, clinical care tends to be specialized and segmented, parallelizing diversified diseases and sophisticated therapies. Diversified skills have come to be increasingly required in physicians. The University Hospital is particularly required to offer advanced medicine, where such a tendency is accelerated. Emergency physicians play a pivotal role in diagnosing the injured/sick as quickly as possible, and giving them suitable care or referring to further specialists, according to their severity. Knowledge and skills required in the initial consultation are an essential qualification for any physician to carry, regardless of their specialty. To give satisfactory education and training (to foster generalists) to medical students and residents who will bear the future of medicine, and acquire their qualifications as physicians will be our greatest task. Equally, fostering expert physicians both clinically and academically is absolutely critical. They must be able to take a leading role at both generalists and specialists in emergency medicine.

As for research and development, we aim to conduct studies relating to shock, cranio-cerebral trauma, post cardiac arrest syndrome (PCAS), and a newly planned animal model study on reanimation. We expect these issues to be our lab’s main themes which can be subject for discussion with younger physicians.

Promoting research on emergency/disaster medicine at the Hospital, we are dedicated to fostering superior human resources, such as emergency physicians, nurses, and life-saving technicians, who can practically deliver advanced and leading-edge emergency/disaster medicine with regard to Kobe, across Hyogo Prefecture, and throughout the world.

Advanced Pediatric Surgery/Cardiac Surgery

Yoshiki Oshimatsu, M.D., Ph.D. Visiting Professor

Head, The Center for Pediatric Cardiology, Hyogo Prefectural Kobe Children’s Hospital Cardiac Surgery

As a part of the Division of Advanced Pediatric Surgery established in 2014, our (sub)Division of Cardiac Surgery is devoted to the investigations into advanced surgical treatment, as an expert team of the unit of the Center for Pediatric Cardiology providing diagnoses and therapies for congenital heart diseases. Among severe heart diseases of neonatal, we especially strive for developing novel surgical treatment strategies and operative procedures for high risk cases such as hypoplastic left heart syndrome or asplenia syndrome. Furthermore, our collaborated researches on cardiovascu lar and great vessel anomalies associating with tracheal stenosis with the team of Pediatric Surgery have received universal praise as well as domestic one.

Abstinence of aortic valve, decreasing repair of two ventricles in clinic research, we focus on disease group-based treatment strategies and their evaluation, and artificial heart/lung and their biogenic reaction, as our major research themes. And, in basic research, we conduct three-dimensional analyses on the run of stimulus transmission system and the intramural distribution of arterial duct tissue in aorta with applying synchrotron radiation-based X-ray phase-contrast tomography (XPTC) in SPring-BHyogo, Japan.
Institute for Experimental Animals

Overview
The Institute for Experimental Animals is a center for supporting research of biomedical science and life science using laboratory animals. This institute was established in 1963, and after twice relocations, moved to Research Building D. The mission of our institute is set forth in "Regulations of Institute for Experimental Animals, Kobe University Graduate School of Medicine, Article 2" as "The mission of this institute is providing care for laboratory animals intensively based on animal welfare and relevant legal regulations; providing education about appropriate use of animals in research and about characteristics of laboratory animals; conducting original research of the said institute about laboratory animals." Our institute plays a pivotal role in supporting the research of biomedical science and life science through appropriate care of laboratory animals, development of the system for appropriate use of animals in research, and training and education of those concerned with care and use of animals in research. The institute also works as an international research center regarding WHHLmI rabbits which have been developed at our University (see article 5 below). Our staff now consists of a director (also Chair of Cell Physiology), a full-time associate professor, an assistant professor, four technical personnel (including a veterinarian and two animal health technicians), five adjuncts, and other technical experts for care of laboratory animals.

Ongoing Activities
1. Appropriate care of laboratory animals: We are devoted to the appropriate care of animals following the basic policy of the "3Rs" of animal welfare: Reduction of the number of animals for use, Replacement to alternative experimental methods from animal studies, and Refinement for reduction of pain and distress of animals, and to maintaining hygienic conditions to avoid infectious diseases in animals.
2. In vitro fertilization and embryo transplantation: We support the establishment of genetically modified animals and other strains of animal models for the study of human disease through in vitro fertilization and embryo transplantation.
3. Cryopreservation of the sperm and fertilized eggs: We promote the cryopreservation of the sperm and fertilized egg of animal strains including genetically modified animals, in order to prevent valuable animal strains from being lost due to natural disasters or widespread infections.
4. Development of systems for appropriate use of animals in research and training/education of those concerned: We support activities of the institutional animals care and use committee with the latest information on legal issues and animal welfare, and on domestic and international developments in animal experimentations norms corresponding to the appropriate care and use of animals in research. We also deliver information on appropriate care and use of animals in research through lectures and workshops.
5. International research center of the WHHLmI rabbits: We developed the WHHL rabbits (spontaneous hypercholesterolaemia and atherosclerosis) in 1979, which contributed to Nobel prize-winning research in 1985 and to the development of Statins (Inhibitors of cholesterol biosynthesis) which has recently come to be focused as the first-choice drug for hypercholesterolaemia. Subsequently, we developed WHHLmI rabbits with spontaneous severe atherosclerosis in coronary arteries and spontaneous myocardial infarction. We are providing more than one hundred WHHLmI rabbits annually to domestic and international research institutes. We introduce research papers using WHHL or WHHLmI rabbits on our official website (http://www.med.kobe-u.ac.jp/sea/WHHL-home.html). Currently, we investigate atherosclerosis and acute coronary syndromes using WHHLmI rabbits, and promote the development of novel hypolipidemic agents in collaboration with the Division of Comparative Pathophysiology.

CID: Center for Infectious Diseases

Overview
The International Center for Medical Research (ICMR), the precursor of the Center for Infectious Diseases, an affiliated institute of the Graduate School of Medicine at Kobe University was established based upon the background achievements in medical research international exchange between our School/Graduate School of Medicine and the research institutes in Asian Countries, corresponding to the proposition by the Council of Science of the Ministry of Education, Science, Sports and Culture in 1999. It has succeeded in its mission to act in the following roles: as a "Center of Research and Learning in Asia" (proposed in the 1999 policy report by the Council of Science of the Ministry of Education, Science, Sports and Culture), an example of "New Developments in Science and Technology Policy: Responding to National and Societal Needs"; and as the "Education and Research Core for Various Fields of Infectious Diseases and Tropical Diseases" (proposed in the "Council for Medicine and Medical Services in the 21st Century: the 4th Report").

Since its establishment, the Center has been devoted to leading-edge advanced medicine, and to contributing to meeting global needs. We aim to execute domestic and international multidisciplinary research on infectious diseases, to study for the development of diagnosis, therapy, and prevention of infectious diseases, and to carry out further international deployment of infectious disease investigations, having been reorganized and renamed the International Center for Medical Research and Treatment (ICMRT), and the Center for Infectious Diseases for the further improvements.

Meanwhile, through our activities including the Core Universities Academic Exchange Programs in Asia, a big collaborative project (1993 to 2002) which was conducted by the Japan Society for the Promotion of Science (JSPS), we widely operate international collaborative research with ASEAN countries including Indonesia. Based upon these achievements, we performed the Construction Project of International Collaborative Research Core in Indonesia (2007 to 2009), and the Research Project on Helicobacter pylori Infection in Asian Countries (2006 to 2009), part of a larger project, Founding Research Centers for Emerging and Reemerging Infectious Diseases, under the auspices of the Ministry of Education, Culture, Sports, Science and Technology, Japan, as well as the Project for Strengthening of Malaria Control in Solomon Islands under the auspices of JICA (2006 to 2009).

Furthermore, we were engaged in national policy projects such as the Japan Initiative for Global Strategic Medical Research and Development (G-STRIDE), and the Japan-Indonesia Collaborative Research Center, and the Science and Technology Research Partnership for Sustainable Development (SATREPS). Regarding the project “Collaborative Research on Emerging and Re-emerging Infectious Diseases in Indonesia”, our cooperative activities with Airlangga University in Indonesia will be carried out from April 2015, supported by the Japan Agency for Medical Research and Development (AMED).

Research Fields and Areas
1. Core research fields (Basic) Microbiology, Clinical Virology, Infectious Disease Control, Infectious Disease Pathology
2. Dual research fields (Basic) Vaccine Development
3. Dual research fields (Clinical) Infectious Disease Therapeutics, Infectious Disease Field Research (Cooperative Graduate Programs), Infection and Immunology (Cooperative Graduate Programs)

Concepts for the Future
1. In the Kobe area, we aim to carry on the tradition of research activities of our Center, which has promoted international collaborative studies with Asian countries. To develop it further, we will strengthen our research and education system in Asia.
2. We expect to further develop the Kobe-Indonesia Collaborative Research Center for Emerging and Reemerging Infectious Diseases (in the Institute of Tropical Disease, Airlangga University), already established in Indonesia.
3. We aim to expand the prominence of the power of synthesis and quality assurance, and to be recognized as a destination for the world, so saying, "Visit Kobe University, if any inquiry in infectious diseases arises". We also seek to become a center of infectious disease research domestically and internationally in the future.
4. We expect to strongly develop a system of cross-sectional collaborative research.

Institute of Tropical Disease, Airlangga University, Indonesia
Global Research Network on Infectious Diseases (J-GRID), Kobe-Indonesia Collaborative Research Center, and the Science and Technology Research Partnership for Sustainable Development (SATREPS).

Laboratory work
Get-together Researchers and students
Presentation at conference

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58
Core Equipment Facility

The Joint Research Facility

Objective
Medical and biological sciences are an academic discipline to examine biological phenomena and their abnormalities at multiple hierarchical levels from molecular, cellular, tissue-organ, and whole body levels, and are related to various diseases including malignant tumors, metabolic diseases, mental and neurological disorders, cardiovascular diseases, allergic and autoimmune diseases, and infections. Remarkable progress in medical and biological sciences in these decades have been realized through the development of experimental technologies and apparatuses. Now advanced techniques and precision apparatuses are indispensable to perform qualified medical and biological researches. In the post-genomic era, a style of research has dramatically changed from technology-based single-discipline approaches to hypothesis-driven multidisciplinary approaches which integrate various technologies. Furthermore, since the development of experimental apparatuses has been accelerated every year, researchers need to keenly survey emerging technologies and to actively and continuously introduce new technologies and apparatuses, if necessary. Given such research environments, it becomes nearly impractical for each principal investigator to independently set up all the apparatuses for her/his research. The Joint Research Facility maintains a broad range of state-of-art experimental apparatuses necessary to perform cutting-edge medical and biological sciences for shared use, and provides scientists with the information regarding new experimental technologies. Through these activities, the Joint Research Facility aims to promote medical and biological researches in Kobe University as well as other universities and research facilities.

Overview
To meet a broad spectrum of needs from multiple disciplines, the Joint Research Facility has a variety of precision experimental apparatuses, such as those for capillary DNA sequencing, NMR, X-ray diffraction, chemical imaging, fluorescence imaging, real-time PCR, confocal and multi-photon microscopes, laser-captured microdissection, imaging cytometer, flow cytometer, and cell sorter, multi-mode acquisitions for multi-well plates, X-ray irradiation and others. The Facility maintains and continuously upgrades these apparatuses, so that multiple users employ these apparatuses for their researches with minimal time and effort. The Facility arranges training courses including lectures and hands-on training on a regular basis, so that the users can learn the features and correct uses of experimental apparatuses according to their interests as well as the most updated information about the technologies using these apparatuses. Based on opinions and requests from the users as well as the information collected by the Facility, the Facility evaluates the current values of existing apparatuses, and renovates them or introduces new apparatuses, if necessary. Besides the advanced apparatuses, the Joint Research Facility also maintains conventional laboratory apparatuses, such as those for ultrapure water production, liquid nitrogen generator, spectral photometer, high-speed centrifuge and ultra-centrifuge, autoclave, deep freezer and others, by which the Facility can support newly appointed faculties to set up their researches smoothly.

The Integrated Center for Mass Spectrometry

Objective
The Integrated Center for Mass Spectrometry was established in 2008. Our specific aim is biomedical application of mass spectrometry, which contributes to understanding biological phenomena and investigating the etiology and pathophysiology of diseases and develop diagnostic methods and treatment strategies. Our center is strategically located at the graduate school of medicine, so that the Center can have close collaborative relationships not only with basic research groups in our graduate school, but also with clinical research groups in our university hospitals.

Comprehensive profiling of proteins and metabolites, namely proteome and metabolome, are closely related to biological physiology and pathophysiology. Specific proteins and metabolites may work as enzymes and substrates for energy production. Other metabolites may have distinct biological activities which can directly regulate cellular functions. Mass spectrometry has made possible unbiased, comprehensive, and sensitive analyses of such proteins and metabolites, and using this method, we aim to establish systems biology based on physiology-related and disease-related profiles of proteome and metabolome.

The Center has been a core facility for mass spectrometry dedicated to medical and biological sciences, and has been studying on a wide range of basic and clinical medical research fields, including cancer, atherosclerosis, metabolic disorders, lifestyle diseases, and neurological disorders. The Center not only performs its own researches, but also provides contract mass spectrometry analyses for researchers inside and outside our university on a collaborative basis.

Overview
Specific research aim (1): Bioactive lipid mediators in inflammation and resolution.
Recently it has been revealed that bioactive lipid-derived small molecule metabolites, namely lipid mediators, play critical roles in maintenance of homeostasis, including inflammation and its resolution, tissue repair and regeneration, and brain functions. However, these lipid mediators are structurally unstable and biosynthesized only at mmol – pmol/L range on demand, exert stereoselective actions, and are degraded to inactive metabolites. To analyze these mediators quantitatively and comprehensively, advanced technologies are necessary for mass spectrometry and its preprocessing. We employ an automated system for solid phase extraction to extract lipid mediator-enriched fraction, and perform sophisticated quantitative, wide-targeted lipid mediator profiling with ultra-sensitive liquid chromatography-mass spectrometry (LC/MS/MS). We have been conducting basic and clinical researches about bioactive lipid mediators especially those related to inflammation and its resolution.

Specific research aim (2): Distinct metabolism in cancer cells.
Whereas normal cells produce their energy, namely ATP, mostly through oxidative phosphorylation in mitochondria, cancer cells depend on distinct metabolism, aerobic glycolysis to produce their ATP (the Warburg effect). Our working hypothesis is that the distinct metabolism in cancer cells could confer their characteristics, such as motility and invasiveness. We mainly focus on hydrophilic metabolites, and employ gas chromatography/mass spectrometry (GC/MS) system with in-house developed data-integration software.

Contract analysis:
The Center has seven apparatuses composed of three different kinds of mass spectrometry, and performs contract analyses for diverse medical research fields. Regarding proteome analyses (Dr. Naoya Hatano), the Center provides the sensitive proteome identification service and the analysis for post-transcriptional modifications of a target protein using LC/MS/MS system. Regarding metabolome analyses (Dr. Masakazu Shinhara and Yasuhiro Iino), we perform wide-targeted, semi-quantitative GC/MS analysis for hydrophilic metabolites and quantitative GC/MS analysis for fatty acids. Wide-targeted lipid mediator profiling with liquid chromatography-mass spectrometry (LC/MS/MS) is also provided to analyze bioactive small molecules derived from arachidonic, eicosapentaenoic, and docosahexaenoic acids.

Website
Contact information
078-382-5355(TEL) 078-382-5568(FAX)
Next Generation International Center (NIC)

Objective
Kobe University School of Medicine and Graduate School of Medicine aim to nurture professional physicians and medical researchers who can internationally contribute to medicine and the medical sciences. Therefore, the Next Generation International Center (NIC) was established in 2017 in order to promote international exchange more actively. NIC aims to contribute to qualitative improvement of medical education and research environment by supporting international exchange of medical students, researchers, and faculty members of Kobe University Medical School and Graduate School of Medicine.

Outline of activities
1. Regarding the formulation of basic policy of international exchange
2. Regarding the academic exchange agreements
3. Exchange students
4. Acceptance of international students
5. Exchange researchers
6. Other things about the operation of the center

Activities
1. Conclude memorandum of understanding between universities and agreement for student exchange.
2. Accept guests’ courtesy visits to the School of Medicine and the Graduate School of Medicine.
3. Coordinate elective program for the medical school students.
4. Coordinate elective programs for the overseas students from partner universities.
5. Support the international research exchange.

Members
Director: Prof. Ikuo Shoji, MD, PhD.
Vice Director: Prof. Seiji Kawano, MD, PhD.
Prof. Hiroshi Yokozaki, MD, PhD.
Prof. Toshiaki Sakisaka, MD, PhD.
Prof. Yasuhiro Minami, MD, PhD.
Prof. Tomoyuki Furuyashiki, MD, PhD.
Prof. Hironobu Minami, MD, PhD.
Prof. Hiroaki Wake, MD, PhD.
Prof. Yasuko Mori, MD, PhD.
Prof. Ken-ichi Hirata, MD, PhD.
Prof. Ryohei Sasaki, MD, PhD.
Prof. Yoshihiro Kakeji, MD, PhD.
Prof. Ryosuke Kuroda, MD, PhD.
Prof. Hiroya Matsu, MD, PhD.

WHHLMI Rabbit Research and Bioresource Center

Background and Objective
“WHHLMI Rabbit Research and Bioresource Center” was established in Kobe University Graduate School of Medicine on July 1st, 2015. This center has succeeded to keeping and providing WHHLMI rabbits from Institute for Experimental Animals. The WHHLMI rabbit, which is an animal model for spontaneous hypercholesterolemia, coronary atherosclerosis, myocardial infarction, and related diseases, was developed in Kobe University Graduate School of Medicine by selective breeding of WHHL rabbits in 2000. The WHHL rabbit was also developed in Kobe University School of Medicine in 1979, and contributed to a Nobel Prize-winning research (Goldstein, J.L., and Brown M.S.) in 1985, studies about development of statin (the first-choice drug for hypercholesterolemia), and elucidation of atherogenesis. Even now, WHHLMI rabbits have been used many researchers in the world. Therefore, it is important for Kobe University Graduate School of Medicine to maintain the WHHLMI rabbit strain. Based on these backgrounds, the purpose of this center is follows; 1) Breeding of WHHLMI rabbits 2) Providing WHHLMI rabbits based on Materials transform Agreement (MTA) 3) Collection of scientific papers using WHHL or WHHLMI rabbits and publication of the list in the home page of WHHLMI rabbits (http://www.med.kobe-u.ac.jp/iae/WHHL-home.html) 4) Elucidation of the characteristics of the WHHLMI rabbit and improvement of the WHHLMI rabbit strain to be more close to humans 5) Propelling studies using WHHLMI rabbits

Overview
This center consists of the director, vice director, and a few stuff. The center is managed based on approval by the Management Committee of the center. In actual activity, Institute for Experimental Animals performs breeding of WHHLMI rabbits, providing WHHLMI rabbits based on agreement to MTA, improvement of WHHLMI rabbit strain to be more close to humans, collecting papers using WHHL or WHHLMI rabbits, publication of information of WHHL or WHHLMI rabbits on the homepage of the WHHL rabbit (http://www.med.kobe-u.ac.jp/iae/WHHL-home.html). Division of Comparative Pathophysiology performs elucidation of the characteristics of the WHHLMI rabbit strain

Activities
1) Breeding of WHHLMI rabbits: Using breeding stocks, which show very high serum cholesterol levels, severe coronary atherosclerosis showing vulnerable feature, and development of myocardial infarction, 60-120 pairs are mated, and 190-200 rabbit pups are weaned every year.
2) Providing WHHLMI rabbits based on MTA: More than 100 rabbits are provided every year. In total, 4,471 WHHL or WHHLMI rabbits were provided to 79 domestic and 43 foreign research institutes.
3) Collection of scientific papers using WHHL or WHHLMI rabbits and publication of the list in the home page: 683 research papers written in English were collected and the list was opened in the home page of the WHHL rabbit (http://www.med.kobe-u.ac.jp/iae/WHHL-home.html).
4) Elucidation of the characteristics of WHHLMI rabbits and improvement of WHHLMI rabbits to be more close to humans: Atherosclerotic lesions in various arteries, aortic vascular disease, and favorite site of atherosclerotic lesions in coronary arteries have been examined.
5) Propelling studies using WHHLMI rabbits: In cooperation with researchers using WHHLMI rabbits, studies using WHHLMI rabbits have been propelled.
Center for Cell Signaling and Medical Innovation (CSMI)

We have newly opened our core facility, the “Kobe University Research Center for Cell Signaling Medical Innovation (CSMI)” on April 1, 2016, by integrating and developing our previous facilities, called “Center for Education and Research in Membrane Biology Medicine” and “Medical Innovation Center”. The CSMI is aiming to further deepen our medical research for cell signaling, on the basis of our excellent research career and infrastructure for basic medical research in this field. The CSMI is going to promote systematically the medical innovations such as drug discovery, clinical diagnostic drugs, and the development of medical devices, by incorporating the findings obtained by the basic research (Seeds) into the joint research cooperating with the Center for Clinical Research, Kobe University Hospital, other faculties of our University (including Graduate School of Health Sciences and of Science Technology and Innovation, and Biosignal Research Center) or external research institutes (including RRKEN and enterprises).

The CSMI promotes advanced medical research on 6 areas, i.e. “Cancer”, “Metabolic Syndrome”, “Mental Disorder/Mental Health”, “Immune Disorder/Inflammation”, “Drug Discovery” and “Regenerative Medicine”, and accelerates collaboration between them. Through these research activities, we are going to discover novel signaling pathways and to elucidate etiology and pathology of various diseases caused by the aberration of signaling molecules. We are also aiming to identify the “Seeds” for drug discovery, to develop super-early diagnosis and innovative therapeutic methods, and to establish disease prevention approaches and methods in order to provide a safe and secure social environment.

Director: Yasuhiro Minami, M.D., Ph.D. Professor

Library for Medical Sciences, Kobe University Library

Outline

The Library for Medical Sciences, Kobe University Library is located in the Administration Building which is located on the south side of Kobe University Hospital. The library occupies three floors from the basement to the second level of the building. Kobe University Library consists of a General Library and 9 subject-specific branches. Among them, our Library functions as a special library for medical sciences, holding 152,857 books and 3,885 journals. The number of visitors exceeds 114,748 annually (as of March 31, 2017).

History

The development of library is one of the pivotal factors in enhancing our university. What makes the library notable both in quantity and quality today began during the construction of the Library of Kobe Medical College more than 50 years ago. In 1961, with the purpose and pledge of establishing the “Ideal Library for Medical Science”, a $100,000 donation was made from the China Medical Board of New York, and construction started, being completed on July 7, 1962. While the size of the library was not great, the advanced features, rare at the time, such as centralization of books and journals previously stored in the laboratories and the open shelf system were introduced. The library stood out as a building with state-of-the-art function and a characteristic facade. Later, the Library collection became enriched with a large quantity of donated books from the China Medical Board of New York and the Japanisch-Deutsche Gesellschaft. On March 31, 1965, following the promotion of Kobe Medical College to national status, the library was reorganized in a branch library of Kobe University Library. The existing building was newly constructed as a combined facility (administration building) with the School of Medicine in October 1996. On April 1, 2004, associated with the national universities’ conversion into independent corporate entities, the library was transformed and relaunched as the Library for Medical Sciences, Kobe University Library.

Library collection

Our library collection includes mainly academic journals on the medical sciences and has recently begun digitalization of academic information with a focus on services of digital documents. The Library has subscriptions to approximately 90 major e-journals in the medical sciences. We also provide links to approximately 26,000 e-journals included in the packages (Elsevier, Wiley-Blackwell, Springer, Oxford, Cambridge, Nature, etc.) that Kobe University Library subscribes to. All University constituent members can exclusively get free access from their laboratories and homes. The Library is enriched with databases such as “Web of Science” to get article information and “UpToDate” to support clinical practices using Evidence Based Medicine. The rising price of e-journals and the financial condition of the university present a growing challenge. With the kind consideration and support of the School of Medicine, the Graduate School of Medicine, and University Hospital, we underline their research and clinical services.

User service

Concerning user access, our Library has implemented the special service of 24-hour opening since 1997, which greatly contributes to research and learning support for our members. Our Library is devoted to maintaining a secure environment, introducing the Library ID Card system at the entrance since 1999, first among the branch libraries of our University. The Library is equipped with 17 Information Science and Technology Center terminals for students, and 5 library PCs for searching the books and journals. As for reading rooms, we provide a bright and relaxed place for learning, and many students use the rooms until midnight before periodic exams or the national exam for medical practitioners.

Conclusion

While keeping true to the original concept of our facility, “the library open for all visitors,” in the future, not only for our University’s constituent members such as medical students, residents, and physicians of the University Hospital, but also more widely for people in the medical business and medical experts, we expect to improve as a community-based library of medical science resources. We welcome your visit to our Library.
### Number of Academic Staff: (As of May 1st, 2017)

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### Number of Students: (As of May 1st, 2017)

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#### Graduate School of Medicine (PhD)

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*The figures in parentheses are for the course "Igaku-kei Kenkyu-ka", the former name for the present course.*

#### Graduate School of Medicine: Division of Biomedical Sciences (Master’s)

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### International Exchanges of Researchers and Students (2016)

#### Invited Researchers from Overseas (2016)

**Country of Origin**
- Korea 3
- Italy 1
- Spain 1
- France 1
- UK 1
- Colombia 1
- USA 1
- China 1
- Egypt 2

**Invited Researchers from Overseas**
- 14

#### Visiting Researchers from Overseas (2016)

**Country of Origin**
- Hellenic 1
- Spain 4
- Brazil 1
- USA 1
- China 2

**Visiting Researchers from Overseas**
- 9

#### Medical Students from Overseas (2016)

**Country of Origin**
- China 2
- Korea 1
- Indonesia 14
- Malaysia 3
- Philippines 3
- Turkey 1
- Egypt 3
- Tanzania 1
- Guinea 1
- Kenya 1
- Sri Lanka 4

**Medical Students from Overseas**
- 43

#### Faculty 6th year Students Studying Abroad (2016)

**Host Countries**
- Australia 1
- Indonesia 9
- Malaysia 1
- Germany 2
- Philippines 1
- Taiwan 2
- Nepal 3
- Singapore 5
- USA 6

**Faculty 6th year Students Studying Abroad**
- 35
(As of September 1st, 2016)

Academic Exchange Agreements: Graduate School of Medicine School of Medicine

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Number of Degrees Awarded
Accumulated Total 2016: PhD (Course): 2,708 PhD (Papers): 2,153 Master’s:409

Aspects of Research Performance

◆ Major Achievements of the Graduate School of Medicine

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<tr>
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Citation counts of Monographs*  
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Number of Research Publications  
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Figures in parentheses: Number of peer-reviewed monographs.

*Source of citation counts: Thomson & Reuters, Inc., InCitesTM  
(Date of Citation Counting: August 2017)

◆ Patents and Inventions developed at the Graduate School of Medicine

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Kusunoki Campus

To the nearest stations

Access from Airports
- Access from Kansai International Airport (KIX)
  Take Osaka Monorail from “Osaka Airport” station and get off at “Hatanaka” station (time required: 3 min). Change to Hankyu Takarazuka Main Line and get off at “Juso” station (time required: 15 min). Change to Hankyu Kobe Main Line and get off at “Kosaka” station (time required: 30 min).

Access from Kansai International Airport (KIX)
  - By Railway
    Take JR (Japan Railway) Kansai Airport Line from “Kansai Airport” station and get off at “Osaka” station (time required: 1 hour). Change to JR Kobe Line and get off at “Kobe” station (time required: 30 min).
  - By Bus
    Take the Limousine Bus bound for “Kobe Sannomiya” from Kansai International Airport (time required: 65 min). At “Sannomiya” station, change to Kobe Municipal Subway Sannomiya Line and get off at “Ookurayama” station (time required: 3 min).

When using a Limousine bus, go out of the passenger terminal building to buy a ticket for “Kobe Sannomiya” at the ticket counter; board the bus at No. 6 bus stop.

KIX Airport Limousine web site: http://www.kixairport.com/
By MK “Skygate shuttle” Gionbus
- To your destination in Chuo-ku, Higashinada-ku, Nada-ku, or Hyogo-ku in Kobe city from Kansai International Airport (fare: 2,300 yen, one-way/per person).

Reservation by phone or web is required up to 2 days prior to the date of use.
When using the MK “Skygate shuttle” omnibus, go to the MK counter on the first floor of the passenger terminal.
MK “Skygate shuttle” web site: http://www.mkkansai.jp/

Access from Kobe Airport
Take Port Island Line from “Kobe Airport” station and get off at “Sannomiya” station (time required: 17 min). Change to Kobe Municipal Subway Sannomiya-Yamate Line and get off at “Ookurayama” station (time required: 3 min).

Access from Stations on Shinkansen line
- Access from “Shin-Osaka” station
  Take JR (Japan Railway) from “Shin-Osaka” station and get off at “Kobe” station (time required: 30 min).
- Access from “Shin-Kobe” station
  Take Kobe Municipal Subway Sannomiya-Yamate Line from “Shin-Kobe” station and get off at “Ookurayama” station (time required: 5 min).

Access from the nearest stations to Kusunoki Campus
- Access from JR “Kobe” station
  By taxi: about 5 minutes
  By Kobe City Bus: Take No. 9 to “Daiaji-Bouyin-Mae” bus stop.
- Access from Kobe Municipal Subway Tsurumi Line “Yodoji” station
  On foot: about 5 minutes

International Clinical Cancer Research Center (ICCRC)

To the nearest stations

Access from Airports
- Access from Osaka International Airport (TAMJ)
  Take Osaka Monorail from “Osaka Airport” station and get off at “Hatanaka” station (time required: 3 min). Change to Hankyu Takarazuka Main Line and get off at “Juso” station (time required: 15 min). Change to Hankyu Kobe Main Line and get off at “Sannomiya” station (time required: 25 min). Change to Port Island Line from “Sannomiya” station and get off at “Iyo Center” station (time required: 12 min).

Access from Kansai International Airport (KIX)
  - By Railway
    Take JR (Japan Railway) Kansai Airport Line from “Kansai Airport” station and get off at “Osaka” station (time required: 1 hour). Change to JR Kobe Line and get off at “Sannomiya” station (time required: 25 min).
  - By Bus
    Take the Limousine Bus bound for “Kobe Sannomiya” from Kansai International Airport (time required: 65 min). At “Sannomiya” station, change to Port Island Line from “Sannomiya” station and get off at “Iyo Center” station (time required: 12 min).

When using a Limousine bus, go out of the passenger terminal building to buy a ticket for “Kobe Sannomiya” at the ticket counter; board the bus at No. 6 bus stop.

KIX Airport Limousine web site: http://www.kixairport.com/
By MK “Skygate shuttle” Gionbus
- To your destination in Chuo-ku, Higashinada-ku, Nada-ku, or Hyogo-ku in Kobe city from Kansai International Airport (fare: 2,300 yen, one-way/per person).

Reservation by phone or web is required up to 2 days prior to the date of use.
When using the MK “Skygate shuttle” omnibus, go to the MK counter on the first floor of the passenger terminal.
MK “Skygate shuttle” web site: http://www.mkkansai.jp/

Access from Kobe Airport
Take Port Island Line from “Kobe Airport” station and get off at “Iyo Center” station (time required: 7 min).

Access from Stations on Shinkansen line
- Access from “Shin-Osaka” station
  Take JR (Japan Railway) from “Shin-Osaka” station and get off at “Sannomiya” station (time required: 25 min). Change to Port Island Line from “Sannomiya” station and get off at “Iyo Center” station (time required: 12 min).
- Access from “Shin-Kobe” station
  Take Kobe Municipal Subway Sannomiya-Yamate Line from “Shin-Kobe” station and get off at “Sannomiya” station (time required: 2 min). Change to Port Island Line from “Sannomiya” station and get off at “Iyo Center” station (time required: 12 min).

Access from the nearest stations to International Clinical Cancer Research Center (ICCRC)
- Access from Port Island Line “Iyo Center” station
  On foot: about 5 minutes