5. Details and Areas of Research by Faculty Members at the Graduate School of Biomedical Sciences

**Doctoral Courses [Four years (Majors in Medical and Dental Sciences, Infection Research, Life Sciences and Radiation Research)]**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Area of Research</th>
<th>Professor, etc.</th>
<th>Details of main research work</th>
</tr>
</thead>
</table>
| Anatomy and Neurobiology | Nozomu MORI (Professor) | ① Research into activity regulation of memory/learning, in particular investigation and analysis of molecular groups related to synapse configuration and function control  
② Research into configuration and function of neuromuscular control molecules relating to structure: neuromuscular  
③ Research into configuration and function of intermediary molecules communicating pathognomonic signals to the nerves  
④ Analysis of configuration and function of transfer control molecules in nerve specific geneti expression  
⑤ Investigation and analysis of molecules relating to neural network reconfiguration in developing an ageing brains  
⑥ Research into the role of the cerebral nervous system in ageing control and lifespan control |
| Macroscopic Morphology | Toshiyuki TSURUMOTO (Professor) | ① 3D microstructural analysis of hard tissue  
② Research into functional adaptation of motor organs from the perspective of skeletal microevolution among Japanese people  
③ Research into gene polymorphism in skeletal/joint structure  
④ Translational research on human clinical anatomy  
⑤ Anthropological research into skeletal transformation in archeological remains excavated in western Japan |
| Histology and Cell Biology | Takehiko KOJI (Professor) | ① Development and improvement of molecular histochemical techniques  
② Epigenetic regulation of germ cell differentiation  
③ Control of cell proliferation by keratinocyte growth factor (KGF/FGF-7) and its receptor  
④ Molecular mechanism of steroid hormone action on spermatogenesis  
⑤ Effect of liver injury upon liver stem cell kinetics |
| Oral Anatomy and Dental Anthropology | | |
| Cell Biology | Toshihisa KOMORI (Professor) | ① Research on the mechanism of osteoblast differentiation and proliferation  
② Research on the mechanism of chondrocyte differentiation and proliferation  
③ Elucidation of the mechanism of skeletal development using knockout mice and transgenic mice  
④ Research on tooth development  
⑤ Development of regenerative methods for bone and cartilage |
| Molecular Physiology | Naomasa MAKITA (Professor) | ① Genetic and molecular basis of lethal arrhythmias  
② Electrophysiological mechanisms of inherited arrhythmias  
③ Structure-function of ion channels |
| Biochemistry | Takashi ITO (Professor) | ① Mechanisms of DNA higher-order structure formation in the nucleus  
② Mechanisms of Estrogen receptor-induced gene activation  
③ Post-translational histone modification and structural changes of chromatin  
④ ES cell differentiation and structural changes of chromatin  
⑤ Development of novel gene therapy for canncer patients  
⑥ Development of novel transplantation therapy with allogeneic cells  
⑦ Research into T cell functionality |
| Oncology | Hiroaki IKEDA (Professor) | ① Research into the epidemiology and clinical epidemiology of cancer and risk factors  
② Research into viral-related cancers and inflammatory diseases  
③ Research into oncology and drug development based on bioinformatics  
④ Biochemistry and molecular epidemiology on environmental stress and disease biomarkers  
⑤ Research into the mechanisms of progression and persistence of inflammatory diseases  
⑥ Research into opioid receptor system in the nervous system |
| Frontier Life Sciences | Masako IWANAGA (Professor)  
Mitsuko MASUTANI (Professor) | ① Development of novel cell therapy for cancer patients  
② Development of novel gene therapy for canncer patients  
③ Translational research of novel immuno-therapy for cancer patients  
④ Development of novel transplantation therapy with allogeneic cells  
⑤ Research into T cell functionality |
| Geriatric Oral Pathophysiology | | |
| Oral Molecular Biology | Takayuki NEMOTO (Professor) | ① Research on bacteriogenic proteases as factors in infection  
② Function of proteases produced by bacteria related to periodontal disease  
③ Structure and function of molecular chaperones  
④ Analysis of calcification mechanism |
| Pharmacology | Jun ARUGA (Professor) | ① Molecular function and physiological role of synapse organizer proteins  
② Function and pathophysiology of blood-brain-barrier  
③ Analysis of pathological conditions and development of therapeutic strategies in neurological disorders  
④ Wiring mechanism of neural circuit and its regulation by diffuse modulatory system |
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<tr>
<td><strong>Basic Medical Sciences</strong></td>
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</table>
| Deantal pharmacology         | Takayuki TSUKUBA (Professor)     | ① Functions and pathological condition of endo-lysosomal protease  
② Molecular biological research into endosome and lysosome systems  
③ Cellular biological research into osteoclast-induced bone resorption mechanisms  
④ Research into protease in bacteria pathogenic in gum disease                                      |
| Pathology                    | Junya FUKUOKA (Professor)         | ① Standardization of pathological diagnosis using digital technology  
② Clinical pathological consideration of obesity-induced pulmonary disease  
③ Investigation and research into biomarkers in cancer and other difficult-to-cure diseases  
④ Comprehensive analysis of histological identification of factors effective in treatment of cancer |
| Pathology                    | Isao SHIMOKAWA (Professor)        | ① Experimental research on regulation of ageing and age-related diseases  
② Mechanisms underlying the anti-ageing effect of calorie restriction  
③ Investigation of longevity genes  
④ Pathology of Breast Cancer  
⑤ Molecular mechanisms linking wound inflammation and fibrosis                                       |
| Oral Pathology and Bone Metabolism |                                   |                          |                                                                                                                                                                                                                             |
| Dental and Biomedical Materials Science | Ikuya WATANABE (Professor)         | ① Development of low-elasticity, highly corrosion-resistant titanium alloy for bone replacement material  
② Optical characteristics of all-ceramic repair porcelain  
③ Quantitative evaluation of corrosion and discoloration resistance of prototype non-palladium additive low-carat gold alloy for dental use  
④ Abrasion resistance evaluation of metallic biomaterial  
⑤ Cellular suitability evaluation of biomaterials for dental or biological implant                     |
| Molecular Bone Biology       | Kosei ITO (Professor)              | ① Differentiation, proliferation and tumorigenesis of mesenchymal stem cells  
② Molecular bone metabolism using gene targeted mice  
③ Functional analysis of oncogenes and anti-oncogenes using gene targeted mice                          |
| Forensic Pathology and Science | Kazuya IKEMATSU (Professor)       | ① Forensic pathology  
② Child abuse and neglect  
③ Forensic molecular pathology  
④ Forensic genetics  
⑤ Metabolic Autopsy                                                   |
| Forensic Dental Science      | Toshiyuki SAITO (Professor)        | ① The impact of periodontal disease in arterial sclerosis, diabetes and other systemic health  
② The impact of LPS from periodontal bacteria on adipokine production  
③ Research into the epidemiology of dental caries and periodontal disease, and their prevention  
④ Research into prevention of dental caries through recalcification  
⑤ The impact of bite frequency on health  
⑥ Community oral health activities and their evaluation                                                                    |
| Ophthalmology and Visual Science | Takashi KITAOKA (Professor)       | ① Research into macular disease and its treatment methods  
② Research into anatomy and function of the vitreous body  
③ Basic and Clinical research on retinal and choroidal circulation  
④ Development of new operating methods on the vitreous body  
⑤ Research and clinical practice relating to the treatment of diabetic retinopathy                     |
| Otolaryngology/Head and Neck Surgery | [Haruo TAKAHASHI (Professor)]     | ① Analysis of normal swallowing using a multi-channel pressure sensor, and clarification o pathophysiology of dysphagia  
② Genetic clarification of the mechanisms of growth of mastoid air cells and its inhibition by otitis media  
③ Analysis of vocal cord vibration using high-speed cameras  
④ Clarification of mechanism of middle ear negative pressure during otitis media causing eardrum retraction |
| Neurosurgery                 | Takayuki MATSUO (Professor)       | ① Technological development of skull base surgery  
② Development of support system for brain tumor surgery  
③ Research into neuroendoscopic surgery  
④ Research into radiobiological effect for brain tumor after stereotactic irradiation  
⑤ Analysis of mechanism in blood brain barrier                                                                    |
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| Translational Medicine | Anesthesiology                     | Tetsuya HARA                    | ① Pathology of acute heart failure and its control  
② Pathophysiology of airway smooth muscle  
③ Vascular pathology of septic shock  
④ Neural mechanism of chronic pain and its control  
⑤ Control of molecular pathology in ischemia/reperfusion injury  |
|                      | Cardiovascular Surgery             | Kiyoyuki EISHI                  | ① Valvuloplasty  
② Video assistance systems in coronary artery bypass surgery  
③ Microscopic bypass surgery  
④ Robotic surgery  
⑤ Four-dimensional echo use in cardiac surgery  |
|                      | Urology                            | Hideki SAKAI                    | ① Research into chemo-prevention of prostate cancer using animal models  
② Renal transplantation and surgery related to renal failure  
③ Development of molecular targeted therapies for genitourinary cancers  
④ Analysis of prognostic factors in genitourinary cancers  
⑤ Prostate cancer screening with PSA testing  |
|                      | Surgical Oncology                  | Takeshi NAGAYASU               | ① Development of diagnosis and treatment methods for pulmonary and digestive organ cancer using molecular biological approach  
② Decision-making regarding surgical responses to pulmonary and digestive organ cancer depending on malignancy, and establishing accurate surgical method  
③ Establishing malignancy and appropriate treatment methods based on the cellular biological analysis of breast cancer  
④ Research into lung transplants and organ preservation  
⑤ Research into pulmonary function preservation surgery and reconstructive surgery  
⑥ Research into lung and tracheal regeneration  
⑦ Development of innovative medical equipment with collaboration between medical and engineering  
⑧ Research and development of new diagnostic method regarding lymph node metastasis  
⑨ Research into prevention for perioperative infection  |
|                      | Surgery                            | Susumu EGUCHI                   | ① Research into digestive organ transplantation (liver, pancreas, islets, small bowel, etc.)  
② Research into digestive organ regenerative medicine (digestive tract, liver, pancreas, islets, etc.)  
③ Research into digestive organ cancer (digestive tract, hepatobiliary pancreatic)  
④ Research into laparoscopic and robot surgery  
⑤ Research into thyroid and breast surgery  
⑥ Research into development of new strategy for pediatric surgery  
⑦ Research into immunotherapy for malignant tumors and organ transplantation  |
|                      | Obstetrics and Gynecology          | [Hideaki MASUZAKI]              | ① Fetal diagnosis and treatment  
② Diagnostic imaging in obstetrics and gynecology  
③ Fetal DNA/RNA/microRNA in maternal blood  
④ Occurrence and proliferation of endometriosis  
⑤ Cervical cancer and HPV  
⑥ Identification of novel molecular marker in the field of gynecologic oncology  
⑦ Maternal-fetal transmission: HTLV-I  |
|                      | Orthopaedic Surgery                | Makoto OSAKI                    | ① Bone metabolism research using bone marrow adipocyte  
② Epidemiological research into osteoarthritis, osteoporosis, dialytic spondylosis  
③ Research into biofilms  
④ Research into clinical application of photocatalysts in antibacterial material development  
⑤ Bone structure and mechanical analysis using CT and MRI  
⑥ Research into preventing sports injury  
⑦ Analysis of joint kinematics  
⑧ Pathological analysis of osteonecrosis of femoral head  |
|                      | Plastic and Reconstructive Surgery | Katsumi TANAKA                  | ① Research into reconstructive surgery  
② Research into microsurgical research and clinical application  
③ Wound healing  
④ Development of new operating methods in the hand surgery  
⑤ Research into the application of adipose tissue derived stem cells in the reconstructive surgery  |
|                      | Neuropsychiatry                    | Hiroki OZAWA                    | ① Research into post-mortem human brains relating to brain signal transmission in mood disturbance at integration disorder syndromes  
② Investigation into genetic factors behind integration disorder syndrome and mood disturbance (in twins and families)  
③ Psycho-social medical research into psychiatric medicine as a WHO center (infant/adolescent psychiatric medicine, early intervention, prolonged course of conditions, psychiatric medical training, disaster psychiatry)  
④ Neuropsychological and imaging research into psychiatric conditions  
⑤ Development of new treatment methods for neuropsychiatric disorders from the perspective of regenerative medicine (Neuroplasticity/role of neural stem cells)  
⑥ Development of new psychiatric systems (alleviation care, liaison psychology, telepsychiatry, community psychiatry, East Asian psychiatry)  |
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| Dermatology                | Medicine                    | Atsushi UTANI (Professor)         | ① Wound healing  
② Genetic analysis of congenital skin diseases  
③ Keloid pathogenesis  
④ Research into skin regeneration using transgenic mice  
⑤ Mechanisms of cutaneous amyloid fiber formation  
⑥ Gene therapy with read-through drugs                                                                                                                                   |
| Cardiovascular Medicine    | Medicine                    | Koji MAEMURA (Professor)           | ① Basic and clinical research into mechanisms of arteriosclerosis and acute coronary syndrome  
② Development of biomarkers of cardiovascular disease and its clinical application  
③ Research into the application of chronotherapy to cardiovascular disease  
④ Genetic analysis of cardiomyopathy and lethal arrhythmia  
⑤ Epidemiology of risk factors for hypertension and genetic arrhythmia  
⑥ Research into the relationship between sleep disordered breathing and cardiovascular disease  
⑦ Research into the application of adipose tissue derived stem cells in cardiovascular regenerative medicine                                                                 |
| Gastroenterology and Hepatology | Medicine                  | Kazuhiko NAKAO (Professor)         | ① Molecular biology, mutations and pathology of hepatitis virus  
② Interferon signals within hepatic cells  
③ Life and death of hepatic cells  
④ Early diagnosis and carcinogenic inhibition of hepatic cell cancer  
⑤ Development of new treatment methods for digestive organ cancer  
⑥ Digestive organ disorders and metabolic syndrome  
⑦ Pathological analysis and development of new treatment methods for autoimmune hepatitis  
⑧ Pathological analysis and development of new diagnostic methods for D198: D205 hypersensitivit pneumonia  
⑨ Development of new molecularly-targeted treatment for Interstitial Pneumonia  
⑩ Development of a novel immune treatment for severe pneumonia  
⑪ Development of new molecularly-targeted treatment for Intersititital Pneumonia  
⑫ New evaluation method for environmental risks of bronchial asthma  
⑬ Analysis of adverse events in the Immune checkpoint inhibitors  
⑭ Gene expression associated with oncogenesis and complications of thymic tumors  
⑮ Research into mechanisms of kidney diseases and development of new treatment methods  
⑯ Basic and clinical research into renal replacement therapy including hemodialysis, peritoneal dialysis and kidney transplantation                                                                                      |
| Respiratory Medicine       | Medicine                    | Hiroshi MUKAE (Professor)          | ① Elucidation of pathogenicity and antifungal resistance mechanisms of pathogenic fungi  
② Pathological analysis and development of novel therapeutic strategies for deep-seated mycoses  
③ Development of a novel immune treatment for severe pneumonia  
④ Development of new molecularly-targeted treatment for Intersititital Pneumonia  
⑤ New evaluation method for environmental risks of bronchial asthma  
⑥ Analysis of adverse events in the Immune checkpoint inhibitors  
⑦ Genetic analysis associated with oncogenesis and complications of thymic tumors  
⑧ Research into mechanisms of kidney diseases and development of new treatment methods  
⑨ Basic and clinical research into renal replacement therapy including hemodialysis, peritoneal dialysis and kidney transplantation                                                                                     |
| Laboratory Medicine        | Medicine                    | Katsunori YANAGIHARA (Professor)  | ① Research into new methods of diagnosing infectious diseases  
② Clarification of drug-resistant mechanisms and research into drug resistant bacteria control  
③ Clarification of severe infection mechanisms and development of new treatment methods  
④ Clarification of ATL pathology and development of new treatment methods  
⑤ Establishment of custom-made diagnostics for neoplasm and infection  
⑥ Development of new antimicrobials                                                                                                                                   |
| Radiological Science       | Medicine                    | Masataka UETANI (Professor)        | ① Research into diagnostic imaging of musculoskeletal disorders  
② Research into efficacy of MRI in evaluation of rheumatoid arthritis for caly diagnosis and determinin activity disease activity  
③ Research into use of MRI in evaluation of joint cartilage                                                                                                                     |
| Clinical Oncology          | Medicine                    | Kazuto ASHIZAWA (Professor)        | ① Research into management of pulmonary nodules using diagnostic imaging  
② Research into molecular imaging for use in determining effectiveness of cancer treatments  
③ Cutting edge clinical cancer research involving clinical trials on cancer drug treatments in multi-orga cancer cases  
④ Molecular biological research including biomarkers, aiming for "order-made treatments"                                                                                           |
| Clinical Physiology        | Medicine                    | Takao AYUSE (Professor)             | ① Research into management upper airway patency during sleep and anesthesia  
② Investigation on influence of anxiety on pain perception  
③ Research into functional role of opioid receptor  
④ Investigation on ischemia reperfusion injury of liver circulation  
⑤ Investigation on swallowing disorder                                                                                                                                       |
| Orthodontics and Dentofacial Orthopedics | Medicine                  | Noriaki YOSHIDA (Professor)        | ① Effect of soft diet feeding on masticatory function development and craniofacial growth  
② Clarification of causes and pathology of stomatognathic function  
③ Research into osteoclast differentiation guidance and control  
④ Analysis of biomechanics of orthodontic force-induced dental movement/dental movement dynamics  
⑤ Development of efficient dental movement mechanics to shorten orthodontic treatment times  
⑥ Clarification of dental root absorption mechanism  
⑦ 3D measurement of maxillofacial and dental cast profile                                                                                                                        |
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| Pediatric Dentistry         | Taku FUJWARA (Professor)          | ① Virulence factors of cariogenic bacteria  
② Infection and colonization of oral flora of children  
③ Tooth-forming proteins and genes  
④ Virulence factors of periodontopathic bacteria |
| Cariology                   |                                   |                                |                                                                                                                                                           |
| Periodontology              | [Yoshitaka HARA] (Professor)      | ① Research into alveolar bone absorption mechanisms  
② The impact of tissue breakdown on the immune system  
③ Epidemiological research into gum disease  
④ Role of bacteria in the onset of gum disease |
| Applied Prosthodontics      | Takashi SAWASE (Professor)        | ① Biocompatibility and biodynamics of implants  
② Surface analysis of and improvements to dental materials  
③ Manufacture, clinical application and evaluation of polymers/composite materials/ceramics |
| Prosthetic Dentistry        | Hiroshi MURATA (Professor)        | ① Research into the development and clinical application of dental materials such as soft denture liners and denture adhesives  
② Research into mastication function and jaw movement  
③ Basic and clinical research into dental metal allergies |
| Clinical Oral Oncology      | Masahiro UMEDA (Professor)        | ① Clinico-pathological study of oral cancer  
② Research of cancer-related genetics relating to the onset, invasion, and metastasis of oral cancer  
③ Basic research of molecular targeted therapy for oral cancer |
| Regenerative Oral Surgery   | Izumi ASAHINA (Professor)         | ① Regenerative oral medicine (regeneration of the jawbone/alveolar bone, regeneration of mucosal membranes)  
② Computer-assisted surgery  
③ Photodynamic therapy for oral cavity neoplasm  
④ Dental implants |
| Radiology and Cancer Biology| Takashi NAKAMURA (Professor)      | ① Head and neck radiology  
② Diagnostic imaging of the salivary glands/metastatic lymph nodes  
③ Cell stress  
④ DNA damage and repair mechanisms |
| Locomotive Rehabilitation Science | Minoru OKITA (Professor)  
Tomoki ORIGUCHI (Professor)  
Hironobu KOSEKI (Professor)  
Katsuya SATOH (Professor)    | ① Experimental research on immobilization-induced degenerative change of musculoskeletal tissues  
② Research and development in rehabilitation for musculoskeletal diseases  
③ Research in rehabilitation for rheumatic diseases  
④ Research and development in rehabilitation for neuromuscular diseases |
| Psychiatric Rehabilitation Science | Goro TANAKA (Professor)  
Hideyuki NAKANE (Professor) | ① Research into psychiatric disorders in primary care  
② Research into the impact of traumatic stress and treatment strategies  
③ Research into public stigma and self-stigma  
④ Research into the level of burden felt when caring for family members |
| Cardiopulmonary Rehabilitation Science | Terumitsu SAWAI (Professor)  
Misako HIGASHIJIMA (Professor)  
Ryo KOZU (Professor)  
Yuji ISHIMATSU (Professor)   | ① Clinical research on effects of rehabilitation medicine for acute and chronic cardiorespiratory disorders  
② Epidemiological study for early detection and secondary prevention of COPD  
③ Research on development of assessment in cardiorespiratory rehabilitation  
④ Research on evaluation for dysphagia |
| Community-based Rehabilitation | Sumihisa HONDA (Professor)  
Mayumi OHNISHI (Professor)  
Toshio HIGASHI (Professor)  | ① Research on community-based rehabilitation  
② Research on rehabilitation for the disabled  
③ Research in improving the health of people living under disadvantaged conditions  
④ Research on health promotion for the community citizens |
| Medical Pharmacy             | Kazuhiro TSUKAMOTO (Professor)    | ① Research into DNA-based diagnostic methods for personalized medicine  
② Research into association studies on susceptibility genes for diseases, progression, drug effectiveness, adverse effects, and prognosis using genetic polymorphic marker  
③ Elucidation of pathological molecular mechanisms of cleft lip/cleft palate |
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| Medical Pharmacy             | Pharmaceutical Informatics                       | Shigeru KAWAKAMI (Professor)                                                  | ① Research into targeted DDS using external stimuli from medical equipment  
② Research into medical applications of nanobiotechnology  
③ Development of ligand modified liposomes for targeting  
④ Evaluation of medicines for efficacy and safe use  
⑤ Research on pharmacokinetics properties of medicines                                                                                                                                                      |
| Medical Pharmacy             | Pharmaceutics                                    | Koyo NISHIDA (Professor)                                                      | ① Research on drug delivery system aiming to develop new administration forms  
② Development of control method for distribution of generic medicine in the body and its pharmacokinetic formulation with the purpose of optimizing treatment  
③ Research on kinetic analysis of drug disposition in the body and dosage regimen under diseased state                                                                                                                                                      |
| Medical Pharmacy             | Pharmacy Practice                                | Mikiro NAKASHIMA (Professor)                                                  | ① Basic and clinical pharmaceutical research of generic drugs and their proper use  
② Practical scientific research based on drug preparation and medical communication in the clinical setting  
③ Development and clinical application of a novel therapeutic drug monitoring method  
④ Screening and application of disease-specific immune response points for drug development                                                                                                                                                      |
| Frontier Life Sciences       | Comparative Medicine                             | Tatsuya KISHINO (Associate Professor)                                         | ① Molecular analysis of genomic imprinting  
② Clarification of establishment of epigenetics in early embryos and neurons  
③ Production and analysis of model mice of epigenetics diseases  
④ Functional analysis of responsible genes of diseases with mental retardation                                                                                                                                                      |
| Preventive Medicine          | Preventive Medicine                              | Koji KAWASAKI (Associate Professor)                                           | ① Research on community medical network  
② Research on effective and efficient discharge support system  
③ Reasearch on home care  
④ Alignment between medical care and welfare                                                                                                                                                                                                                       |
| Clinical Medicine            | Community Network for Health Welfare             | Osamu TASAKI (Professor)                                                      | ① Research into optimization of drug therapy and appropriate use of drug preparations  
② Development of drugs and genetic delivery systems  
③ Kinetic research relating to movement of drugs within body subsequent to local application and drug efficacy  
④ Drug permeation of biomembranes and electrophysiological research                                                                                                                                                                                                 |
| Clinical Neurosciences       | Nephrology                                      | Hitoshi SASAKI (Professor)                                                    | ① Pathophysiological clarification of septicemia, and research into the development of treatment  
② Pathophysiological clarification of ischemia-reperfusion injury, and research into the development of treatment  
③ Pathophysiological clarification of severe trauma, and research into the development of treatment  
④ Pathophysiological clarification of heatstroke, and research into the development of treatment  
⑤ Research into nutrition management of critically ill patients                                                                                                                                                                                                 |
| Clinical Neurosciences       | Molecular Neuroscience                            | Hidenori MATSUO (Professor)                                                   | ① Development of treatment methods for neuroimmunological disorders  
② Research into immunomodulation induced by extracorporeal circulation therapy  
③ Development of biomarkers in neuroimmunological disorders                                                                                                                                                                                                 |
| Comprehensive Community Care Systems | Comprehensive Community Care Systems           | Takashi MINE (Professor)                                                      | ① Research into comprehensive community care system  
② Research into the policy for community health  
③ Research into network system for comprehensive community care  
④ Research into primary health care in local community  
⑤ Research into dementia and mild cognitive impairment in community                                                                                                                                                                                                 |
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<tr>
<td>Immunology</td>
<td></td>
<td>Katsuyuki YUI (Professor)</td>
<td>① Modulation of T-cell function and immunological memory during malaria infection</td>
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<td>② Basic research towards the development of malaria vaccine</td>
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<td>③ Intravital imaging of immune responses during infection</td>
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<td>④ Role of transcription factor IRF4 in immune responses</td>
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<td>① Analysis of prion pathogen behavior and infection/proliferation mechanisms</td>
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<td>② Analysis of host immune response in regard to prion infection, and development of immunomodulation therapy</td>
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<td>③ Research into development of viral infection and prion infection diagnosis methods</td>
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<td>④ Research into development of new drug treatments for pathogens</td>
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<td>⑤ Pathological analysis of neutrophilic viruses</td>
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<td>① Analysis of antifungal resistance mechanisms and virulence, and development of novel diagnostic tools and treatments for the infections caused by pathogenic fungi (Aspergillus, Candida, and Cryptococcus)</td>
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<td>② Investigation of the molecular basis of host-pathogen interaction for bacteria causing the respiratory infection</td>
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<td>③ Investigation of epidemiology and pathogenesis of the emerging, re-emerging infectious diseases as well as diseases caused by drug-resistant pathogens</td>
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<td>④ Intervention for the prevention of hospital-acquired infection</td>
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<td>① Molecular epidemiology/molecular evolution of infectious diseases</td>
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<td>② Control of diarrhea in the tropics</td>
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<td>③ Understanding the diarrheal disease burden and proposing better vaccination policies for diarrheal diseases</td>
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<td>④ Modelling and analyses of the 3D structures of rotavirus and norovirus particles</td>
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<td>① Relationship of oral microorganisms to systemic diseases</td>
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<td>② Iron acquisition mechanisms of oral anaerobic bacteria</td>
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<td>③ Protein secretion systems of bacteria</td>
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<td>④ Mechanisms of bacterial motility</td>
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<td>① Research on pathogenesis of dengue hemorrhagic fever</td>
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<td>② Sero-epidemiology/molecular epidemiology of arboviruses</td>
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<td>③ Pathogenic analysis of flavivirus using reverse genetics</td>
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<td>④ Development of vaccines for flaviviruses such as West Nile virus</td>
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<td>⑤ Development of rapid diagnostic methods</td>
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<td>① Molecular mechanisms of replication of hemorrhagic fever viruses</td>
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<td></td>
<td>② Development of novel anti-viral strategies against highly pathogenic viruses (especially influenza SFTS, Ebola, Marburg and Lassa viruses)</td>
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<td>③ Development of diagnostic methods for emerging viral diseases</td>
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<td>④ Studies on epidemiology of Lassa fever and pathogenicity of Lassa virus</td>
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<td>⑤ Development of methods to inhibit the replication of endogenous retroviruses</td>
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<td>① Molecular mechanisms of erythrocyte invasion and modification by malaria parasite</td>
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<td>② Calcium signaling in malaria parasite</td>
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<td>③ Molecular epidemiology of malaria vaccine candidate antigens and drug-resistance genes</td>
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<td>④ Evolution of malaria parasites</td>
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<td>⑤ Functional analysis of trypanosoma parasite specific trans-sialidase</td>
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<td>⑥ Molecular mechanisms of erythrocyte invasion and modification by babesia parasite</td>
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<td>① Immune response and host defense mechanism to parasites(Amoebiasis, Leishmaniasis, Schistosomiasis, Filariasis and other parasitic diseases)</td>
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<td>② Cohorts study and genome epidemiology of parasitic diseases under intervention in tropics</td>
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<td>③ Development and evaluation of new diagnoses</td>
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<td>④ Study on pathogenicity of parasites</td>
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② Majors in Infection Research:
<table>
<thead>
<tr>
<th>Unit</th>
<th>Area of Research</th>
<th>Professor, etc.</th>
<th>Details of main research work</th>
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</thead>
<tbody>
<tr>
<td>Immunogenetics</td>
<td>Kenji HIRAYAMA (Professor)</td>
<td>① Analysis of infection resistance against tropical infections (malaria, trypanosome, schistosome dengue fever, tuberculosis, etc.) and host genetic factors in aggravation ② Molecular level analysis of pathogenicity of tropical infectious diseases ③ Clarification of human immunity mechanisms in regard to tropical infectious diseases ④ Development of vaccines and drugs against tropical infectious diseases</td>
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<tr>
<td>Clinical Investigation</td>
<td>Richard CULLETON (Associate Professor)</td>
<td>① Genomics and genetics approaches to malaria drug and vaccine development ② Whole genome sequencing approaches to phylogenetics in Apicomplexan parasites ③ Molecular epidemiology of malaria ④ Evolutionary Ecology of malaria parasites ⑤ Transmission dynamics and Evolutionary history of African P. vivax ⑥ Transmission-blocking vaccine antigen discovery</td>
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<tr>
<td>Eco-Epidemiology and Epidemiological Informatics in Tropical Medicine</td>
<td>Satoshi KANEKO (Professor)</td>
<td>① Research on a continent-wide surveillance system for infectious diseases in Africa ② Research on development of multiple and simultaneous assay system for Neglected Tropical Diseases ③ Research on community health information system using biometrics ④ Epidemiological research on stunting and malnutrition in developing countries ⑤ Epidemiological research on non-communicable diseases in developing countries ⑥ Cancer epidemiology in developing countries</td>
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<tr>
<td>International Health</td>
<td>Taro YAMAMOTO (Professor)</td>
<td>① Research into international health policy (G8 and the Conference on African Development) ② Reassembly of infectious disease on a time axis (study of ancient infectious diseases) ③ Molecular evolutionary research into maternal-child HTLV-1 infection ④ Infectious diseases and climate change (the environment)/changes to ecosystems ⑤ Research into the history of medicine relating to the history of tropical medicine in Japan ⑥ Research into factors in the spread of AIDS in the Greater Mekong Economic Corridor and China ⑦ High altitude medicine from evolutionary perspective ⑧ Field research in microbiome and modern epidemic ⑨ Molecular epidemiology of mycobacteria and its risk as zoonosis</td>
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<tr>
<td>Tropical Infectious Diseases</td>
<td>Nohoru MINAKAWA (Professor)</td>
<td>① Biology of malaria vector mosquitoes in tropical regions ② Biology of viral disease vector mosquitoes in tropical regions ③ Malaria and dengue vector control tools in Kenya, Vietnam, Malawi etc.) ④ Impacts of environmental chages and climate variability on insect vectors ⑤ Ecology and control of non-mosquito vectors scuh as tsetse flies, sandflies, ticks, etc. ⑥ High altitude medicine from evolutionary perspective ⑦ Field research in microbiome and modern epidemic</td>
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<tr>
<td>Clinical Tropical Medicine</td>
<td>Koya ARIYOSHI (Professor)</td>
<td>① Clarification of immunological response in respiratory infection ② HIV and AIDS in developing countries ③ Clarification of acute respiratory infection in developing countries, and countermeasures ④ Pathological clarification of other tropical infectious diseases in developing countries, an countermeasures</td>
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<tr>
<td>Tropical Pediatric Infectious Diseases</td>
<td>Masahiro HASHIZUME (Professor)</td>
<td>① Clinical epidemiology of paediatric infectious diseases in tropical regions ② Research in health risk assessment and adaptation strategies against global environmental change ③ Statistical analysis of disease surveillance data ④ Health effects of Asian dust and other transboundary air pollution</td>
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<tr>
<td>Clinical Product Development</td>
<td>Juntra LAOTHAVORN (Professor)</td>
<td>① Developing new tools for monitoring drug resistant falciparum malaria ② Developing Herbal drug for Cholangiocarcinoma ③ Developing tools to enhance the understanding of informed consent for clinical research ④ Clinical trial of Shiunko ointment for Cutaneous Leishmaniasis treatment</td>
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<td>Tropical Bacteriology</td>
<td>[Yoshio ICHINOSE] (Professor)</td>
<td>① Clinical research of hepatitis C and B, and research into the development of treatment methods ② Research into analysis of medical and genetic information using data mining ③ Research into the genetic mutation, pathology and treatment of hepatitis virus</td>
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<tr>
<td>Tropical Microbiology</td>
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<td>Integrative Regulation</td>
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<td>Healthcare Research</td>
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<td>Hepatology</td>
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<tr>
<td>Viral Hepatitis</td>
<td>Hiroshi YATSUHASHI (Professor)</td>
<td>① Clinical research of hepatitis C and B, and research into the development of treatment methods ② Research into analysis of medical and genetic information using data mining ③ Research into the genetic mutation, pathology and treatment of hepatitis virus</td>
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<tr>
<td>Unit</td>
<td>Area of Research</td>
<td>Professor, etc.</td>
<td>Details of main research work</td>
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| Advanced Research | Molecular Immunology               | Minoru NAKAMURA (Professor) | ① Development of molecular target therapy for refractory autoimmune liver diseases (primary biliary cholangitis, autoimmune hepatitis)  
② Development of order-made treatment for chronic viral hepatitis based on individual analysis of immune-response  
③ Development of regenerative medicine for diseases in the liver/bile duct based on molecular mechanisms for cellular damage/regeneration |
| Function and Morphology | Hikaru FUJIOKA (Professor) | ① Diagnosis and surgical treatment for liver cancers hepatic cancer, intrahepatic bile duct cancer, etc.  
② Clinical and experimental research into regenerative capacity and mechanisms in liver diseases  
③ Development of the novel assessment method for hepatic functional reserve hepatic cell transplant methods  
④ Clinical and experimental research into the relationship between hepatocellular carcinoma and lifestyle diseases |
| Clinical Pathology | Masahiro ITO (Professor) | ① Clinical and pathological research into viral hepatitis/hepatic neoplasm  
② Clinical and pathological research into refractory autoimmune hepatic disease  
③ Molecular pathological research into neoplastic disorders  
④ Clarification of occurrence mechanisms for radiation-induced neoplasm |
| Basic Mycobacteriosis | Satoshi MITARAI (Professor) Naoto KEICHO (Professor) | ① Research on the development and evaluation of bacteriological diagnostic methods for tuberculosis  
② Research into drug-resistant mechanisms in mycobacteria and their diagnosis/treatment  
③ Molecular epidemiology of Mycobacterium tuberculosis  
④ Analytical research on the relationship between mycobacterial function and its microstructure  
⑤ Research on mycobacterial infection, development and recurrence of the disease at genetic, molecular and cellular levels |
| Clinical Mycobacteriosis | Yuji SHIRAISHI (Professor) Hideaki SENJU (Professor) | ① Clinical research into treatment of susceptible pulmonary tuberculosis  
② Research into DOTS (Directly Observed Treatment Short-course)  
③ Clinical research into multi-resistant tuberculosis  
④ Clinical research (including clinical trials) into the effectiveness of new antituberculosis drug treatments  
⑤ Research into non-tuberculous mycobacterial disease  
⑥ Research into pulmonary rehabilitation for patients with mycobacterial disease |
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<tr>
<th>Social Radiation Medicine</th>
<th>Area of Research</th>
<th>Professor, etc.</th>
<th>Details of main research work</th>
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<tr>
<td>Radiation Medical Sciences</td>
<td>Molecular epidemiological study of radiation effects and thyroid cancer</td>
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<tr>
<td>Molecular Epidemiology</td>
<td>Radiation emergency medicine and radiation health risk management</td>
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<tr>
<td>Radiation Biology and Protection</td>
<td>Radiation medical sciences and radiation biology</td>
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<td>Basic research on nuclear disaster medicine</td>
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<th>Radiation Molecular Epidemiology</th>
<th>Research into evaluation and management of radiation risks</th>
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<tr>
<td>Radiation Biology and Protection</td>
<td>Maintenance of genome integrity after exposure to ionizing radiation</td>
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<td>Investigative research into ionizing radiation and UV protectants</td>
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<td>Development of safety technology for radiation</td>
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<th>Radiation and Environment Health Effects</th>
<th>Epidemiological research in local population</th>
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<td>Researches on health effects due to radiation</td>
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<td>Epidemiological researches on health effects due to various environmental factor or radiation</td>
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<td>Clinical and epidemiological research on thyroid</td>
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<th>Genome Function Analysis</th>
<th>Genome Repair</th>
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| Molecular Epidemiology | Translational studies on stem cells (cardiovascular diseases, wound healing, cancer, aging…)
| | Understand how low dose radiation exposure affects the health by viewing the stem cells. |
| | Characterize cancer stem cells and uncover the mechanism on therapeutic resistance. |

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<tr>
<th>Cellular Function Analysis</th>
<th>Stem Cell Biology</th>
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<tr>
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<td>Development of new diagnostic methods and treatments for hematopoietic diseases</td>
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<td>Molecular analysis for the pathogenesis of hematopoietic neoplasms</td>
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<tr>
<td></td>
<td>Epidemiology and pathological research for radiation-induced hematopoietic diseases</td>
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<tr>
<td></td>
<td>Molecular analysis for hematopoietic stem cells</td>
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<td>Development of treatments for hematological disorders using hematopoietic stem cell transplantation</td>
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<th>Atomic Bomb Disease and Hibakusha Medicine</th>
<th>Radioisotope Medicine</th>
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<td>Research into cellular response/susceptibility to radiation</td>
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<td>Research into DNA damage repair</td>
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<td>Research into the clinical/pre-clinical use of radioisotopes</td>
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| International Hibakusha Medicine | International Hibakusha Medical Sciences |
### Majors in Division of Advanced Preventive Medical Science

<table>
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<tr>
<th>Unit</th>
<th>Area of Research</th>
<th>Professor, etc.</th>
<th>Details of main research work</th>
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</table>
| Neurobiology and Behavior | Kazuyuki SHINOHARA (Professor) | 1. Neuroscientific/endocrinological/molecular biological research into attachment (maternal/paternal affection, heterosexuality)  
2. Neuroscientific/endocrinological/molecular biological research into bullying, social withdrawal and impulsivity  
3. Neuroscientific/endocrinological/molecular biological research into developmental disorders and abuse  
4. Alternative medical treatment aiming to use odorous or flavored substances to improve mental/dermatological conditions | |
| Public Health | Kiyoshi Aoyagi (Professor) | 1. Community health based on health promotion science  
2. Prevention of bone/joint disease  
3. Industrial health  
4. Prevention of lifestyle-related disease  
5. Physiological polymorphism based on physiological anthropological research | |
| Medical Informatics | Masayuki Honda (Professor) | 1. Research into development and management of EMR (electronic medical record) system  
2. Research into hospital information system security  
3. Research into efficient management of regional medical network system  
4. Research of introducing ICT system into welfare field of regional community | |
| Community Medicine | Takahiro Maeda (Professor) | 1. Research in community medicine  
2. Research into the epidemiology of life-style related disease  
3. Research into community medical information and partnerships  
4. Research into community medical training | |
| Advanced Preventive Medical Sciences | Atsushi Kawakami (Professor) | 1. Research into causes and pathology of autoimmune disease, and autoinflammatory disease, and development of new treatment methods  
2. Integrated research into the causes and pathology of early rheumatoid arthritis, and its treatment  
3. Genetic analysis of autoimmune disease, and autoinflammatory disease  
4. Onset mechanisms for autoimmune disease brought on by viral infection  
5. Research into causes and pathology of refractory neural disease  
6. Research into causes and pathology of lifestyle-related disease, and development of new treatment methods  
7. Pathological clarification of radiation exposure, thyroid cancer and osteoporosis, and development of new treatment methods | |
| Neurology | | 1. Epidemiological research into Hibakusha in the former Soviet Union  
2. Research into international health and welfare  
3. Molecular epidemiology of lifestyle-related disease in regional and international fieldwork  
4. Development of new radiation monitoring systems  
5. Epidemiological research in Fukushima | |
| Global Health, Medicine and Welfare | Noboru TAKAMURA (Professor) | 1. Identification of the genes responsible for onset of disease  
2. Research into the relationship between human genetic polymorphism and disease  
3. Research into the control of genetic expression through epigenetics mechanisms  
4. The creation of disease model mice and pathophysiological analytical research thereof  
5. Development of methods to quantify radiation damage | |
| Human Genetics | Koichiro YOSHIURA (Professor) | 1. Research into thyroid cancer using genetically-modified mice  
2. Cancer stem cells in thyroid cancer  
3. Pathological analysis of thyroid autoimmune disease | |
| Molecular Medicine | Yuji NAGAYAMA (Professor) | 1. Research into molecular pathological specificity of neoplasms in atomic bomb Hibakusha  
2. Research into late-onset radiation-induced disorders  
3. Creation of Hibakusha neoplasm tissue bank  
4. Pathology of thyroid neoplasm  
5. Research into pathological diagnostics and new molecular pathological diagnostics | |
### Doctoral Course [3 years]

#### Majors in Pharmaceutical Sciences

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<tr>
<th>Unit</th>
<th>Area of Research</th>
<th>Professor, etc.</th>
<th>Details of main research work</th>
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</table>
| Cell Regulation | Kohsuke TAKEDA (Professor) | ① Intracellular signaling mechanisms controlling stress response  
② Mechanisms of mitochondrial sensing and stress response  
③ Molecular mechanisms of cell motility |
| Pharmacology and Therapeutic Innovation | Hirosi UEDA (Professor) | ① LPA, the key molecule for chronic pain and drug discovery  
② Neuroprotection and drug discovery  
③ Therapeutic studies based on memory processes through epigenomics  
④ Therapeutic innovation against Infectious disease and radiation damage |
| Pharmaceutical Chemistry | Masakazu TANAKA (Professor) | ① Design and synthesis of non-proteinogenic amino acids and their use in pharmaceutical chemistry  
② Development of helical peptides as an asymmetric organocatalyst  
③ Design of cell-penetrating foldamers and their application to drug delivery system |
| Pharmacological Organic Chemistry | Osamu ONOMURA (Professor) | ① Development of highly selective organic reactions for synthesis of pharmaceuticals  
② Exploitation of reactions for efficient synthesis of unnatural amino acids  
③ Exploitation of methods for selective molecular transformation of poly-ols  
④ Development of environmentally friendly oxidation reactions for production of bulk chemicals |
| Synthetic Chemistry for Pharmaceuticals | Nobuhisa IWATA (Professor) | ① Analysis of Alzheimer’s disease pathogenesis and development of new therapeutic methods  
② Searching of biomarkers for early diagnosis of Alzheimer's disease  
③ Modeling Alzheimer's disease using iPS cells and their application to drug development  
④ Gene therapy for neurodegenerative diseases using a novel viral vector system |
| Natural Product Chemistry | Takashi TANAKA (Professor) | ① Isolation and structure elucidation of functional natural products  
② Study on structures and functions of plant polyphenols and its application to health food  
③ Dynamic chemistry of polyphenols in plants and biomimetic molecular conversion  
④ Chemical diversity of plant secondary metabolites |
| Medicinal Plant Biochemistry | Koji YAMADA (Associate Professor) | ① Research into the bioactive constituents of medicinal plants  
② Drug development research into the physiologically active component substances in marin invertebrates  
③ Drug development research into physiologically active component substances derived from marin bacteria |
| Structure Analysis for Chemicals | Toshihide MAKI (Associate Professor) | ① Research into design and functions of molecular probes for molecular structure analysis  
② Research into structure-activity relationship of bioactive compounds based on organic chemistry  
③ Exploitation of practical synthetic methodologies and their application for medicinal chemistry |
| Chemistry of Biofunctional Molecules | Morio NAKAYAMA (Professor) | ① Analysis of marine organisms as a source of trace essential metals  
② Clarification of selenium metabolic pathways within living organisms  
③ Development of nanosize particles with glutathione peroxidase-like activity  
④ Development and clinical application of new ⁶⁸Ge/⁶⁸Ga generator  
⑤ In vivo imaging of pathological elements resulting from amyloid deposition  
⑥ Development of molecular probes for early diagnosis of cancer |
| Hygienic Chemistry | Naotaka KURODA (Professor) | ① Development of rapid separation method for biologically active substances  
② Development of ultra sensitive analytical method for trace biologically active substances an pharmaceuticals  
③ Development of luminescence reagent and its application to biomedical analyses  
④ Study on the measurement of environmental pollutants and pollution assessments  
⑤ Development of a novel method for proteomic analysis |
| Analytical Chemistry | | | |

※ For latest information regarding areas of research, please see the Graduate School of Biomedical Sciences website (http://www.mdp.nagasaki-u.ac.jp)  
※ Note: Names in (brackets) are of professors due to retire at the end of March 2018