The road from Interface Oral Health Science at Tohoku University Graduate School of Dentistry to Oral Health Scientist and Oral Health Care Professional
Tohoku University Graduate School of Dentistry Commences the Next Generation of Dentistry, Dental Care and Oral Health

Dean, Tohoku University Graduate School of Dentistry
Keiichi Sasaki

The Graduate School of Dentistry’s mission is to train international leaders and highly specialized professionals of dentistry, dental care and oral health for the next generation, who have a research-oriented outlook and a scientific mind, by utilizing characteristic programs such as the Interface Oral Health Science program and the Master’s course (Japan’s first master’s course in dentistry). Here the education and research systems of various fields converge, utilizing the facilities of Tohoku University, one of the world’s leading comprehensive universities.

Seiryo-machi, where the campus is located, is famous as the home of Masamune Date, a Daimyo, or powerful local lord. At the foot of Kitayama Gozan Terrace in the north part of an old urban area in the city of Sendai is the temple of Oshu.

The Graduate School of Dentistry of Tohoku University, together with the School of Dentistry, the Graduate School/School of Medicine, the Institute of Development, Aging and Cancer, and Tohoku University Hospital, form one of the largest centers for medical/dental research, education and advanced medicine in Eastern Japan.

The Graduate School of Dentistry was established on the Seiryo Campus in 1972, seven years after the School of Dentistry opened. Since then, in accordance with the founding principles of Tohoku University—“to be research-oriented” “an open-door policy” and “emphasis on practical science”—the Graduate School of Dentistry has been involved in training dentists and researchers with a global perspective who will play a leading role in the broader field of dentistry, from basic research to clinical practice and oral health.

In 2000, in response to the educational policy of placing an increased emphasis on graduate schools, the Graduate School of Dentistry became an independent graduate school in Tohoku University and its new history began.

As a pioneer of independent graduate-level education across the country, the Graduate School of Dentistry has been involved in a wide variety of research and educational projects to fulfill these expectations.

The Seiryo Campus suffered severe damage from the Great East Japan Earthquake of March 11, 2011. However the education and research environment has been restored and the progress of reconstruction has been remarkable. The facilities are improving, and will soon be even better than before.

In 2002, we proposed a new concept to promote the reform of the existing dental research and education system, which we call “Interface Oral Health Science.” At present, we are conducting a number of studies based on the “interface” concept, in a convergence of various fields. These studies are being conducted in collaboration with other departments of the university and research facilities around Japan and overseas, and we have made remarkable progress.

In 2004, to expand the range of dental medicine and oral health, as well as to “open the door” to dental research and education, we established the Graduate School of Dentistry Master’s course, the only master’s course in dental medicine in Japan. Currently, people who have a wide range of disciplines and a variety of careers, such as dental assistants, medical assistants, engineers, nutritionists, health and welfare administrators, and medical personnel are studying in our Master’s program.

Also, significant progress has been attained in education and research with international cooperation with world-leading research schools, including Peking University and Sichuan University Tianjin Medical University, in China and Seoul University and the University of Chonnam in South Korea. We are investigating establishing standards of dental education in East Asia, and are currently organizing a double degree program in which students can receive academic degrees from two universities.

Dental education at the Graduate School of Dentistry is supported by scientific excellence and a global perspective, which have been developed through advanced research activities in accordance with our “research-oriented” policy. Furthermore, it has been developed into a clinical application as a “practical science.”

The Graduate School of Dentistry aims to train dentists and researchers with an inquiring mind and a scientific perspective who will play a central and leading role in dental research, education and practice, as well as medical administration. We are looking forward to welcoming competent, qualified and promising students to gather in Sendai, who are motivated to develop the next generation of dentistry and dental care under the rigorous school spirit of Tohoku University.
Tohoku University Graduate School of Dentistry

Interface Oral Health Science program and the Master's course (Japan's first master's course in specialized professionals of dentistry, dental care and oral health for the next generation, who have the Next Generation of Dentistry, who are motivated to develop the next generation of dentistry and dental care under the rigorous school spirit of Tohoku administration. We are looking forward to welcoming competent, qualified and promising students to gather in Sendai, program.

Assistants, engineers, nutritionists, health and welfare administrators, and medical personnel are studying in our Master's education, we established the Graduate School of Dentistry Master's course, the only master's course in dental medicine concept, in a convergence of various fields. These studies are being conducted in collaboration with other departments of School/School of Medicine, the Institute of Development, Aging and Cancer, and Tohoku University Hospital, form one.

At the foot of Kitayama Gozan Terrace in the north part of an old urban area in the city of Sendai is the temple of Oshu. Dental education at the Graduate School of Dentistry is supported by scientific excellence and a global perspective.

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Contents

1948
Dentist training by national institutions in Japan starts.

1946
Dentist National Examination begins.

1943
Fact that dental plaque causes tooth decay discovered in U.S.

1942
Medical practice test rules established and dental medicine becomes specialized field.

1941
First school of dental medicine in Japan, Tokyo College of Dental Medicine, established (closed the next year).

1940
Fauchard makes full maxillary dentures.

1723
Pierre Fauchard (known as the father of modern dental medicine) announces "Le Chirurgien Dentist".

1728
Tooth extraction conducted under general anesthesia using nitrous oxide.

1722
Production of dental equipment starts in Japan.

Oral surgery conducted using ether anesthesia in the U.S.

1844
Dental Practitioners Law instituted.

1811
Takayama publishes first dental technical book in Japan, "Hashishinron".

1883
American dentist Willoughby D. Miller announces "Miller's chemico-parasitic theory."

1881
First school of dental medicine in Japan, Tokyo College of Dental Medicine, established.

1893
Dental Practitioners Association established (in 1926, changes name to Dental Practitioners Law institution).

1902
Japan Association for Dental Science established.

1901
Dental Practitioners Law revised to restrict doctors from practicing dentistry.

1900
Takayama School of Dentistry established. (In 1900, changes name to Tokyo College of Dentists; in 1946, restructured into Tokyo Dental College.)

1888
First school of dental medicine in Japan, Tokyo College of Dental Medicine, established (closed the next year).

1891
Dental Practitioners Law revised to restrict doctors from practicing dentistry.

1890
Dental Practitioners Law instituted.

1911
Dental College established.

1916
Cavity Prevention Day instituted.

1928
Dental Practitioners Law revised to restrict doctors from practicing dentistry.

1946
Dental Education Council begun under the General Headquarters orders.

1947
Dentist training by national institutions in Japan starts.

1948
Dental Education Standards Draft passed.

History

1965
Tohoku University School of Dentistry established, advocating the philosophies of "Training dentists who can think," "One mouth is a unit," and "Holistic dentistry."

1967
Tohoku University Dental Hospital opens.

1972
Tohoku University Graduate School of Dentistry established.

1975
Dental Technicians School established.

1993
Prof. Emeritus Hajime Yamamoto awarded Japan Imperial Prize for "Research into applications related to prevention of tooth decay by laser irradiation."

2000
Tohoku University Graduate School of Dentistry, responding to the government's educational policy of emphasizing graduate schools by educating students with inquiring minds and scientific perspective who can be leaders in dental research.

2002
Interface Oral Health Science concept proposed by Tohoku University Graduate School of Dentistry.

2003
Organization of Tohoku University Dental Hospital and University Hospital.

2004
Graduate School of Dentistry establishes first Master’s course in dentistry in Japan. Graduate School of Dentistry starts conducting special education in oral science for people other than those in the medical and dental field.

2005
First International Symposium on Interface Oral Health Science held.

2007
Tohoku University Dental Hospital and Medical Center renamed, beds and operating rooms moved to new location.

2008
Implant outpatients accepted at Dental Medical Center of Tohoku University Hospital.

2009
Renovation of Lecture Building of Graduate School of Dentistry completed.

2010
Prof. Emeritus Shobu Hinuma awarded Order of Culture.

2011
Renovation of Clinical Research Building, Graduate School of Dentistry (floors 1-4) completed.
The Stomatognathic System
– Be an ‘Oral Scientist’ Rather Than a ‘Dentist’

According to the Dental Practitioners Act, dentists should take responsibility to support people so that they can lead a healthy life through dental care and oral health guidance, which will result in the improvement and promotion of public health. Therefore, the dentists’ social mission is not only to prevent oral-related diseases such as cavities and periodontal disease, but also to lead people towards a healthy lifestyle. Good oral health allows us to enjoy our meals and smile with confidence. In other words, the responsibility of the dentist is not only the treatment of oral diseases but also to ensure that people have a mouth that can “talk, smile with confidence and truly enjoy meals”, by promising better quality of life from the very young to the elderly. At Tohoku University School of Dentistry, we do not educate plain dentists but ‘Oral Scientists’.

What is Oral Science? Oral Science is part of Life-Science, which seeks to contribute to the people’s happiness and high standard of quality of life through a thorough understanding of the importance of oral health. The clinical segment includes an intense study of major oral diseases, namely: dental caries, gum disease, malocclusion, templomandibular joint disease, and also oral cancer, fracture injuries due to traffic accidents, congenital conditions such as cleft lip and palate, jaw deformities, and various diseases of the jaw and facial area around the mouth. These diseases impair the function of the oral cavity, jaw and facial area. In some cases these diseases may affect other parts of the body, or in some cases the whole body, and vice versa.


The living body ingests energy from the outside world in order to maintain life and movement. The stomatognathic system functions as the organ for this purpose. In addition, it has a social function of expressing emotion and feelings of pressure and discomfort. These functions of the stomatognathic system are controlled by the central nervous system via the peripheral sensory and motor nervous subsystems. Artificial manufactured parts used in the reconstruction of the stomatognathic system are harmonized with the living body and brought to “life.” Clinical dentistry is carried out based on these realities.

Therefore, in order to cultivate Oral Science, it is necessary to learn not only about the oral cavity, jaw and mouth area, but also the organization and functions of the human body. These include the various life phenomena which support the organization and function of the human body, and the origins of the disease. On the basis of a wide-ranging basic medical knowledge and techniques, providing dental care is required to master special and unique knowledge and techniques that Oral Science offers.
The kinds of stresses that occur at various interfaces between bone and implant, teeth during occlusion, and the oral environment present new problems when an implant is inserted. In these circumstances, how to control materials, stress, the living body and bacteria is the challenge. At Tohoku University Graduate School of Dentistry we call this concept “Interface Oral Health Science.” Interface oral health science requires collaboration with a variety of other disciplines. For instance, the stomatognathic (maxillofacial) system consists of organs close to the brain. How are the perception of pain from oral decay and sensations during occlusion sent to the brain? How do they affect the brain? To find out, it is necessary to research in cooperation with Brain Science.

The stomatognathic system is a place to masticate the food and send it on to the digestive organ. How is the stomatognathic system connected with the digestive organs? We collaborate with Gastroenterology to find out. When considering what kind of material is appropriate for making and processing dentures, we collaborate with Materials Science and Mechanical Engineering. To determine the affect of dental procedures on the living body, we must collaborate with Biosciences. Tohoku University’s School of Dentistry conducts scientific research in collaboration with various fields, such as brain science, medicine, materials science, engineering and bioscience based on “interface oral health science.” Students learn about the results of the studies like these and participate in actual scientific research projects at Tohoku University Graduate School of Dentistry.

In dental treatment, biomaterials are widely used as implant materials, including titanium and calcium phosphate-based materials which are used for bone regeneration. The Graduate School of Dentistry is committed to the development of various new biomaterials, in collaboration with, for example, the Institute for Materials Research, University of Tokyo. Furthermore, in order to increase the performance of interfaces between biomaterials and the living body, cooperative research has been conducted with Tohoku University Graduate School of Engineering and Graduate School of Biomedical Engineering. Also, biological tissue changes according to the force applied from the outside via biomaterials, and we are pursuing the controlling of such changes by interface functions.

Research has revealed a clear relationship between oral health and death due to pneumonia and stroke. The Tohoku University Graduate School of Dentistry, in collaboration with Nihon Fukushi University and others, conducted a large-scale cohort study targeting the elderly in the city of Iwanuma, Miyagi Prefecture. Analyzing 4,425 people followed for four years, the study showed that people with 19 or fewer teeth and who could not masticate well had a lower survival rate by major cause of death compared to people with 20 or more teeth.

The risk of death from cardiovascular disease was 83% higher, and the risk of respiratory disease mortality was 85% higher (J Dent Res 2011). The study suggested the risk of death from these diseases increases with the loss of teeth or not being able to masticate. It is possible to reduce the risk of death by these diseases by maintaining the health of the oral cavity. Other research we conducted showed that when the oral cavity is healthy, there is less of a chance for the individual to need long-term care (J Am Geriatr Soc 2012).
What is Interface Oral Health Science?
(Interface Oral Health Science, since 2002)
– Next-generation oral health science from
Tohoku University Graduate School of Dentistry –

The Birth of Interface Oral Health Science

The academic field that is acknowledged as dentistry (dental medicine) nowadays was mainly treatment theory. Etiology and basic dentistry were subdivided and far from systematized. In 2002, Tohoku University Graduate School of Dentistry proposed connecting the various areas of expertise, which were at that time subdivided, and systematizing them as Interface Oral Health Science.

The oral cavity consists of 1) oral tissue (teeth, mucosa, bone, muscles, etc. – the living body); 2) parasitic microorganisms that live in the oral cavity; and 3) biomaterials, as well as mechanical stress as represented by the occlusal force. These are the characteristics of the oral cavity.

Interface oral health science concerns itself with the places where the various systems interact. In other words, healthy oral function works where the interfaces harmonize biologically and biomechanically. In addition, the oral cavity is itself an interface, between the inner body and the outside world. It is understood that oral cavity related diseases, such as aspiration pneumonia and gastrointestinal tract infections, occur due to the collapse of the interfaces between systems.

From Oral Cavity Interface to Academic Interface
–and Society Interface

This concept not only covers the area of oral health science and dental science, it relates to a wide range of academic disciplines, including medicine, agriculture, materials science, pharmacology and so on. Practicing interface oral health science leads to further promotion of dental research and activation of interdisciplinary research in related areas.

In 2007, the “Highly-functional Interface Science: Innovation of Biomaterials with Highly-functional Interface to Host and Parasite” was approved by the Ministry of Education, Culture, Sports, Science and Technology, and we began collaborating with the Institute for Materials Research of Tohoku University and the Research Institute for Applied Mechanics of Kyushu University to conduct research and develop clinical applications.

This is the realization of the “Academic Interface,” which is a new academic system created by bringing together existing disciplines.

In addition, in order to achieve healthy oral function in local and international communities, it is essential to communicate with local and international communities interactively (two-way communication).

In other words, it is necessary to grasp the situation of the oral health of local residents, solve existing problems and get these solutions back to local communities. We also investigate the oral health situation overseas and bring home our findings, as well as cooperate with overseas research institutes and contribute to international society with Japanese dental science.

Tohoku University Graduate School of Dentistry sets up Regional Dental Health Promotion Office to enhance cooperation with local communities. Also, to strengthen cooperation with foreign research institutes, Tohoku University Graduate School of Dentistry has signed a partnership international academic school agreement with core schools in the United States (Harvard University), Canada (University of British Columbia), the United Kingdom (King’s College London), Sweden (Umea University), Finland (Oulu University), China (Peking University, Sichuan University, Tianjin Medical University), South Korea (University of Chonnam) and Oceania (University of Sydney, Australia).

They are playing an important role as “Regional and International Interfaces.”

Sending out ‘Interface Oral Health Science’ to the World

The concept of Interface Oral Health Science, is widely recognized in Japan and abroad as the next generation of dentistry and oral science.

In 2005, the International Symposium for Interface Oral Health Science: IS-IOHS was held in Sendai and many researchers gathered there from Japan and overseas. Its results were compiled and published as an English book and distributed around the world. Every 2 years since 2005, IS-IOHS has been held in Sendai, with publication of an English book about the new outcomes of IOHS.

In addition to Sendai, the Third (2009) and Fourth (2011) Tohoku-Harvard-Forsyth Symposia (Satellite symposia) were held in Boston in collaboration with the Harvard-Forsyth Research Institute. Interface Oral Health Science is spreading more and more.

Its foundation is in the characteristics of Tohoku University Graduate School of Dentistry – the uniqueness of dentistry and oral science and the desire to conduct unique research with universality to other academic disciplines; the passion of research educators and graduate students who gather at the place; and finally, the orientation toward international, interdisciplinary and fusion-oriented research.


You can take courses while you’re working

I have been working as a full-time dental hygienist at a city office in Shizuoka Prefecture. As I’m in charge of dental health operations, I have many opportunities to advise people on how to improve their diet and use fluoride for preventing cavities. However, I noticed that children who have many cavities have low awareness about cavity issues. I faced many difficulties in improving their situation just by giving health guidance. Under the circumstances, I started wondering if that was acceptable as a dental hygienist, a person in charge of the dental health operations of a city office.

One day, at a symposium, I had a chance to hear that the occurrence of dental caries is influenced by social factors such as economic conditions in society. It is almost as if the answer to the question that I had been wondering about was suddenly right in front of me, and I became very interested.

I’m currently researching the relationship between children’s caries and social factors in the area I’m in charge of. Taking a course while living in Shizuoka and having a job sometimes makes things difficult, especially the commuting. However, I use Skype and e-mail for consultations on the seminar I am taking and for research.

I am going to continue doing research in order to explore effective measures for improving dental health, by taking advantage of my position on the staff of the municipality.

Basic research connected to clinical practice is a lively program.

I first enrolled in the Faculty of Dentistry, University of Sao Paulo, in the state of Sao Paulo, Brazil. Since first year, I have been interested in research and often visited the Faculty of Pharmaceutical Sciences Laboratory of Physics & Science, biochemistry. After graduating from university, I visited Japan with support of the JICA as I have roots as a Japanese-Brazilian, and enrolled in the Tohoku University Department of Medical Science Master course (Institute of Development, Aging and Cancer, Department of Immunogenetic Control). I had opportunities to learn a variety of scientific methodologies and ways to study through meeting with researchers in a variety of fields.

For the Doctoral course, I considered the Graduate School of Medicine, but eventually decided on the School of Dentistry. The reason is that basic research work is active in addition to clinical research at this graduate school and I thought I could research the themes I really wanted to work on. One research theme is Porphyromonas gingivalis, and the bacteria component’s toll-like receptor system (TLR), which is one of the research themes regarding endodontic treatment of periodontal disease. By linking this research and the study of immunological component in periodontal tissue inflammation, I can do that research that I truly want to do.

I am very proud of having this opportunity to study in Tohoku University Graduate School of Dentistry.

I am very proud of having this opportunity to study in Tohoku University: the educational environment is very rewarding and creative for students, especially under the supervision of experienced faculty members and with the support of other students. Carrying out my clinical and academic duties satisfactorily in the University, I am sure that I will be able to be a confident Orthodontist.

Tohoku University has introduced numerous scientific researches to the field of Dentistry, particularly in my field of Orthodontics. Moreover, it has discovered many materials and techniques that enable orthodontic treatment with high quality and in reasonable treatment duration. Tohoku University has strong educational curriculum with strategy for personal education. Students are provided with front-line scientific information based on problem-oriented approach. For example; in weekly-held journal club sessions, we are kept update with newly published international articles with high impact factors. There is also laboratory and paper work that develop our clinical skills.

Training in the Tohoku University Hospital Dental Clinics is highly advanced: the clinics are supplied with high standard machines and instruments and are supervised by experienced staff members. Students treat many patients with different malocclusion and make all appliances by themselves, which allow them to be familiar with various technical treatments. In weekly-held clinical cases presentation meetings, students present their own cases and have discussions with faculty members regarding their treatment diagnosis and results based on problem-oriented approach and evidence-based dentistry.

I’m gaining clinical experience in addition to research – and my life is fulfilled.

I enrolled in the Doctoral course after I completed one year of clinical training at Tohoku University Hospital upon graduation from School of Dentistry, Tohoku University.

What made me think of continuing my research after the training was my experience in basic laboratory work. I experienced the satisfaction of research during the training in the lab and really enjoyed the experience when I was a 5th year undergraduate. I was hesitating to enroll in the Graduate School of Dentistry, as I wanted to learn clinical dentistry while I was an undergraduate; however, I learned that at the Graduate School of Dentistry you can gain clinical experience at the same time as doing research. Therefore, I decided to continue at the university. I’m working on basic research themes which are also related to clinical dentistry in graduate school.

Currently, I’m preparing a presentation for an upcoming international symposium with great support from the teachers. This is my first time to attend an international symposium, and I’m looking forward to meeting and communicating with various teachers besides the presentation. I expect to learn many things from this experience.

In clinical practice, there are many opportunities to learn dental medicine from various facilities such as university hospitals, dental practitioners and dental hospitals, as well as teachers. I’m very busy with research and clinical practice, but I feel that my life is fulfilled.

In the future, besides research and clinical practice, I want to take on various other challenges. I think graduate school is a place where you can reach your potential and gain valuable experience. I’m sure students have various reasons for studying at graduate schools at Tohoku University. I feel graduate school here is a place where you can gain valuable experiences and expand your abilities.
## Outline of Course

In response to the Japanese government’s national educational policy of increased emphasis on graduate schools, the Graduate School of Dentistry implemented graduate educational reform. Following the principle of “Integration of basic and clinical research,” what were previously the departments of Basic Dentistry and Clinical Dentistry were reorganized into the Graduate School of Dentistry, consisting of six major classes and cooperative classes. We also encourage the acceptance of foreign students from China, South Korea and other countries, as well as working students.

The new curriculum, in which one student studies under the guidance of multiple instructors, encourages students to begin research at an early stage of their doctoral course, acquire expertise and specialized knowledge, and develop an interdisciplinary outlook.

Students are required to take “Advanced theory of Dentistry” from the first year, and learn about the latest research from instructors who are from various specialized fields. Students acquire many different experimental techniques necessary for conducting research in the “Experiment Technique Training” course. “Special Training for Doctoral Thesis,” provided from the first to fourth year, helps students develop the skills necessary to write a doctoral thesis. In “Research Theme Selection Conference,” first year students present their research theme and plan, and have discussions with each other, developing their research skills in the early stages of their doctoral education. “Dental Seminars,” in which small groups of students work on recent research themes, are designed to help develop their sense of purpose and increase their motivation to conduct research.

To produce quality theses, assessments from many different viewpoints and from multiple instructors is essential. We recently introduced preliminary screening and other efforts in the thesis assessment process. As a result, in the past several years, not only has the number of academic dissertations submitted by students in this graduate school increased, but their quality as well has been highly evaluated. In recent years, a large number of young researchers who graduated from the Graduate School of Dentistry have received awards from academic societies for their research conducted at the school.

## Requirements for Completion

To complete the Doctoral course, students are required to be in the program for four years or more, and earn 30 credits or more from the following subjects: nine or more credits for Advanced Theory of Dentistry, six or more credits for Dental Seminars, six or more credits for the Experimental Technique Training course, and nine or more credits for Special Training for Doctoral Thesis. Students must also receive the necessary research guidance and submit a Doctoral thesis, then pass the evaluation and the final examination.

If a student who has outstanding research achievements is admitted, only three years’ enrollment is required. Students who are currently employed are permitted through examination to study for more than four years under the planned schedule, during a period to be decided by the School.

### Course List for Doctoral Course, Dentistry Curriculum (2012)

<table>
<thead>
<tr>
<th>Oral biology</th>
<th>Dental practice</th>
<th>Experimental technique training course</th>
<th>Doctoral Thesis Special Training</th>
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<tbody>
<tr>
<td>Oral Microbiology</td>
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<td>Oral Function and Morphology</td>
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<tr>
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<td>Oral Function and Morphology</td>
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The Master’s Course

Outline of Course

Dental medicine has been progressing rapidly in recent years, and a wide range of advanced knowledge and specialized skills are becoming necessary for dental hygienists, technicians and other dental professionals. Sophisticated dental equipment and materials are being developed to support advanced dental medicine, so it is essential to train researchers with the latest knowledge of dentistry and oral science who will promote research and development of such equipment.

Currently, there are increasing opportunities for people who are not highly educated in dentistry, including nurses, speech therapists, school nurses and health administration officials, to become involved as health care professionals in nursing care in dental and oral care science, oral health management, and health care education, public relations, and other activities to raise public awareness.

Tohoku University Graduate School of Dentistry established a new Master’s program to encourage these people to develop practical or research skills required in dental and oral professions or research fields, and provide a wider range of people with specialized research and educational programs.

The new Master’s course has allowed dental hygienists and technicians, nurses and other health care professionals, graduates in science and engineering, food and nutrition, and health and welfare to acquire extensive knowledge and advanced research skills in dentistry and oral science, and contribute to maintaining and promoting public health based on dentistry and oral science.

The new curriculum, designed to provide flexible programs according to students’ interests, consists of a wide range of basic and specialized subjects in dental and oral fields – Introduction to Dentistry, Medical and Dental Biomaterials, Medical/Dental Equipment, Food Science, International Dental Health, and Social Dentistry.

Requirements for Completion

To complete the Master’s course, students must be enrolled for two years or more, and earn 30 credits or more from the subjects below. Students must earn 18 credits from compulsory subjects and 12 credits or more from selected subjects (12 credits or more). They must also receive the necessary research guidance and submit a Master’s thesis, then pass the evaluation and the final examination. If a student is admitted who has outstanding research achievements, only one year’s enrollment is required. Students who are currently employed are permitted to study for more than two years, during the determined period.

Course List for Master’s Course (2012)

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<tr>
<th>Classification</th>
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<td>Special Training for Oral Cancer Care</td>
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What we study at the Graduate School of Dentistry

### Oral Biology

#### Oral Ecology and Biochemistry
**Professor:** Nobuhiro Takahashi

Continually moistened with saliva, the oral cavity is made of various soft and hard tissues, such as teeth, gingival and the tongue, and is the pathway of foods to enter the body. In addition, a tremendous number of microorganisms inhabit there in the form of oral biofilm (or dental plaque). The oral cavity forms an ecosystem where the host (humans) and parasites (microorganisms) cohabit. Disruptions of balance of this healthy oral ecosystem lead dental caries, oral malodor and periodontal diseases. Using leading-edge techniques of molecular biology, anaerobic experimental systems and the notion of “omics”, we conduct research on the role of oral biofilms in oral health and disease from an oral ecosystem viewpoint. In addition, we propel clinical research on caries-preventive effects of xylitol, fluoride etc. and on parasite-caused degradation of biomaterials. Recently, we have also started conducting research on the metabolism of cancer cells which exhibit a similarity to parasites.

**Main research themes**
- Genomics, proteomics, and metabolomics of oral biofilm
- Pathogenicity of dental caries-, oral malodor- and periodontal disease-associated microorganisms using anaerobic experimental systems
- Caries-preventive properties of xylitol and fluoride
- Evaluation of cariogenicity of food products using pH4-telemetry
- Interactions between oral biomaterials and parasites
- Metabolomics (sugar and amino acid metabolite analyses) of cancer tissue

#### Dental Pharmacology
**Professor:** Minoru Wakamori

In dental pharmacology, the major goal of our research programs is to elucidate the operating principles of the body to keep homeostasis on the molecular level by utilizing electrophysiological and molecular biology techniques. Specifically, we are interested in mechanisms to regulate intracellular Ca²⁺ concentration, and transduction mechanisms of oral sensations. By understanding the actuating mechanisms of various sensors in oral cavity, we can contribute to the discovery of the even safer dental treatment methods and to improvement of quality of life in our aging society. In addition, understanding functional mechanisms of biological sensors will eventually be of great benefit to mechanical engineering and electronic engineering fields.

**Main research themes**
- Functional Analysis of Ca²⁺-permeable Cation Channels
- Molecular and Neurobiological Studies of Taste, Pain and Touch Sensations

#### Oral Microbiology
**Professor:** Haruhiko Takada

In the past two decades, immunologists have been excited about the innate immune system, which paternally recognizes various common microbial structures. Cell-surface Toll-like receptors (TLR) recognize bacterial cell-surface components, while intracellular NOD1/2 recognize bacterial cell-wall peptidoglycan; NOD1 and NOD2 recognize desmuranmylpeptide and muramyldipeptide (MDP), respectively. With the aim of elucidating the pathogenesis of infectious diseases in oral mucosa, represented by periodontal diseases, we have investigated innate immune responses via TLRs and NOD1/2 in various cell cultures prepared from human periodontal tissues.

**Main research themes**
- Innate immunity in periodontal tissues and periodontal diseases
- Bacterial cell-wall peptidoglycans in relation to innate immunity
- Immunobiological activities of bacterial cellular components, especially those from oral bacteria
- Mechanisms of apoptosis induced by anti-tumor drugs in cancer cells

#### Periodontology and Endodontology
**Professor:** Hidetoshi Shimauchi

One of our projects is studying on the onset mechanism of periodontal disease (marginal and apical periodontitis), representative chronic inflammation in the oral cavity, in terms of the interaction between host cells and bacteria, and also we study on the regenerative mechanism of periodontal tissue. In addition, I perform the study to apply ME such as lasers for periodontics and endodontics.

**Main research themes**
- Analysis of the onset mechanism of marginal and apical periodontitis
- Analysis of the interaction between cells in the periodontium
- Analysis of the periodontal regenerative mechanism and application to the treatment
- Development of method for periodontal diagnosis using ME
- Development of periodontal regenerative therapy using new biomaterials

#### Oral Molecular Bioregulation
**Professor:** Shunji Sugawara

Interaction among oral mucosal cells, saliva and immune cells through immune regulatory factors and cell-to-cell contact is critical for mucosal defense, and dysfunction (disorder) of the interaction to onset of oral mucosal diseases. We investigate the underlying molecular mechanism to overcome these diseases.

**Main research themes**
- Host Defense and Diseases in the Oral Mucosa
- Inflammatory Mediators and Cytokines in Pathological Conditions
- Immune Regulation of Saliva and Diseases in the Salivary Glands
- Mechanism of Metal Allergy Development
- Regulation of Inflammation by Biotin

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Tohoku University Graduate School of Dentistry
Oral Function and Morphology

Oral and Craniofacial Anatomy

**Professor** Hiroyuki Ichikawa

Our division has research themes about the human anatomy, particularly focused on oral structures. The morphology of human and other mammalians is also compared. In addition, we are interested in motor, sensory, and autonomic systems of oral-facial regions. For this purpose, the distribution and function of neurotransmitters, neuropeptidergic systems and others substances is investigated in the central and peripheral nervous systems. Morphometric methods are used for these anatomical and microscopic studies.

**Main research themes**

- Comparative anatomy of the tooth in various mammalian species
- Congenital deficiency of the human tooth
- Anatomy of oro-facial regions
- Comparative morphometry of craniofacial regions
- Sensory innervation of oro-facial regions

Oral Physiology

**Professor** Minoru Wakamori

Oral physiology mainly concentrates on the research on biological processes in the oral and maxillofacial regions. We are in the field of fundamental studies that establishes basic theories from our understanding of physiological functions, such as gustatory, oral sensation including gustatory sensation, functions of saliva and vocalization. Presently, many still unanswered questions exist in regards to the oral and maxillofacial region's connection to overall bodily functions, including higher brain functions. In the department of oral physiology we focus on individual organism and cell level research that investigate these questions by using electrophysiological and molecular biological techniques.

**Main research themes**

- Neurophysiological analysis of information-processing mechanisms in cortical somatosensory system
- Analysis of receptor mechanisms through mechanical stress in the periodontal tissues and its control by gene transfer
- Analysis of differentiation and regeneration inducing signal reception and its transmission mechanism in neurons and osteoblasts

Advanced Prosthetic Dentistry

**Professor** Keiichi Sasaki

Focus of research and education of our division is on reconstruction of morphology and function of the patients with partial edentulism or maxillofacial defects. In addition to developing the conventional prosthodontic modalities such as removable and fixed dentures, we aim to create novel prosthodontics utilizing the dental implant, tooth transplantation, and tissue regeneration, and to clarify the biomechanical and mechanobiological interactions at the interface between prosthese consisting with biomaterials and living tissues, which is essential for the success of prosthodontics.

**Main research themes**

- Biomechanics based upon in vivo measurements of mechanical features relating to removable partial denture prosthetics and implant prosthothodontics
- Molecular imaging study with nuclear medicine on bone remodeling related to removable partial denture prosthodontics and implant prosthothodontics
- Study on transplantation and regeneration for edentulous prosthodontics and maxillofacial prosthetics
- Development and translational researches of novel biomaterials and functional interface between biomaterials and living tissues
- Study on Long-term clinical results of removable partial dentures and implant prosthothodontics

Aging and Geriatric Dentistry

**Professor** Masahiko Kikuchi

Through biomechanical, morphometrical, physiological, and biochemical studies on stomatognathic functions and their regulations, we work on finding effective intervention measures for the elderly with serious impairment of oral functions. We also pursue the interaction between oral and systemic health, and work on establishing oral health promotion measure which leads independent lives of the elderly.

**Main research themes**

- Studies on forces force generation strategies of the stomatognathic system
- Electrophysiological, nuclear-medical, or kinematical studies on oral functional motion including mastication and deglutition
- Behavioral and biochemical studies on the interaction between stress and stomatognathic functions and dysfunctions
- Large-scale cohort studies on the causal relationship of oral and systemic health
- Studies on the rehabilitation of oral functions

Comprehensive Dental Care Unit

**Professor** Masahiko Kikuchi

The department of comprehensive dentistry aims to develop superior primary care in general dentistry and also practices the management of clinical training program for post graduate residents. Furthermore, following basic and clinical research projects are conducted with the graduate students of this department.

**Main research themes**

- Periodontal regeneration using periodontal ligament cells
- Relationship between dental diseases and systemic illness
- Circadian rhythm of dental pain
- Oral hygiene and oral microorganisms in the elderly
- Development of effective treatment methods in primary care
What we study at the Graduate School of Dentistry

**Restorative Dentistry**

**Dental Biomaterials**

*Professor* Osamu Suzuki (collateral office)

Dental and medical restorative materials are studied under developments of dental alloys, magnetic materials and devices, new implant materials, and machining and forming methods. Furthermore, degradation and safety of the dental restoration materials are required.

**Main research themes**

- New titanium alloys for dental appliances
- New free-cutting dental materials suitable for dental CAD/CAM systems
- Magnetic materials and devices for dental applications
- Influence of a static magnetic field on hard and soft tissues
- Analysis of ions released from dental materials
- Degradation and safety of dental materials in an oral cavity
- Mild antimicrobial or bacteriostatic titanium alloys
- Next-generation dental apparatus

**Operative Dentistry**

*Professor* Hidetoshi Shimauchi

We work mainly on research of the following topics from a clinical perspective: physical properties of composite resins used in restoration for diseases of the hard tissues such as the dental carries; measurement of adhesive strength of dental restorative materials; observation of adhesion/joining conditions by electron microscope; long-term clinical performance of oral restorative materials using the replica method; conformity precision with respect to castability of titanium restorative materials and dentin; and strengthening of the physical properties of porcelain inlays.

In addition to those research topics, we also are making advancements in the following research: structure of periodontal ligament; construction of periodontal fiber with respect to functionality and implant bodies; metal buoys for dental metal allergies that have increased in recent years; identification of metallic element allergens by patch test; re-restoration treatment with materials not containing allergic materials; and dental application of the disinfecting action of functional water formed through the electrolysis of water. This research we are working on is clinically quite useful.

**Fixed Prosthodontics**

*Professor* Keiichi Sasaki

Basic and clinical study on accuracy, strength and esthetics of fixed prosthetics made from various kinds of biomaterials (metal, dental porcelain and plastics material).

**Main research themes**

- Study on the quantitative assessment of the teeth prepared by dental students.
- Study on indirect technique
- Study on organic dental materials and inorganic dental materials (impression materials, indirect resin composite, dental porcelain, dental cement and composite materials)
- Study on fabricating procedures applying CAD/CAM systems
- Study on preparation of TiO2 coating on dental metal materials
- Study on esthetic dentistry
- Study on clinical course of prothetic restorations and implants.
- Development and research of dental remedy applying an effective disinfection system via hydroxyl radical formation by photo energy
Preventive Dentistry

**Professor** Takeyoshi Koseki

The Division of Preventive Dentistry aims to prevent all oral disorders and to promote and maintain oral health and its full function. In the trend of rediscovering the importance of preventive dentistry, our researches focus on the effective measures of preventing oral diseases and the strategies of health promotion involving the individual QOL throughout their entire lifetime.

**Main research themes**
- Estimation of progression and future risk of dental caries
- Accurate evaluation of early lesion of dental caries by using ultrasonic devices
- Risk assessment of enamel surfaces by using laser technology
- Risk assessment of periodontal diseases
- Analysis of microbiological risk factors of dental plaque
- Development of effective protocol of periodontal supportive therapy
- Oral malodor research
  - Microbiological study of source of malodor

2) Development of portable measuring system of oral malodor
3) Psychological approach of treatment of oral malodor
- Application of fluoride for caries prevention
1) Promotion of fluoride application in public measure of caries prevention
- Field research of community oral health
1) Development of educational dental health checkup with health promotion
2) Monitoring the prevalence and incidence rate of oral diseases

Pediatric Dentistry

**Professor** Satoshi Fukumoto

Our division promotes clinical, basic and epidemiological research for tooth development, tooth trauma, mucosal disease to create healthy oral environment in children.

**Main research themes**
- Identification of novel gene involved in tooth development
- Study of enamel formation
- Analysis of gene associated with oral disease
- Regeneration of tooth and salivary gland using tissue engineering
- Development of stem cell research associated with syndromes
- Evaluation of new materials for prevention of dental caries

Orthodontics and Dentofacial Orthopedics

**Professor** Teruko Takano-Yamamoto

One of the clinical dental department that focus on a research related to the diagnosis and treatment of abnormal morphological and functional occlusion. Our aim is to develop a new diagnosis and treatment methods and to elucidate craniofacial growth mechanics, by various clinical and basic scientific research.

We also offer a 3-year postgraduate orthodontic clinical training program with addition to the MD course. Our department is accredited by the Japanese Orthodontic Society as a training institute for orthodontic specialists.

**Main research themes**
1. Clinical research
   - The use of miniscrew as an orthodontic anchorage
   - The use of functional evaluation (gastrichirography) in orthodontic treatment
   - Relationship between Sleep Apnea Syndrome and orthodontics
   - The use of various occlusal indices in quantitatively evaluating the quality and severity of the pre- and post malocclusion in orthodontic treatment

2. Basic research
   - Experimental tooth movement and bone remodeling
   - Biological mechanism of tooth movement
   - Biological mechanism of mechanical response in chondrocytes and osteocytes
   - Biological mechanism of craniofacial development
   - Biomechanical study of development, growth and aging of TMJ
   - Histomorphometric study of bone-implant interface
   - The role of pain during experimental tooth movement

Oral Dysfunction Science

**Professor** Kaoru Igarashi

Oral Dysfunction Science is a clinical dentistry field specializing in research on the normal morphology, function, and development of the stomatognathic system, problems caused by abnormalities, and their treatment.

**Main research themes**
- Research on the function of tooth matrix proteins
- Research on efficient tooth movement
- Research on the diagnosis and treatment of malocclusional congenital anomalies, such as cleft lip and palate (CLP)

Community and International Health

**Professor** Ken Osaka

We have carried out research on the influence that the social capital, or bonds to humans and society have on dental health. We have shown socioeconomic status has an impact on the number of remaining teeth in a cohort study. We have also established the number of remaining teeth has associated with the tendency of becoming nursing care dependent and pneumonia deaths. We are working on education of young students in international support for developing countries, as well as analyzing the oral health condition and health inequalities in Japan and deepening our understanding of the dental care system, long term care insurance system for the elderly and dental public health.

**Main research themes**
- Associations of dental status and society
- The Dental Care System and Health Gap
- Constructions of a Project for Effective Prevention of the Need for Nursing Care
- Infectious Disease Countermeasures and Risk Management for Nursing Care Facilities

Tohoku University Graduate School of Dentistry
What we study at the Graduate School of Dentistry

**Oral Medicine and Surgery**

**Oral Pathology**

Professor Hiroyuki Kumamoto

To clarify the etiology, pathogenesis, pathophysiology, and outcome of various lesions occurring in the oral and maxillofacial region, basic macroscopic and microscopic observations as well as further analyses are performed. Our division research fields are as follows.

**Main research themes**

- Molecular pathology of lesions of the jaws
- Clinico-pathological and genetic studies of developmental abnormalities of the teeth
- Clinico-pathological and immunohistochemical studies of the oral immune diseases and cancer
- Investigation on regeneration of the oral and maxillofacial tissues and application of biomaterials

**Oral Diagnosis**

Professor Takashi Sasano

Oral diagnosis should be defined as a systematic process of identifying oral diseases. To obtain an accurate diagnosis that decides proper and rationale treatment planning, our research is focusing on the relation between oral and systemic diseases, and diagnostic imaging of maxillofacial lesions. We are also interested in clinical research of taste disorder, dry mouth and pain based on physiological evidence, and we treat these diseases.

**Main research themes**

1. Clinical study on the relation between oral symptoms and systemic diseases
2. Diagnostic imaging of maxillofacial lesions
3. Clinical research of taste disorder, dry mouth and pain based on physiological evidence
4. Interactions between pain and blood flow

**Oral and Maxillofacial Surgery**

Professor Tetsu Takahashi

In our division, we cover the diseases of congenital deformities, jaw deformities, benign and malignant tumors, and trauma in oral and maxillofacial area. Our research topics focus on the control and reconstruction of those diseases.

**Main research themes**

- Research on morphological and functional reconstruction in the oral and maxillofacial area.
- Research on bone augmentation using distraction osteogenesis and peristaltic expansion
- Research on various augmentation method for implant placement
- Research on dento-alveolar reconstruction in patients with cleft lip and/or palate
- Research on pathophysiology of temporomandibular joint disorders
- Research on treatment modalities for facial trauma
- Basic and Clinical research on bone substitute
- Research on control of growth and invasion, and surgical reconstruction of oral tumors.
- Development of bone substitute with bone forming property
- Development of dental implants with bone forming property
- Diagnosis and Surgical simulation in patients with jaw deformities using 3D CT/photo
- Dento-alveolar reconstruction using Tissue Engineering

**Dento-oral Anesthesiology**

Professor Eiji Masaki

The purpose of research activity in our division is focused on removal of any hardship in patients undergoing surgery and dental procedure. Control of pain, avoidance of medical complications, and offering comfortable environment for treatment are included in this purpose. The results of our study could reduce cost of medical treatment as well as improve quality of life of patients.

**Main research themes**

- Clarification of pain regulatory systems in the spinal cord
- Development of new therapeutic modalities for intractable pain including postoperative pain
- Development of new therapeutic approaches for bronchial-spasm and asthma
- Investigation into lung epithelium with regard to therapies of COPD
Craniofacial Engineering and Regeneration

Craniofacial Development and Regeneration

**Professor** Yassuyuki Sasano

We have been investigating development, regeneration and healing of bones and teeth using rat experimental models. In particular, we are interested in regulatory mechanisms of extracellular matrices on cell and tissue differentiation in the calcified tissues.

**Main research themes**

- Regulatory mechanisms of extracellular matrices on differentiation of osteoblasts, chondrocytes, cementoblasts and odontoblasts.
- Remodeling of extracellular matrices in the calcified tissues during development, regeneration and healing.
- Differentiation and maturation of cells and extracellular matrices in the calcified tissue during development, regeneration and healing.
- Regulatory mechanisms of calcification.

Craniofacial Function Engineering (CFE)

**Professor** Osamu Suzuki

We are focusing on the fundamental science and the applied research of tissue engineering with the biomaterial science and biology to investigate about regeneration of various bone defects in the fields of dentistry, oral surgery, and an orthopedic surgery. Especially, we are developing new functional biomaterials and new devices based on biomimetics.

**Main research themes**

- Bone regeneration using the synthetic octacalcium phosphate (OCP), which is originally developed in our laboratory and becoming clear to be replaced to hydroxyapatite (HA) spontaneously when implanted in vivo.
- Device development of the controlled release of the growth factors which reproduce bone and periodontal tissues.
- Surface designing of the metal implants using calcium phosphates to increase bone regeneration capability and mechanical adaptability.
- Elucidation of biomineralization and its application to bone regeneration using synthetic or natural polymer carriers.
- Development of the drug and the gene delivery methods utilizing the synthetic calcium phosphates and translational research into bone regeneration field.
- Micro-nano manipulation technology in cell culture and examination using tissue engineering methods.
- Development of the methods to evaluate bone quality of the regenerated bone tissue.

Liaison Center for Innovative Dentistry

**Center director** Keiichi Sasaki

In the dentistry of a new century, the pioneering researches should be done by mutual collaboration with the researchers of other fields, and the contributions both inside and outside of the country are demanded. The Liaison Center for Innovative Dentistry promotes advanced dental research, interdisciplinary integration research, and industry/academic/government collaboration, and coordinates these research activities in the dentistry of a new century for realization of contributions within both regional and international society through educations, researches and clinics.

**Main project contents**

- Promotion of international interdisciplinary integration researches regarding interface oral health science (Integration Research Section).
- Research and development for the new medical devices and biomaterials to realize healthy society of longevity (Integration Research Section).
- Research and education related to reconstruction after earthquakes, disaster prevention, and rehabilitation of Japan (Integration Research Section).
- Development and management of the curriculum for international cooperative education (International Cooperation Section).
- Development and operation of regional cooperative education, clinical supports, and social contribution programs (Regional Cooperation Section).
- Research of social capital within regional and international society (International Cooperation Section, Regional Cooperation Section).

Molecular Pathogenesis of Oral Tumor

**Professor** Shinri Tamura

We are investigating the mechanisms of regulation of intracellular signaling pathways involved in inflammation, cell survival and death and bone remodeling in oral cavity. We are especially focusing on the studies of stress-activated protein kinase (SAPK) signaling pathways.

**Main research themes**

- Mechanism of regulation of SAPK signaling pathways by protein phosphatase 2C (PP2C).
- Mechanism and significance of activation of SAPK pathways in mechanical stress-loaded osteoblasts.
Intractable Diseases and Immunology

**Main research themes**
- Autoimmune diseases
- Immune surveillance
- Metal allergy
- Viral immunity

**Professor** Koetsu Ogasawara

Refactory systemic diseases often show initial lesions in the mouth. However, the relationship between intractable diseases and the onset of lesions in the oral cavity is not well understood. In our laboratory, we examine the immune responses related to oral diseases, to elucidate the pathogenesis of intractable diseases. Since metal allergy is an intractable disease, we will address to research the latest from the immunological point of view.

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Advanced Biomaterials

**Advanced Biocompatible Materials**

**Professor** Takashi Goto

This laboratory is engaged to create novel bio-integrated materials and hybrid artificial tissues for hard tissue regeneration by developing physical/chemical surface modification processing.

**Main research themes**
- Development of high strength, ductility and water-holding bio-integrated materials
- Development of surface modification processing to improve tissue cell adhesion with titan and hydroxyapatite
- Development of high cell adhesion, water/heat-holding and machinable hybrid artificial tissues

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Advanced Biofunctional Materials

**Professor** Mitsuo Niinomi

Our department conducts research on the development of biomaterials with functionality similar to body tissues and promotes and activates gain-of-function of regenerated tissue.

**Main research themes**
- Development of biofunctional materials such as dental implants and artificial bones harmonized with biofunction
- Development of biofunctional materials with mechanical and biological properties as well or better than those of body tissues
- Development of high functional materials supporting the biofunction lost by disease

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Bio-Dental Engineering

**Bio-Dental Engineering**

**Professor** Shinji Kamakura

Teeth are worked enough when the root of a tooth is surrounded by intact bone tissue. If the bone around the teeth were broken by suffering oral and dental diseases, such as periodontal diseases, congenital anomalies, and jaw tumors, several problems including masticatory disturbance would be evoked. The division aims to regenerate bone that was lost by oral and dental diseases with applying biomaterials, and recover the functional disturbances. Furthermore, the division has managed both basic and applied research with considering a low-burden treatment for patients.

**Main research themes**
- Bone regeneration by octacalcium collagen composite
- Establishment of a new animal model for bone regeneration
- Research for quantification of regenerated bone tissue

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Clinical trial of octacalcium collagen composite
Redox Regulation

Laboratory for Redox Regulation

**Professor** Yoshimi Niwano

To elucidate in vivo behavior of reactive oxygen species (ROS) and free radicals accompanied by electron transfer in molecules that constitute living organisms such as lipid membranes, enzymes, and nucleic acids is an important subject in life science. In addition, control technology of ROS and free radicals is one of the important subjects in the medical field. In our laboratory, a wide range of researches covering not only the medical field but the engineering field are conducted by applying control and analysis techniques for redox reactions.

**Main research theme**

- Basic and translational researches on laser-excited radical disinfection technology

Next generation Dental Materials Research

Next generation Dental Materials Research

**Professor** Keiichi Sasaki

In our research of dental equipment and materials, our aim is to deliver a healthy society for our ageing population by ensuring that diverse innovative new technologies that lead the way in the reform of clinical practice are promptly applied in the field of dentistry and used in clinical applications. We will analyze the basic technical properties of dental equipment and materials for reconstruction of lost teeth and bone tissue, and we will study the design, processing, and biological safety of materials including their ability to function as intermediate materials. We will also develop mandatory test methods to ascertain the long-term durability of the materials themselves in the oral environment so that they can continue to function and maintain their shape when used in vivo.

**Main research theme**

- Research of materials for dentures and dental restorative materials that can contribute to oral health care, and an evaluation of their technical characteristics

Immune Regulation and Oral Immunity

Immune Regulation and Oral Immunity

**Affiliate Professor** Satoshi Takaki

The oral mucosa is a front line of host defense system against microbes and hazardous antigens. It also becomes targets of inflammation caused by autoimmune or allergic responses. Immune regulation of oral immunity is critical issue to control infections and keep Quality of Life (QOL) of disease patients. We are investigating 1) Signal transduction and regulation by microenvironments operating in the host defense system, 2) Mechanisms for the production of auto-antibodies involved in the disease development and maintenance of autoimmune disorders including Sjogren syndrome, 3) Regulations for the maintenance and expansion of tissue stem cells, to manipulate and regulate immune responses in oral mucosa.

**Main research themes**

- Signal transduction and regulation in humoral immune responses
- Development of methods for manipulating or reconstituting the immune system

Geriatric Oral Science

Geriatric Oral Science

**Affiliate Professor** Kenji Matsushita

Japan has the highest longevity in the world. Maintaining the quality of life (QOL) of elderly is important for each individual and society. Our department conducts research on the molecular and cellular biology of bone and joint diseases (including alveolar bone and the temporomandibular joint) that lower the QOL of the elderly, and basic and clinical research on caries and periodontal disease causing tooth loss from the viewpoint of vascular biology and bone metabolism.

**Main research themes**

- The role and application of nitric oxide in the periodontal tissue
- Diagnosis and control of the periodontitis
- Exploratory research of the aging and disease related biomolecule by Omics analysis
Entrance Examination Guide, Graduate School of Dentistry

Selection procedures

<table>
<thead>
<tr>
<th></th>
<th>General screening</th>
<th>Special screening for working students</th>
<th>Special screening for foreign exchange students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s course</td>
<td>Evaluation based on: Score on written examination (English and short essay), interview and transcript</td>
<td>Evaluation based on: Score on written examination (short essay), interview, transcript and statement of motives for applying</td>
<td>Evaluation based on: Score on written examination (short essay) and transcript</td>
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<tr>
<td>Doctoral course</td>
<td>Evaluation based on: Score on written examination (English, specialized subject), interview and transcript</td>
<td>Evaluation based on: Score on interview, transcript and statement of motives for applying</td>
<td>Evaluation based on: Score on written examination (specialized subject) and transcript</td>
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Examination schedule

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<tr>
<th>Fiscal 2012 (October entrance)</th>
<th>Period of application</th>
<th>Examination date</th>
<th>Announcement date of screening results</th>
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<tbody>
<tr>
<td>First semester</td>
<td>June 25-29, 2012 (Mon.-Fri.)</td>
<td>July 12, 2012 (Thurs.)</td>
<td>Aug. 2, 2012 (Thurs.) 10:00 am (Planned)</td>
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<td>Second semester</td>
<td>Nov. 26-30, 2012 (Mon.-Fri.)</td>
<td>Dec. 17, 2012 (Mon.)</td>
<td>Jan. 17, 2013 (Thurs.) 10:00 am (Planned)</td>
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</table>

Fiscal 2013

<table>
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<tr>
<th>Curriculum* Year of enrollment</th>
<th>Tohoku University graduates</th>
<th>Other university graduates</th>
<th>Foreign exchange student special screening</th>
<th>Total</th>
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<tr>
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<td>2010</td>
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*Curriculum

**Year of enrollment**
Admissions, Graduate School of Dentistry

Mandatory fees

Admission fee: ¥282,000  
Tuition (first half-year): ¥267,900 (annual amount: ¥535,800)

These amounts are subject to change, and if the entrance fee or tuition fee is revised at the time of entrance or during enrollment, the new amount will be applied at the time of the change.

1 Admission fee and tuition exemption

When a student has extreme difficulty in paying the admission fee or tuition because of financial reasons, and the student is recognized as excellent, upon the student’s request, the admission fee or half or all of tuition may be exempted. For more details, please refer to the Admission Procedures Information Sheet.

2 Japan Student Services Organization Scholarship

The Japan Student Services Organization Scholarship provides scholarships to excellent students who have financial difficulties in paying school fees. The amount provided per month (for new students in 2012) is the Daichi Shogakukin/No.1 Scholarship (interest-free): ¥88,000 for the Master’s course and ¥122,000 for the Doctor course.

The Daini Shogakukin/No.2 scholarship (interest-free): choice of ¥50,000, ¥80,000, ¥100,000, ¥130,000 and ¥150,000. It is possible to combine both No. 1 and No. 2 scholarships. Students who display excellent performance have a chance to receive the First Repayment Exemption Scholarship. Besides the Japan Student Services Organization Scholarship, there are scholarships given by private foundations and local governments.

Japan Society for the Promotion of Science Fund

A Special Researcher Program is available for excellent students, supported by the Japan Society for the Promotion of Science. At the beginning of the course, to help people concentrate on life as a researcher and to choose a field and place of research with a free, unencumbered mind, grants of ¥200,000 for students in the Doctoral Course and ¥364,000 for students who complete the Doctoral Course (post-doc) will be granted.
Transportation from JR Sendai station

By Sendai city bus:
From JR Sendai Station West Exit bus stop, take the bus bound for Sakuragaoka 7-channe via Yamate-machi, get off at Shigaku-bu • Tohokukai-byoin-mae (Dentistry • in front of Tohokukai Hospital)

From JR Sendai Station West Exit bus stop, take the bus bound for Kitanakayama • Nishi-nakayama via Kitayama Tunnel • Nakayama Bound for Sumiyoshi-dai • Nanoshiroishi-dai • Shigaku-bu, get off at Shigaku-bu • Tohokukai-byoin-mae (Dentistry • in front of Tohokukai Hospital)

From JR Sendai station West Exit bus stop, take the bus bound for Sihei-machi — Kitayama-Junkan (circle) via Aoba Dori, get off at Shigaku-bu • Tohokukai-byoin-mae (Dentistry • in front of Tohokukai Hospital)

By subway:
Get off at Kita Yoban-cho station, North No. 2 Exit and walk toward Hachimarimachi for 10 minutes.

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Graduate School of Dentistry

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