TOHOKU UNIVERSITY
GRADUATE SCHOOL
OF DENTISTRY

2020

The road from Interface Oral Health Science
at Tohoku University Graduate
School of Dentistry to Oral Health Scientist
and Oral Health Care Professional

Master’s Course    Doctoral Course
Greetings from the Dean

Tohoku University
Graduate School of Dentistry
Leads the Next Generation of Dentistry, Dental Care and Oral Health

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, the Master’s course (Japan’s first master’s course in dentistry) and the East Asia Double Degree Program (Japan’s first DD 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.

The Graduate School of Dentistry, together with the School of Dentistry, the Graduate School/School of Medicine, the Institute of Development, Aging and Cancer, and Tohoku University Hospital are located in Seiryo-machi, at the foot of Kitayama Gozan, famous temples related to the powerful local lord in Oshu, Masamune Date, in the north part of an old urban area in the city of Sendai. They 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.

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.

Since 2012, significant progress has been attained in education and research with international cooperation with worldleading dental schools, including Peking University and Sichuan University Tianjin Medical University, in China and Seoul National University and the Chonnam National University in Korea. We are investigating establishing standards of dental education in East Asia, and are organizing a double degree program in which students can receive academic degrees from two universities. We are currently expanding this program to Southeast Asia, including Thailand, India and Indonesia, to seek Asia standards of dental education.

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.

Keiichi Sasaki
Director,
Tohoku University
Graduate School of Dentistry
Dean,
Tohoku University
School of Dentistry
Greetings from the Dean

Tohoku University, one of the world’s leading comprehensive universities, is distinguished by its facilities, including the first degree course in dentistry in Japan. The education and research systems of various fields converge, utilizing characteristic programs such as the Interface Oral Health Science program which have been developed through advanced research activities in accordance with our “research-oriented” policy. Dentistry aims to train dentists and researchers with an inquiring mind and a scientific perspective who will play a role in the regional development of the north of Japan. Tohoku University’s Graduate School of Dentistry was established on the Seiryo Campus in 1946, and in 2002, we proposed a new concept to promote the reform of the existing dental research and education system. In 2003, we established 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. We are currently expanding this program to Southeast Asia, including Thailand, India, and Indonesia, to seek Asia’s standards of dental education.

We are looking forward to welcoming competent, qualified and promising students to gather in Sendai, who will contribute to Southeast Asia, including Thailand, India, and Indonesia. In 2015, the medical dental center outpatient clinic was transferred and integrated as dental department of Tohoku University Hospital. The Graduate School of Dentistry has been involved in a wide variety of research and educational projects, including the establishment of 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.

Dental education at the Graduate School of Dentistry is supported by scientific excellence and a global perspective, with other departments of the university and research facilities around Japan and overseas, and we have made a strong commitment to the advancement of dental and medical research. Tohoku University and its new history began. As a pioneer of independent graduate-level education across the globe, we are committed to providing a high-quality education that prepares our students for leadership in the field of dentistry.

Tohoku University Graduate School of Dentistry School of Dentistry

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What is Interface Oral Health Science?

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.

What is Interface Oral Health Science?

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 areas.

In 2007, the “Highly-functional Interface Science: Innovation of Biomaterials with Highly-functional Interface to Host and Parasite” program was approved by Japan’s Ministry of Education, Culture, Sports, Science and Technology, and we began collaborating with Tohoku University’s Institute for Materials Research and Kyushu University’s Research Institute for Applied Mechanics to conduct research and development on new biomaterials and develop clinical applications aimed at interface control. As a successor project, moreover, “Creation of a Biological and Non-Biological Intelligent Interface” was launched in 2012. These are the realization of the “Academic Interface” that aims to link existing academic fields and create a new academic discipline.

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 gain an understanding of the status of the oral health of local residents, solve existing problems, and return these solutions to local communities.

From Oral Cavity Interface to Academic Interface – and Society Interface

We also must investigate the oral health status overseas and provide what is needed, as well as cooperate with overseas research institutes and contribute to the general good by returning the outcomes of Japanese dental research to the international community.

We have set up a Liaison Center for Innovative Dentistry in 2011 to enhance cooperation with local communities and foreign research institutes; it has concluded international academic partnerships with core schools in the United States (Harvard University), Canada (the University of British Columbia), the United Kingdom (King’s College London), Sweden (Umeå University, University of Gothenburg), Finland (Oulu University), Asia (Peking University, Shanghai Jiao Tong University, Tianjin Medical University, Dalian Stomatological Hospital, Fujian Medical University, The University of Hong Kong, Sun Yat-sen University, Wuhan University in China; Seoul National University, Chonnam National University, Yonsei University in Korea; National Taiwan University, National Yang Ming University, Taipei Medical University in Taiwan; Chulalongkorn University, Prince of Songkla University, Khon Kaen University in Thailand; Airlangga University in Indonesia; V.S. Dental College in India; Mongolian National University of Medical Sciences in Mongolia) and Oceania (University of Sydney in Australia). The Liaison Center is playing an important role as “Regional and International Interfaces.”

Sending out ‘Interface Oral Health Science’ to the World

At present, 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. 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, satellite symposia were held at the Harvard-Forsyth Institute in the United States, Peking University in China, Seoul National University in Korea and University of Sydney in Australia. Interface Oral Health Science is spreading more and more. (In 2019, the 8th International Symposium was held in Fuzhou, China, and realized the overseas development of Interface Oral Health Science.) 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.
We have launched a multi-modal dentistry innovation program. This is a graduate school educational project aimed at establishing a setup for accepting overseas students, focusing on the Joint Graduate School Education system through collaboration with some of Asia’s core universities. Another of its goals is to construct an “Asian standard” through dentistry innovations with “global knowledge” and “integrated knowledge” as the keywords and to enhance the level of dentistry and dental treatment in Japan and Asia.

Specifically, we will step up educational and research collaborations by focusing on developing and implementing the Double-Degree Program (DD Program) with influential dentistry graduate school in China and South Korea. Under this program, a graduate student will be registered at two university graduate schools, receive education from the school of both universities, and earn academic degrees from both universities if he or she meets the requirements. By means of this setup, we aim to establish dentistry and dental treatment based on a foundation common to all of Asia (the “Asian standard”), and realize dental innovation.

While still enrolled in graduate school, participants in the DD Program study abroad at the partner university for a set period of time, and carry out joint research. An agreement has been made with several universities, including Peking University and Sichuan University and Tianjin Medical University in China, and Seoul National University and Chonnam National University in South Korea. These schools have already begun accepting graduate students from abroad.

Research has revealed a clear relationship between oral health and death due to pneumonia and stroke.

The Living Body–Creation of Non-biological Intelligent Interfaces

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.
What we study at the Graduate School of Dentistry

The Doctoral Course

Admissions policy

The missions of Tohoku University Graduate School of Dentistry are to contribute to the progress and development of dentistry by promoting creative and innovative research, and to enhance the health and welfare of all mankind.

The goal of education and research at our graduate school is to cultivate a scientific mind that constantly questions and investigates all phenomena. To this end, we strive to produce researchers, medical professionals, educators and administrative officers equipped with high-level specialized knowledge and skills, as well as exceptional insight, who will play an active role not only in their regional community and within Japan, but also in the broader global community.

We are seeking individuals for the doctoral course who, in addition to having a strong motivation to study dentistry combined with outstanding capabilities for doing so, have a broad perspective and flexible sensibilities, and who can carry out creative, innovative, academic and groundbreaking research, following the principle of integrating basic and clinical research.

Curriculum policy

The doctoral course’s dentistry curriculum, in which one student studies under the guidance of more than one instructor, encourages students to begin research at an early stage of their doctoral course, acquire expertise and specialized knowledge, and develop an interdisciplinary outlook. The Special Training for a Doctoral Thesis, provided from the first to the fourth year, helps students develop the skills necessary to write a doctoral thesis. The Basic Theory on Graduate School Research class, taken in the first year, provides students with the mass of rules that a researcher must comply with, from research ethics to various types of regulations. At the Research Theme Decision Conference, first-year students present their research proposals, and hold discussions with a variety of supervisors developing their research skills in the early stages of their doctoral education. Students are required to take the Advanced Theory of Dentistry course from the first year, in which they learn about the latest research from instructors who are experts in various fields. They acquire many different experimental techniques necessary for conducting research in the Experimental Technique Training course. In addition, Dental Seminars, in which small groups of students work with the latest research information, 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 by multiple instructors are essential. To make this possible, we have been strengthening the screening setup by introducing a system of a preliminary reviewing that uses “contributing a paper to a top-rated international journal” as the chief criterion. At the same time, we provide assistance to students in giving presentations at international academic meetings, with the aim of having them cultivate a global outlook and perspective.

Diploma policy

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 the Advanced Theory of Dentistry course, 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.

Number of graduate students in the doctoral course

46%

| General students |

24%

| Foreign students |

Nationalities of foreign students including Chinese, Taiwanese, Korean, Indonesian, Vietnamese, Indian, Mongolian, Thai, Jordanian, Philippines, Haiti, Saudi Arabian and SriLankan

186

(80 women)

30%

| Adult students |

Employed dentist, director of a dental clinic, and employee of a major chemical manufacturer
The missions of Tohoku University Graduate School of Dentistry are to contribute to the progress and development of dentistry by promoting creative and innovative research, and to enhance the health and welfare of all mankind.

The Doctoral Course provides students with the mass of rules that a researcher must also receive the necessary research guidance for Special Training for Doctoral Thesis. Students are required to be in the program for four years or more, and earn 30 credits or more from the following sub-courses:

- Dentistry Theory (9 credits)
  - Introduction to the specific research field

- Dentistry Exercise (6 credits)
  - Exercise in the specific research field

- Experiment Technique Training Course (6 credits)
  - Technical training in experiments

- Special training for doctoral thesis preparation (9 credits)
  - Students will earn credits by attending the class “Foundation of Graduate Research,” presenting a research subject and acquiring technical knowledge.

The goal of education and research at our graduate school is to produce quality theses, assessments from many different viewpoints by multiple instructors are essential. To make this possible, Tohoku University Graduate School of Dentistry is equipped with high-level specialized knowledge and skills, as well as exceptional insight, who will play an active role not only in their regional community and within Japan, but also in the broader global community.

We are seeking individuals for the doctoral course who, in addition to being informed in research philosophy, I have the chance to sharpen my clinical skills through hands-on courses in orthodontics in which we tackle classic and pioneered orthodontic mechanics. We also hold a weekly meeting where we discuss different orthodontic cases and treatment models. All of this combined is molding me to achieve my goal of being a confident professional.

Hello, my name is Aseel Marahleh, a PhD student in the Graduate School of Dentistry. I have always been searching for the opportunity to fulfill a never ending pursuit of knowledge and I have come all the way from Jordan to the right place. Tohoku University is the perfect place for science enthusiasts. In the Department of Orthodontics in the Graduate School of Dentistry in Tohoku University, we thrive to produce cutting edge scientific research with the help of a skilful group of professors and graduate students.

Since I started my PhD course I have gained great knowledge in my specific field of interest which is “Bone Remodeling and Orthodontic Tooth Movement” through weekly seminars, journal and book clubs. Being one of the top universities in Japan, our Graduate School of Dentistry has a keen eye for international scientific crosstalk. There is always the chance to participate in meetings and conferences to discuss interdisciplinary research in the area, and that is not all, at the end of day the scientific atmosphere in our conferences melts into a light-hearted, cheerful vibe.

In addition to being a confident professional.

My colleagues and lab mates have a great spirit of hospitality and they had a great role in helping me adjust and understand the language and customs. In my free days, Sendai city in which Tohoku University is located leaves me no space for boredom. The Beautiful scenery, delicious food and immense culture are really the cherry on the top for this meaningful journey.

Aseel Mahmoud Suleiman Marahleh
To Achieve Sometimes, to Discover Often, to Endeavor Always

As quoted by Dr. Trudeau, it is the doctors’ responsibility “to cure sometimes, to relieve often, to comfort always”. While in my opinion, an excellent researcher lives by “to achieve sometimes, to discover often, to endeavor always”.

After awarded the master degree from Guanghua School of Stomatology, Sun Yat-sen University, a top dental school in China, the doctor degree program of Tohoku University had attracted my attention. Not only because the great literatuer Xun Lu once studied in Tohoku University, but also that as one of Japanese leading universities, Tohoku University possesses unique educational system, experienced staff members, and superior research conditions. Fortunately I was accepted as a PhD candidate by Professor Sasaki, the dean of Tohoku University Graduate School of Dentistry.

Two years has passed and my research life here is wonderful. The atmosphere is free, which means except for experiments, plenty of interesting activities are organized for researchers. For instance, each week there is a meeting to discuss the latest developments in dental science and technology, and everyone shares their thoughts and ideas. Sometimes the meetings are held by knowledgeable professors, who often enlighten me on my own research. Sometimes the meetings are held by famous companies, and in that case I may have the possibility to try their novel inventions such as the next generation root canal preparing files or dental implants. Besides, for foreign students like me who are fond of clinical work, Tohoku University Graduate School of Dentistry has organized the "Clinic Tour". A lot of clinical cases are discussed and I also have the chance to practice clinical skills. Through these actives and the communication with professor, engineers and dentists, my experience has been enriched and horizon broadened. In addition, the President Fellowship awarded to outstanding researchers contributes much to my life in Japan. However, as the path to glory is always rugged, each achievement takes great endeavors. Thanks to the superb platform and numerous resources provided by Tohoku University Graduate School of Dentistry, I am able to explore further in my research field. Meanwhile Tohoku University Graduate School of Dentistry helps me develop a global perspective too, which plays a significant role in my discovery of the unknown. It is a great honor to be part of Tohoku University Graduate School of Dentistry!

Wang Zhuyu

Doctoral Course 4th year | from China

Standing on the shoulders of giants

Among the top universities in Japan, Tohoku university is the best one that welcomes foreign students and provides excellent international courses. After I graduated from Taiwan university, I was fortunate to get into the graduate school of dentistry of Tohoku university and become a PhD student in the division of orthodontics and dentofacial orthopedics. My research is about the relationship between diabetic medicines and bone metabolism. Every week we have a journal reading club and meetings to present our research progress. In addition to the learning of research, there are orthodontic typodont courses and clinical sessions to gain our insight into orthodontic techniques.

I am also honored in participating international symposiums held by the graduate school of dentistry of Tohoku university every year. I am happy to know top researchers around the world and renew my knowledge in these symposiums. The graduate school of dentistry provides me with the giants’ shoulders that allow me to see further and further.

The staff members in the graduate school of dentistry also help foreign students apply scholarships and rent houses. This works support the life of foreign students, and we can focus on our research instead of looking for other financial support or part-time jobs. It is never too late to become the part of our graduate school of dentistry!

Shen Wei-Ren

Doctoral Course 3rd year | from Taiwan

The Master’s Course

Chronology of events that led to the establishment of the Master’s course

Dental medicine has been progressing rapidly in recent years, and dental treatment support staff, such as dental hygienists, technicians and other professionals, is now being expected to acquire an even wider range of advanced knowledge and to possess specialized skills based on such knowledge. To promote the research and development of dental equipment and materials that support advanced dental medicine, moreover, it is becoming an urgent task to train researchers and developers who are familiar with the latest advances in dentistry and oral science.

On the other hand, the importance of oral functions such as eating and speaking is becoming more broadly recognized. People in occupations who have no opportunities to receive specialized dentistry education, such as nurses, speech therapists, nursing teachers, and health administration officials are increasingly being called on to demonstrate knowledge and skills relating to dental and oral care in executing their nursing, long-term care, health guidance, public relations, and other awareness-raising activities. Examples include the provision of oral health guidance and management, and education on maintenance of the oral cavity.

In April 2004, the Tohoku University Graduate School of Dentistry established a new Master’s program especially for these types of individuals, and opened the door for specialized education and research in dentistry and oral science with the aim of cultivating the abilities needed for such advanced specialist professions, or the ability to conduct research on dentistry and oral science.
Admissions policy

The missions of Tohoku University Graduate School of Dentistry are to contribute to the progress and development of dentistry by promoting creative and innovative research, and to enhance the health and welfare of all mankind. The goal of education and research at our graduate school is to cultivate a scientific mind that constantly questions and investigates all phenomena. To this end, we strive to produce researchers, medical professionals, educators and administrative officers equipped with high-level specialized knowledge and skills, as well as exceptional insights, who will play an active role not only in the regional community and within Japan, but also in the broader global community.

The Master’s course seeks individuals who have diverse and specialized academic knowledge and skills related to oral health, hygiene and public health, health science, speech and language therapy, medical sociology, agriculture, engineering, and science, and who are willing to carry out active research into dentistry and oral science.

Curriculum policy

The Master’s course curriculum, which is designed to provide flexible programs that meet students’ interests, consists of a wide range of basic and specialized subjects, beginning with Introduction to Dentistry, and covering subjects needed for future dentistry and oral science such as Medical and Dental Biomaterials, Theory of Medical/Dental Equipment, Food Science, International Dental Health, and Social Dentistry. Each student studies under the guidance of more than one instructor. During the first year, students take Introduction to Dentistry as well as Introduction to Clinical Dentistry and Practical Training at Hospitals to acquaint themselves with dentistry and dental medicine. In the Special Training for the Master’s Thesis, which covers the period from the first to second years to the completion of a Master’s thesis, students study the Basic Theory of Graduate School Research to familiarize themselves with matters that govern all research, from ethics to technical regulations. They then summarize their research themes and plans as a Summary of Theme Selection, allowing them to begin research at an early stage of the Master’s course. These courses allow dental hygienists and technicians, nurses and other healthcare professionals, as well as graduates in science and engineering, and nutrition and health, to acquire extensive knowledge and advanced research skills in dentistry and oral science that will enable them to contribute to maintaining and promoting these areas in public health.

Diploma policy

To complete the Master’s course in dentistry, students must be enrolled for two years or more, and earn 30 credits or more (18 credits or more from compulsory subjects and 12 credits or more from elective subjects). They must also undergo the necessary research guidance and submit a Master’s thesis, then pass the evaluation and final examinations to be certified as having completed the course.

If a student is recognized to have made outstanding research achievements, only one year of study is required. Students who are currently employed or subject to other special circumstances are permitted to study for more than two years under the planned schedule, during a period to be determined by the School.

Master’s course program

Course acceleration Students with excellent research achievements (eg, a first-authored paper accepted by an established journal) may complete the course in one year.

Long-term enrollment Working students and those with a compelling reason for long-term enrollment may stay in the course for up to 4 years with no extra cost other than the 2-year tuition.

Number of graduate students in the master’s course

(as of May 1, 2019)

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<th>Occupation of adult students</th>
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<td>Students (15) (10 women)</td>
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<table>
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<tr>
<th>General students</th>
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<td>20%</td>
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<th>Adult students</th>
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<td>80%</td>
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Admission Submit graduate thesis abstract

Acquire special knowledge and receive research training

First year

Second year

Submit graduate thesis

Final examination

Course completion

Students with excellent research achievements (eg, a first-authored paper accepted by an established journal) may complete the course in one year.

Working students and those with a compelling reason for long-term enrollment may stay in the course for up to 4 years with no extra cost other than the 2-year tuition.
Admission fee and tuition

| Admission fee | 282,000 yen |
| Tuition (yearly) | 535,800 yen |

*The amount of the admission fee and tuition is subject to change. The newly established amount will be applicable at the time of admission or while the student is enrolled.

Financial support system

Admission fee/tuition waiver

The entire admission fee/tuition or one-half or one-third of tuition may be waived upon a request for students with excellent academic performance having difficulty paying the admission fee and/or tuition due to financial reasons. The information on the waiver program will be included in the admission documents.

President Fellowship/President Fellowship for Undergraduates

This scholarship system is unique to Tohoku University. It provides an amount covering tuition fees for international students of excellent character and academic standing.

Japanese Government (MEXT) Scholarship applying from within Japan

Students can apply as self-financed foreign students through recommendation of Tohoku University.

Other Scholarship

Self-financed foreign students may be eligible for scholarships under the JASSO Honors Scholarship for Privately Financed International Students, or for scholarships offered by private foundations. These scholarships vary with regards to eligible fields of study, and amount, but in general students apply for them through Tohoku University.

Teaching Assistant (TA) and Research Assistant (RA)

Students who assist in classes or research activities will be paid an allowance (hourly rate).

The program provides students with financial support as well as opportunities to teach and instruct other students or learn how to proceed with research activities and construct theories.

School of Dentistry Researcher Development Program

The School of Dentistry has a researcher development program to help doctoral students become international researchers and enhance their research activities. Up to 300,000 yen will be paid per student as travel expenses and conference participation fees.

Japan Society for the Promotion of Science Fellowship Program

The program provides fellowship support to researchers with excellent research ability, who are taking or have completed the doctoral course and wish to join research institutes such as universities in the future.

A monthly amount of 200,000 yen (estimated in 2014) will be provided to fellows in the doctoral course.

Great Environments will make you into a Great Person

Tohoku University is one of the great Universities in Japan located in Sendai. Being a student in Tohoku University Graduate School of Dentistry is a pride and surely I am very pleased to be here. I came to Japan in Oct 2016 and enrolled doctoral course in Oral Ecology and Biochemistry with supported by Monbukagakusho (MEXT scholarship). In our beloved faculty, you can focus to study, do your research, and increase your insight in dentistry. As a second-year Ph.D. student, I learned a lot of knowledge especially the diversity of oral microorganisms, their metabolism, oral ecosystem related to oral disease and others. Every week we have a journal club, seminar session or present your research progress, hence each student always kept up to date with the latest trend of international research. This faculty always provides good facilities for you to support your research, and then you can enjoy your research every day even on your holiday. Furthermore, you can join an international conference to increase your knowledge or even showing your research’ result to the participant and get some advice on your research. At here you will meet good classmates and it will create a good atmosphere to study. And also the great professors and teachers will help and guide you to make your research looks perfect!!

Sendai is a beautiful city with a lot of trees, good environment, and delicious foods, and then you can enjoy living here. Even though it is a little bit cold for me, but you will meet humble and kind people and it make you feel warm. In Sendai, around our campus, you do not only learn about your field, but also you can learn other things such as; Japanese culture, their passion, politeness, hard work, and friendship. You can learn all the kindness here and finally you can adopt it. These entire great environments will make you into a great person.

From West China to Tohoku

I’m a double degree student from West China School of Stomatology. I find Tohoku University an ideal choice for intensive study due to its encouraging academic atmosphere. I graduated from the School of Stomatology of Sichuan University. I find Tohoku University an ideal choice for intensive study due to its encouraging academic atmosphere.

Dimas Prasetianto Wicaksono

Doctoral Course 3rd year | from Indonesia
Variety of educational programs

**Double degree program**

The double degree (DD) program of Tohoku University Graduate School of Dentistry is a graduate school educational project involving the major graduate schools of dentistry in China and South Korea to improve dentistry and dental care in Asia by developing Asian standards through innovative dentistry based on global and integrated knowledge.

In the DD program each graduate student enrolls at two universities and studies at the sister school for a specific period of time. The DD program offers an opportunity to study under the faculties of two universities at the same time. Students will be able to earn degrees from both universities if the requirements are met.

**The International Priority Graduate Program – Advanced Graduate Course for International Students –**

Tohoku University Graduate School of Dentistry has launched the new PhD degree program “The International Priority Graduate Program- Advanced Graduate Course for International Students-” since 2014. The international students being accepted at this program can be adopted as a Japanese Government (Monbukagakusho: MEXT) Scholarship student. This program accepts excellent students from Southeast Asia, Southwestern Asia, Southern Asia and the East Asia countries.

**Coordination with other research departments and institutions**

A cross-department, integrated educational program involving the Schools of Medicine, Pharmacy and Engineering is available for the students at Tohoku University School of Dentistry. Students will be able to receive guidance from members of non-dentistry faculties.

**Future Global Leadership Program**

Tohoku University Graduate School of Dentistry has launched the new course “Interface Oral Health Science Course” taught entirely in English since 2011.

The conceptual objective of the “Interface Oral Health Science Course” is to integrate the diverse research achievements of the Graduate School of Dentistry in order to advance the understanding of issues concerning oral health. We offer an English education program covering wide range of Oral Health Science.

**Entrance examination information**

**Selection procedures**

<table>
<thead>
<tr>
<th>Doctoral course</th>
<th>Master’s course</th>
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<tr>
<td><strong>Special screening for foreign exchange students</strong></td>
<td><strong>Written examination</strong>&lt;br&gt;Specialized subject</td>
</tr>
<tr>
<td>Interview</td>
<td>Application screening</td>
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</table>

**Qualification Screening**

Applicants who graduated from foreign universities have to undergo the qualification screening for application in advance. Please contact us by e-mail before the beginning of qualification screening, if applicants want to obtain more detail information.

e-mail: international@dent.tohoku.ac.jp

**Mater’s Degree and Internship Program of African Business Education Initiative for Youth (ABE Initiative)**

Tohoku University Graduate School of Dentistry has launched the new Master’s course “Mater’s Degree and Internship Program of African Business Education Initiative for Youth (ABE Initiative)” since 2015. The objective of this program is to support young personnel who have the potential to contribute to the development of industries in Africa. This program offers opportunities for young African personnel to study at master’s courses in Tohoku University as international students. Japan International Cooperation Agency (JICA) will provide the tuition fee, living allowance and round-trip airfare for participant of the program.

**Dental oncologist training course**

This course provides training for dentists to become dental oral surgeons specializing in oral cancer treatment.

Students will take the systematic lecture course to obtain general and particular knowledge about clinical oncology required for cancer treatment, participate in clinical work at affiliated institutions and related departments at the School of Medicine and prepare a thesis related to oral oncology in the doctoral dissertation program.

**From West China to Tohoku**

I’m a double degree student from West China School of Stomatology of Sichuan University. I find Tohoku University an ideal choice for intensive study due to its encouraging academic atmosphere, advanced scientific instrument and inspiring teaching style.

Tohoku University has very dedicated and professional teachers who are so considerate towards students. Given my identity as a Joint-Supervision student, Professor Sasaki and Professor Hong, in an effort to select the most suitable research theme for me, made a face-to-face detailed communication with my advisor in West China. In addition to that, they enabled me to do research in an excellent experimental condition while conscientiously offering guidance for problems I encountered in the experiment.

This university also offers free language training courses on Japanese, and hosts a good number of cultural activities to help international students integrate into Japanese community. With all these experiences, I sincerely recommend more friends to come to Tohoku University Graduate School of Dentistry study.

**Zhang Yi-fan**

**Examination schedule**

<table>
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<tr>
<th>Admision in October 2019</th>
<th>Admision in April 2020</th>
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<tr>
<td>First Recruitment</td>
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</table>

**Accepting application**

- May 20 to May 24, 2019
- May 20 to May 24, 2019
- October 15 to October 21, 2019

**Examination date**

- July 9, 2019
- July 9, 2019
- December 6, 2019

**Announcement date of examination results**

- July 18, 2019
- July 18, 2019
- December 19, 2019
**Oral Biology**

**Oral Ecology and Biochemistry**

The oral cavity forms an ecosystem where the host (humans) and parasites (a tremendous number of microorganisms) cohabit. Using leading-edge techniques, we conduct research on the role of oral biofilm 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-induced deterioration of biomaterials. Recently, we have also started metabolomics research on oral cancer.

**Main research themes**
- Genomics, proteomics and metabolomics of oral microbial ecosystem (oral biofilm)
- Metabolism and pathogenicity of microorganisms associated with dental caries, periodontal disease and oral malodor, using an anaerobic experimental system
- Caries preventive properties of fluorides and sugar alcohols
- Evaluation of cariogenic potential of food products and sweeteners using pH-telemetry
- Oral biofilm-induced deterioration of dental biomaterials

**Oral Pharmacology**

The oral cavity forms an ecosystem where the host (humans) and parasites (a tremendous number of microorganisms) cohabit. Using leading-edge techniques, we conduct research on the role of oral biofilm 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-induced deterioration of biomaterials. Recently, we have also started metabolomics research on oral cancer.

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

**Oral Microbiology**

**Periodontology and Endodontology**

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 for 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**

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 leads to onset of oral mucosal and salivary gland diseases. We investigate the underlying molecular mechanism to overcome these diseases. Moreover, we investigate the innate immune responses induced by the infection with oral bacteria, especially the enhancement or failure of immunological homeostasis in the oral mucosa.

**Main research themes**
- Host Defense and Diseases in the Oral Mucosa
- Immune Response in Pathological Conditions
- Immune Regulation of Saliva and Diseases in the Salivary Glands
- Mechanism of Metal Allergy Development
- Regulation of Inflammation by Biota
- Role of chronic allergic inflammation in oral infectious diseases
- Role of epithelial barrier dysfunction in oral infectious diseases
- Regulation of oral mucosal homeostasis by oral commensal bacteria
- Innate immune responses of bacterial cellular components

**Oral Ecology and Biochemistry**

**Professor** Nobuhiro Takahashi

**Oral Pharmacology**

**Professor** Minoru Wakamori

**Oral Microbiology**

**Periodontology and Endodontology**

**Professor** Saroru Yamada

**Oral Molecular Bioregulation**

**Professor** Shunji Sugawara
**Oral Function and Morphology**

**Oral and Craniofacial Anatomy**

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

**Main research themes**

- Distribution and function of various sensors in the orofacial and cervical regions of human and other mammals
- Change and mechanism of the pain threshold in animal chronic pain models
- Mechanism of motor and sensory dysfunction in muscular atrophy diseases

**Dental and Digital Forensics**

Forensic dentistry is the science concerning the application of dental evidence to the resolution of legal problems. We aim to integrate the advanced knowledge and skills of information science into conventional research methods in forensic dentistry. Our division is the first and only one laboratory in the northern Japan, engaged in research and education of forensic dentistry. The education goal of the division is that the students gain knowledge and understanding of the process of forensic dentistry in Japan and of personal identification using dental records or skeletal remains.

**Main research themes**

- Morphological studies on the human skeletal remains
- Application of dental Information in identification
- Morphological studies on the teeth of the Japanese

**Oral Physiology**

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 mastication, oral sensation including gustatory sensation, function 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**

Focus of research and education of our division is on reconstruction of morphology and function of the patients with partial edentulism or maxilofacial defects. In addition to developing 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 interaction at the interface between prostheses consisting with biomaterials and living tissues, which is essential for the success of prosthodontics.

**Main research themes**

- Biomechanics and mechanobiology for stomatognathic morphology and function based on in vivo measurements and evaluation
- Studies on transplantation, regeneration and construction for prosthodontics, implantology and maxilofacial rehabilitation
- Studies on development and clinical application of novel biomaterials and creation of novel interfaces for prosthodontics, implantology and maxilofacial rehabilitation
- Developmental and translational research for novel dental treatment technology and dental equipment based upon multi-disciplinary research and academia-industrial collaboration
- Studies on clinical outcome of prosthodontics, implantology and maxilofacial rehabilitation

**Aging and Geriatric Dentistry**

Through gaining a broad range of experience on dental practice, which includes collaboration with various different professions, in outpatient and domiciliary care, we examine how best to ensure geriatric oral health care in the future. We also spend enormous effort investigating the interrelation between oral and systemic health/QoL, thorough longitudinal cohort study, and also developing evaluation and rehabilitation methodologies of various oral functions.

**Main research themes**

- Analysis of causal relationship of oral and systemic health/QoL through large-scale cohort study.
- Research on the aging of oral functions
- Study on the delivering system of multidisciplinary dental care for the elderly

**Comprehensive Dentistry**

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
**RESTORATIVE DENTISTRY**

**Dental Biomaterials**

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 inquired.

**Main research themes**

- Development of new dental titanium alloys and their clinical application
- Research on mild antimicrobial or bacteriostatic dental alloys
- Research on functional devices and dental applications using magnets
- Research on new cutting-free dental materials suited to the CAD/CAM system
- Research on deterioration and safety of dental materials in an oral cavity

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**Operative Dentistry**

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 onto enamel and dentin; 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. We also work on clinical studies that are re-restoration treatment with materials not containing allergic materials, and application of novel disinfecting technique using functional water. In addition to these studies, we develop regenerative therapy which expected to create innovative dental therapeutic systems in the 21st century. A feasibility study of the realization of tooth regeneration therapy is performed in research projects that are stem cell transplantation and local administration of bioactive molecules.

**Main research themes**

- Development of Tooth Regeneration Therapy
- Investigation of Molecular Mechanisms that regulate Periodontal ligament formation
- Research Related to Physical Properties and Adhesion/Joining Conditions onto Dentin of Composite Resin
- Research Related to Dental Precision Casing and Level of Conformity of Pure Titanium and Titanium Alloys
- Research Related to the Strengthening of Physical Properties and Clinical Application of Ceramic Inlays

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**Molecular and Regenerative Prosthodontics**

Our major research focus is the development of next-generation biotechnology to 1) regenerate missing alveolar bone and teeth for functional and esthetic rehabilitation using cells and biomimetic materials and 2) introduce tailor-made diagnostics for prosthetic and implant treatments to prevent further tooth loss.

**Main research themes**

- iPS cell-based oral tissue engineering
- Development of gingiva-derived iPS cells for safe therapeutic application
- Biomimetic materials for bone tissue engineering
- Chemical biology for bone regenerative medicine
- Osteo-immunology in alveolar bone resorption
- Development of genome-based diagnostics for prosthetic/implant treatments
- Basic and clinical research on all-ceramic restorations

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**ORAL HEALTH AND DEVELOPMENT SCIENCE**

**Preventive Dentistry**

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

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**Pediatric Dentistry**

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
- Analysis of gene associated with oral disease
- Development of stem cell research associated with syndromes
- Study of enamel formation
- Regeneration of tooth and salivary gland using tissue engineering
- Evaluation of new materials for prevention of dental caries

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**Osamu Suzuki (collateral office) Professor**

Osseo tissue formed on a titanium surface

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**Hiroyuki Kumamoto Professor**

A model for tooth regeneration therapy (Upper panel)

Local administration of bioactive molecules (Lower right panel)

Arrow indicated regeneration of fibers in tooth.
Orthodontics and Dentofacial Orthopedics

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 PhD course. Our department is accredited by the Japanese Orthodontic Society as a training institute for orthodontic specialists.

Main research themes

1. Clinical research
   - Use of miniscrew as an orthodontic anchor
   - Use of various occlusal indices in quantitatively evaluating the quality and severity of the pre- and post malocclusion in orthodontic treatment
   - Analysis on morphology of maxillofacial structures
   - Use of functional evaluation (gnathophotograph) in orthodontic treatment

2. Basic research
   - Molecular mechanism of orthodontic tooth movement
   - Biological mechanism of mechanical response in osteocytes, periodontal ligament cells and chondrocytes
   - Biological mechanism of craniofacial development
   - Regeneration techniques of artificial tooth germ
   - Development of materials for orthodontic treatment
   - Development of acceleration techniques of orthodontic tooth movement with physical stimulation
   - Cell and matrix response of TMJ to joint loading

Professor Iratu Mizoguchi

Oral Medicine and Surgery

Oral Pathology

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
- Clinopathological and genetic studies of developmental abnormalities of the teeth
- Clinopathological and immunohistochemical studies of the oral immune diseases and cancer
- Investigation on regeneration of the oral and maxillofacial tissues and application of biomaterials

Professor Hiroyuki Kumamoto

Oral Diagnosis

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

Professor Tetsu Takahashi (collateral office)

Oral and Maxillofacial Surgery

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 focuses 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 perististal 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

Professor Tetsu Takahashi

Craniofacial Anomalies

Our division is a clinical dentistry field specializing in research on the diagnosis and treatment of craniofacial anomalies, such as cleft lip and palate.

Main research themes

- Research on the diagnosis and treatment of craniofacial anomalies, such as cleft lip and palate
- Research on the role of immune cells in osteoclastogenesis
- Research on the effect of dietary habit on glycemic homoeostasis
- Development of a new anti-inflammatory bisphosphonate that also promotes bone formation
- Development of a new biocompatible shape memory alloy

Professor Kaoru Igarashi

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

- Association of dental status and society
- Construction of a Project for Effective Prevention of the Need for Nursing Care
- Infectious Disease Countermeasures and Risk Management for Nursing Care Facilities

Professor Ken Osaka

International Oral Health

Express of toluerase in ameloblastoma (a: TRAP assay, b: immunohistochemistry)

Before bone graft

After bone graft

A case of dental reconstruction after bone grafting to the alveolar cleft in a patient with cleft lip and palate.
Dento-oral Anesthesiology

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

Main research themes
- Exploring the pathogenesis of obesity-induced asthma
- Exploring novel therapeutic targets for bronchospasm, asthma, and COPD
- Exploring the role of oral/gut microbiota on pathogenesis of asthma and COPD
- Parasympathetic reflex vasodilatation in orofacial area

Craniofacial Engineering and Regeneration

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 mechanism of calcification

Craniofacial Function Engineering (CFE)

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
- Device development of the controlled release of the growth factors which reproduce bone and periodontal tissues
- Surface design of the metal implants using calcium phosphates to increase bone regeneration capability and mechanical adaptability
- Elucidation of bio-mineralization 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 method to evaluate bone quality of the regenerated bone tissue

Department of Community Medical Supports (Tohoku Medical Megabank Organization)

Community Oral Health Science

Progress of low fertility, high life expectancies and nuclear family tendency facilitates to reduce connectivity between members in a local community and family, and then to bring about a deterioration of functions for community. This weakened community function leads us to construct a sustainable health support system. Our division aims at clarifying a factor influencing to maintain and promote the oral and general health, based on a large-scale genome cohort study providing health, medical and genomic information of human as well as microbiome in the human body.

Main research themes
- Construction of an oral health support system and program for the community
- Elucidation of oral health factors related to general health
- Genomics for oral health maintenance and promotion

Molecular Pathogenesis of Oral Tumor

Small GTPases function as molecular switches in cell proliferation, cell movement and intracellular traffic. We are investigating roles of small GTPases in oral cancer proliferation, invasion and metastasis. Bisphosphonates are used for the therapy of osteoporosis by inhibiting lipid modification of small GTPases in osteoclasts. We are also investigating about the posttranslational lipid modification.

Main research themes
- Regulatory Mechanism of Oral Tumor Proliferation, Invasion and Metastasis by Small GTPases
- Research on Lipid Modification of small GTPases

We have discovered an inhibitory regulator of small GTPase Raf, RafGAP. In its KO mice, chemically induced bladder cancer were large and with high malignancy, compared to wild type (WT). Then, human bladder cancer with weak expression of RafGAP exhibited poorer prognosis compared to that with stronger expression. Thus, RafGAP could inhibit bladder cancer progression.
Bio-Dental Engineering

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 (OCP/Collagen)
- Establishment of a new animal model for bone regeneration
- Research for quantification of regenerated bone tissue
- Clinical application of OCP/Collagen

2D 6M

Intractable Diseases and Immunology

Refractory 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 from oral diseases, to elucidate the pathogenesis of intractable diseases.

Main research themes
- Dressed NK cell
- Viral immunity
- Immune surveillance against tumor
- Autoimmune diseases
- Metal allergy
- MHC II dressed NK cells (Red) acquire MHC II (Green) from Dendritic cells.

Advanced Biocompatible Materials

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

Advanced Biofunctional Materials

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

Immune Regulation and Oral Immunity

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 microenvironements operating in the host defense system, 2) Mechanisms for the production of autoantibodies involved in the disease development and maintenance of autoimmune disorders including Sjögren 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
- Mechanisms for the generation and function of auto-antibodies involved in various autoimmune diseases
- Development of methods for manipulating or reconstituting the immune system

Methodology for quantification of bone regeneration

Fig. X-ray photographs of fracture models made in tibiae of rabbits at 24 weeks after implantation of intramedullary rods made of low modulus titanium alloy (Ti-29Nb-13Ta-4.6Zr) and SUS316L stainless steel: Low modulus titanium alloy can suppress bone resorption, resulting in good bone remodeling.

Developed materials

Low modulus titanium alloy (Young's modulus ≈ 100Pa)
SUS316L stainless steel (Young's modulus ≈ 180Pa)
**Geriatric Oral Science**

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 periodontosis
- Exploratory research of the aging and disease related biomolecule by Omics analysis

**Redox Regulation**

Free radicals are generated in the innate immune system to kill or inactivate invading microorganisms. On the other hand, excessive free radical generation causes damage on healthy tissue. Thus, the control of free radical generation is a critical issue in the field of medicine. In our laboratory, we have conducted research to develop dental therapeutic devices based on antimicrobial chemotherapies utilizing the control technology of free radical generation.

**Main research themes**
- R&D of dental therapeutic devices based on radical disinfection technique
- Development of novel antimicrobial treatment utilizing pro-oxidant activity of photo-irradiated polyphenol

**Next Generation Dental Materials Research**

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

**Liaison Center for Innovative Dentistry**

In the dentistry of a new century, the pioneering researches should be done by mutual collaboration with researchers of other fields based on international collaboration, and contributions both inside and outside of the country are demanded. The Liaison Center for Innovative Dentistry promotes the international expansion of education and research based on the next-generation dental concept “Interface Oral Health Science” proposed by our school, and promotes the advanced dental research, interdisciplinary integration research, and industry/academic/government collaboration, and coordinates these education and research activities in dentistry of a next generation for the realization of contributions within both regional and international society through educations, researches, and clinics.

**Main research themes**
- Promotion of international interdisciplinary integration researches regarding interface oral health science (Division for Interdisciplinary Integration, Division for Globalization Initiative)
- Research and development for the new medical devices and biomaterials to realize healthy society of longevity (Division for Interdisciplinary Integration)
- Research and education related to reconstruction after earthquakes, disaster prevention, and rehabilitation of Japan (Division for Interdisciplinary Integration)
- Development and management of the curriculum for international cooperative education (Division for Globalization Initiative)
- Development and operation of regional cooperative education, clinical supports, and social contribution programs (Division for Regional Community Development)
- Research of social capital within regional and international society (Division for Globalization Initiative, Division for Regional Community Development)
- Development and realization of a new education system for contributes to the establishment of leading dentistry (Division for Advanced Education Development)
Tohoku University Medical Hospital and Tohoku University Dental Hospital were merged to become a united Tohoku University Hospital in January 2010. The merger of the two hospitals was carried out to further advance research, education and clinical practice in the field of medicine and dentistry.

On average, 3000 outpatients and 1200 inpatients are treated at Tohoku University Hospital daily. About 600 outpatients visit the Department of Dentistry. Being one of the major large-scale hospitals in Japan, Tohoku University Hospital has a good reputation among local patients as well as those visiting from other areas in Japan and overseas. We promote development of cutting-edge medical technologies and original, steady research activities to ensure harmonization of patient-friendly medical care and advanced medicine.

Recently established facilities and projects to promote clinical research include the Clinical Study Promotion Center (2012) and the Community Healthcare and Education Support Unit (2013). Graduate students are paid for their clinical work at Tohoku University Hospital. An employment contract is signed between the students and the hospital to cover the former with occupational injury insurance and provide them with financial support. We encourage our students to take advantage of this opportunity.

After admission to the School of Dentistry, many graduate students will get a hands-on clinical experience at Tohoku University Hospital. We hope you will learn much from patients and become warm-hearted leaders of global dentistry/dental care and advanced specialists.

Tohoku University Hospital

General Vice Director, Tohoku University Hospital
Prof. Tetsu Takahashi
(Oral and Maxillofacial Surgery)
Sendai: the City of Trees.

Tohoku University is located in Sendai called the “City of Trees”. Sendai is a great combination of beautiful greenery and urban sophistication and is also known as an academic city rich in culture and history.

HISTORY

The quintessence of Date culture is still present

Surrounded by greenery and located along the Hirose River, Sendai used to be a castle town that yielded 3 million gallons of rice. Built by Masamune Date 400 years ago, Sendai still has the legacy of the Date Domain such as Sendai Castle, Zuiho-den and Rinno-ji Temple. It is also an academic town where a large number of students live. Apart from the museums, cultural activities at Sendai Mediatheque draw much public attention.

FESTIVALS

Traditional festivals taking place throughout the four seasons

Popular festivals taking place in Sendai include the Aoba Festival with floats and dances, a heritage of Date culture, in spring; Sendai Tanabata Festival with paper art blowing in the breeze in summer; Jozenji Dori Jazz Festival that fills the streets with music in the fall; and in winter the Sendai Pageant of Starlight that feels as if it has come right out of a fairy tale.

Location of Tohoku University

Sendai City, Miyagi Pref.