Tohoku University
Graduate School
of Dentistry 2018

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

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.

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

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 Oushu, 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 fulfil 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.
Greetings from the Dean

Tohoku University Graduate School of Dentistry leads the next generation of dentistry, dental care, and oral health. Our mission is to train international leaders and highly specialized professionals in dentistry, dental care, and oral health for the next generation. We are motivated to develop the next generation of dentistry and dental care under the rigorous school spirit of Tohoku University, with 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. The Master's course is the only master's program in Japan, which is significant for the advancement of dentistry.

In 2004, to expand the range of dental medicine and oral health, as well as to “open the door” to dental education in Southeast Asia, including Vietnam, Laos, and Thailand, we sought to establish standards of dental education in East Asia. We are currently organizing a double degree program in which students can receive academic degrees from two universities. We are currently expanding this program in collaboration with world-leading dental schools, including Peking University and Sichuan University Tianjin Medical Center.

In 2002, we proposed a new concept to promote the reform of the existing dental research and education system with world-leading dental schools. This concept is known as the “interface” concept, in a convergence of various fields. These studies are being conducted in collaboration with world-leading dental schools, including Peking University and Sichuan University Tianjin Medical Center.

In 2011, 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. Since then, in accordance with our “research-oriented” policy, we have developed characteristic programs such as the Interface Oral Health Science, which have been developed through advanced research activities in accordance with our “research-oriented” policy.

In 1972, seven years after the School of Dentistry opened, the Liaison Center for Innovative Dentistry was established. In 1988, the first school of dental medicine in Japan, Tokyo College of Dental Medicine, established (closed the next year). In 1990, Takayama School of Dentistry established. (In 1900, changes name to Tokyo College of Dentists; in 1946 restructured into Tokyo Dental College.) In 1989, fact that dental plaque causes tooth decay discovered in U.S.


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In 1902, Japan Association for Dental Science established. In 1903, School of Dentistry at School of Medicine, University of Tokyo established. In 1906, Dental Practitioners Law instituted. In 1911, Dental College established. In 1916, Dental Practitioners Law revised to restrict doctors from practicing dentistry.

In 1928, Cavity Prevention Day instituted. In 1929, Dental Practitioners Law revised to restrict doctors from practicing dentistry. In 1933, Dental Practitioners Association established (in 1926, changes name to Japanese Dental Association).

In 1939, Dental Practitioners Law revised to restrict doctors from practicing dentistry. In 1945, Dental Practitioners Law revised to restrict doctors from practicing dentistry. In 1946, Dental Education Council began under the General Headquarters orders.

In 1947, Dental Education Council began under the General Headquarters orders. In 1948, Dental Education Standards Draft passed. In 1950, Dental Practitioners Association established (in 1926, changes name to Japanese Dental Association).

In 1965, Tohoku University School of Dentistry established, advocating the philosophies of “Training dentists who can think,” “One mouth is a unit,” and “Holistic dentistry.” In 1967, Tohoku University Dental Hospital opens.

In 1972, Tohoku University Graduate School of Dentistry established. In 1975, Dental Technicians School established. In 1993, Prof. Emeritus Hajime Yamamoto awarded Japan Imperial Prize for “Research into applications related to prevention of tooth decay by laser irradiation.”

In 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.

In 2002, Interface Oral Health Science concept proposed by Tohoku University Graduate School of Dentistry. In 2003, Organizational integration of Tohoku University Dental Hospital and University Hospital. In 2004, Graduate School of Dentistry establishes first Master’s course in dentistry in Japan.

In 2005, First International Symposium on Interface Oral Health Science held. In 2007, Tohoku University Dental Hospital and Medical Center renamed, beds and operating rooms moved to new location.

In 2008, Implant outpatients accepted at Dental Medical Center of Tohoku University Hospital. In 2009, Renovation of Lecture Building of Graduate School of Dentistry completed. In 2010, Prof. Emeritus Shubu Hinuma awarded Order of Culture.


In 2015, Center for Epidemiology, Biostatistics, and Clinical Research established. In 2016, Center for Advanced Stem Cell and Regenerative Research established.
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.

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” 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. 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), Finland (Oulu University), Asia (Peking University, Sichuan University, Shanghai Jiao Tong University, Tianjin Medical University, Dalian Stomatological Hospital, Fujian Medical University, The University of Hong Kong 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. 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.
Interface Oral Health Science (IOHS), since 2002

Next-generation oral health science from Tohoku University Graduate School of Dentistry

International joint education to establish standards of dental education in East Asia

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 East Asia’s core universities. Another of its goals is to construct an “East 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 East 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 East Asia (the “East 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, Sichuan University, 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 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).

Study case of IOHS

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.

\[\text{Stress distribution of bone around the implant in a finite element analysis model using patient data.}\]

\[\text{These PET images show the metabolic activity of bone around an implant when force is applied to the implant (} ^{18}\text{F isotope radioactive tracer)}\]
The Doctoral Course

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

(as of April 1, 2017)

| 53% | General students |
| 17% | Foreign students |
| | Nationalities of foreign students including Chinese, Taiwanese, Korean, Indonesian, Nicaraguan, Mexican, Vietnamese, Indian, Mongolian and Thai |
| 30% | Adult students |
| | Occupations of adult students |
| | Employed dentist, director of a dental clinic, and employee of a major chemical manufacturer |

173 (64 women)
Great research, great people, great experience.
About my life as a PhD student in Tohoku University.

Hi! I am a PhD student in the department of Advance Prosthetic Dentistry in Tohoku University. Since I arrived in 2013, all the people that I have met during my stay here always ask me: “Why did you choose Tohoku University?” And I always answer: “Great research, great people, great experience.”

Tohoku University is at the vanguard of research. Being one of the top universities in Japan means that you have a great group of professors, graduate students and researchers working hard in the basics and clinical fields to improve our knowledge in Dentistry. Since I started my research in the area of Bone Tissue Engineering, I have learned more about the process and techniques developed for bone regeneration; and being able to discuss about this matter with my professor and advisor on how to make improvements in the field, is one of the most enrichment and gratifying experience so far.

Also, there is the opportunity to improve your clinical skills. Being able to participate in the seminars of the Tohoku University Hospital Implant Center, where Doctors from different departments, mainly from Prosthodontics and Surgery, gather together to discuss the diagnosis and treatment plan of every patient, has help me to know more about different approaches and protocols in implant treatments according to the patient’s necessities.

And there is also the people, my professor, advisor and dear fellows; the culture, the food, the places and more around the Tohoku University School of Dentistry that makes it unique to do great research, to meet great people and to have a great experience.

Student’s Message

Vanegas Saenz Juan Ramon
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.
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.

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.

Tohoku University Graduate School of Dentistry

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active research-oriented philosophy in which you will be able
to

To Achieve Sometimes, to Discover Of/ten, to Endeavor Always

Gerardo Martinez de la Cruz

In April 2004, the Tohoku University Graduate School of

09

Second year

Admission

Final examination

Course completion

Acquire special knowledge and receive research training

Course acceleration

Long-term enrollment

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.
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 recruitment procedures, 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.

Student’s Message

A Worthwhile Journey

I, a double-degree student from West China School of Stomatology, Sichuan University, have studied at Tohoku University for 1 year and a half. During this period, not only have I learnt how to do the research, but also how to enjoy the research work.

Nothing about the cost here should be concerned because the scholarships from both schools fully afford me. I have got used to daily life in Sendai, a city of serenity but not lacking passion, who can make everyone living here love her.

Even though I felt homesick sometimes, the solicitude from all the faculty members gave me inner strength and made me more optimistic. My research also moved smoothly with the help of my easy-going teachers of patience, no matter what difficulties happened. Moreover, I improved my Japanese a lot, which makes the 1 year and a half in my life worthier.

I plan to go on the research after returning China, and hope that in the near future I can get opportunities to do something which may contribute the development of relationship between China and Japan in my field.

What can you do at Tohoku University?

- Academic
  - Joint research with overseas universities
  - Clinical skills program
  - Clinical tour/simulation training
- Culture
  - Special Japanese classes
  - Cultural exchange with local Japanese society
  - Experiencing Japanese traditional culture such as tea ceremonies and kabuki

Li Xinghan

Doctoral Course 2nd year | from China
**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 East Asia by developing East 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**

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<td>Written examination (specialized subject)</td>
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<td>Interview</td>
<td>Written examination (Short essay writing)</td>
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<td>Application screening</td>
<td>Interview</td>
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**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

**Examination schedule**

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<th>Master’s Degree and Internship Program of African Business Education Initiative for Youth (ABE Initiative)</th>
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<td>Tohoku University Graduate School of Dentistry has launched the new Master’s course &quot;Mater’s Degree and Internship Program of African Business Education Initiative for Youth (ABE Initiative)&quot; 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 airlfare for participant of the program.</td>
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**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.

**Message from Foreign Student**

I am very proud of having an opportunity to study in Graduate School of Dentistry Tohoku University. This is my first come to Japan. I come to Sendai by Monbukagakusho (MEXT Scholarship). Currently I study at Dental and Digital Forensic under the supervision of experienced Professor and faculty members.

I enjoy daily living in Sendai, which known as “City of Trees”. A cold place with very humble and friendly people. This is the correct place to learn all about knowledge and science. This is the comfortable place for study. I hope I can do some research collaboration in dentistry, especially in dental forensics field with Tohoku University.

AROFI KURNIAWAN

Doctoral Course 3rd year | from Indonesia
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 carries-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 carcinogenic potential of food products and sweeteners using pH-telemetry
- Oral biofilm-induced deterioration of dental biomaterials
- Metabolomics of oral cancer cells

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.

Main research themes
- Functional Analysis of Ca²⁺-permeable Cation Channels
- Molecular and Neurobiological Studies of Taste, Pain and Touch Sensations
- Cellular localization of TRPC5-eGFP fusion protein expressed in a single HEK293 cell

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 mechanisms 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
- 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
- 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

Control mechanism

The cause of dysfunction

Oral mucosal defense and research aim

P. gingivalis increases IL-33 expression in human gingival epithelial cells.
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 anatomical 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
- Mass fatality incident management and assistance
- Comparative odontology on the mammals
- Application of dental Information in identification
- Morphological studies on the teeth of Japanese

Oral Physiology

Oral physiology mainly concentrates on the research by 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 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 interaction at the interface between prostheses 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 prosthodontics
- Molecular imaging study with nuclear medicine on bone remodeling related to removable partial denture prosthodontics and implant prosthodontics
- 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 prosthodontics

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
- Development of evaluation methods of oral functions by applying and combining diverse modalities
- 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

Denture base view of implant-supported (left unilateral molar clench)

Clinical use of experimental Denture

The role of epithelial rests of Malassez to promote periodontal regeneration
Restorative Dentistry

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

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 Casting and Level of Conformity of Pure Titanium and Titanium Alloys
- Research Related to the Strengthening of Physical Properties and Clinical Application of Ceramal Inlays

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

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 research focuses 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
  1) Accurate evaluation of early lesion of dental caries by using ultrasonic devices
  2) Risk assessment of enamel surfaces by using laser technology
  3) Risk assessment of periodontal diseases
  1) Analysis of microbiological risk factors of dental plaque
  2) Development of effective protocol of periodontal supportive therapy
  3) Psychological approach of treatment of oral malodor
  4) Application of fluoride for caries prevention
  1) Promotion of fluoride application in public measure of caries prevention
  2) Field research of community oral health
  3) Development of educational dental health checkup with health promotion
  4) Monitoring the prevalence and incidence rate of oral diseases

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

Guide of course

Tokai University Graduate School of Dentistry

Osamu Suzuki (collateral office)

Hiroshi Egusa

Takeshi Koseki (collateral office)

Kaoru Igarashi

Tetsu Takahashi

Takahiro Koseki

Satoshi Fukumoto
Tohoku University Graduate School of Dentistry

**Oral Medicine and Surgery**

**Orthodontics and Dentofacial Orthopedics**

One of the clinical dental departments that focus on 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
   - The use of miniscrew as an orthodontic anchorage
   - The use of functional evaluation (gathoholograph) 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 craniofacial development
   - Biostatistical study of development, growth and aging of TMJ
   - Histomorphometric study of bone-implant interface
   - The control of pain during orthodontic tooth movement

**Professor** | Tetsu Takahashi (collateral office)

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**Oral Dysfunction Science**

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

**Main research themes**

- Research on efficient orthodontic treatment
- Research on the diagnosis and treatment of maxillofacial congenital anomalies, such as cleft lip and palate (CLP)
- Research on the role of immune cells in osteoelasticogenese
- Development of new anti-inflammatory bisphosphonate drugs that also promote bone formation
- Research on the effect of dietary habit on metabolic homeostasis
- Development of shape memory alloys that possess high biocompatibility

**Professor** | Kaoru Igarashi

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**International Oral Health**

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
- The Dental Care System and Health Gap
- Construction of a Project for Effective Prevention of the Need for Nursing Care
- Infectious Disease Countermeasures and Risk Management for Nursing Care Facilities
- Development of bone substitute with bone forming property
- Research on control of growth and invasion, and surgical reconstruction of oral tumors.
- Development of shape memory alloys that possess high biocompatibility

**Professor** | Ken Osaka

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**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

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**Oral Diagnosis**

Oral diagnosis should be defined as a systematic process of identifying oral diseases. To obtain an accurate diagnosis that decides proper and rational 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** | Takashi Sasano

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**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 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 periosteal expansion
- Research on various augmentation method for implant placement
- Research on orthodontic 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
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
- Modulation of small GTPases in osteoclasts
- Investigation of small GTPases in oral cancer proliferation, invasion and odontoblasts
- Differentiation and maturation of cells and extracellular matrices in the calcified tissue during development, regeneration and healing
- Regulatory mechanisms of small GTPases
- Elucidation of oral health factors related to general health
- Development of the method to evaluate bone quality of the regenerated bone tissue
- Study on the differentiation in the calcified tissues.

**Research on Lipid Modification of small GTPases**

- Development of the method to evaluate bone quality of the regenerated bone tissue
- Analysis of stem cell load a mechanical stress on osteoblasts
- Development of the method to evaluate bone quality of the regenerated bone tissue
- Differentiation and maturation of cells and extracellular matrices in the calcified tissue during development, regeneration and healing.
- Elucidation of oral health factors related to general health
- Modulation of small GTPases in osteoclasts
- Elucidation of oral health factors related to general health
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- Modulation of small GTPases in osteoclasts
- Investigation of small GTPases in oral cancer proliferation, invasion and odontoblasts
- Differentiation and maturation of cells and extracellular matrices in the calcified tissue during development, regeneration and healing
- Regulatory mechanisms of small GTPases

**Main research themes**
- Immunohistochemical staining of dopamine D1 receptor in human trachea.
- Expression of dopamine D1 receptor on airway smooth muscle (ASM).
- Negative control.

**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 mechanisms of calcification
- Elucidation of oral health factors related to general health
- Development of the method to evaluate bone quality of the regenerated bone tissue
- Differentiation and maturation of cells and extracellular matrices in the calcified tissue during development, regeneration and healing
- Elucidation of oral health factors related to general health
- Development of the method to evaluate bone quality of the regenerated bone tissue
- 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

**Craniofacial Development and Regeneration**

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 design of the metal implants using calcium phosphates to increase bone regeneration capability and mechanical adaptability
- Elucidation of molecular mechanisms underlying the malignant evolution of cancers.
- We have discovered an inhibitor regulation of small GTPase Ras, RalGAP. In the 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 RalGAP exhibited poorer prognosis compared to that with stronger expression. Thus, RalGAP could inhibit bladder cancer progression.

**Craniofacial Function Engineering (CFE)**

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Tohoku University Graduate School of Dentistry
Department of Community Medical Supports

Guide of course

Modification of small GTPases in osteoclasts. We are also investigating about the posttranslational and metastasis. Bisphosphonates are used for the therapy of osteoporosis by inhibiting lipid materials and new devices based on biomimetics.

Research themes

Elucidation of oral health factors related to general health
Construction of an oral health support system and program for the community
Development of the method to evaluate bone quality of the regenerated bone tissue
Elucidation of biomineralization and its application to bone regeneration using synthetic or natural polymer carriers
Surface designing of the metal implants using calcium phosphates to increase bone regeneration capacity
Remodeling of extracellular matrices in the calcified tissues during development, regeneration and healing

Clinical application of OCP/Collagen (1:1) after cystectomy. Radiopacity in the affected region at 2 days (2D) after implantation of OCP/Collagen is increased at 6 months (6M).

Intractable Diseases and Immunology

Professor Koetsu Ogasawara

Intractable 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.

Research themes

Dressed NK cell
Viral immunity
Autoimmune diseases
Metal allergy
MHC II (dressed NK cells (9-Pr)-NK cells (Red) acquire MHC II (green) from dendritic cells.

Advanced Biomaterials

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.

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

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 autoimmun 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 autoantibodies involved in the disease development and maintenance of autoimmune disorders including Siögren syndrome, 3) Regulations for the maintenance and expansion of tissue stem cells, to manipulate and regulate immune responses in oral mucosa.

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

Immune Regulation and Oral Immunity

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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
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

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 research covering not only the medical field but the agronomy and engineering fields is conducted.

Main research themes
- Basic and translational research on laser-excited radical disinfection technology
- Interaction of oxidative stress and antioxidants

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 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 research themes
- Promotion of international interdisciplinary integration researches regarding interface oral health science (Integration Research Section, International Cooperation 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)
To elucidate in vivo behavior of reactive oxygen species (ROS) and free radicals caused by a variety of factors, we plan to perform redox regulation research. For this purpose, we will conduct biological and molecular research on the effects of ROS on human defense mechanisms. We will develop new materials and devices that can maintain the health of the oral tissues and prevent oral diseases. We will also develop new quality control methods for these materials.

To ensure harmonization of patient-friendly medical care and advanced medicine, 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 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 and Tohoku University Dental Hospital were merged to become a united 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.
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.