

# Osaka University School of Dentistry 70th Anniversary International Symposium

*Landmark for  
Next-generation  
Dental BioScience*




RIHGA Royal Hotel Osaka Saturday, May 28, 2022

**Organized by** Osaka University School of Dentistry / Graduate School of Dentistry

**Co-organized by** Osaka University School of Dentistry Alumni Association

**Supported by** International station for Intractable Oral Diseases



 **Challenge to  
Intractable Oral Diseases**



Dear Colleagues and friends

It is my great pleasure and honor to invite you to Osaka University School of Dentistry 70th Anniversary International Symposium. Osaka University School of Dentistry was founded in 1951 as the first dental school in the former Imperial Universities. Since then, we have been producing excellent dental professionals who can play a dominant role in dental health and contribute to the development of global oral health science. With the establishment of Graduate School of Dentistry in 1960, we have been pursuing cutting-edge research in dental and life science fields and nowadays we are recognized as one of the top research-oriented dental institutions in the world.

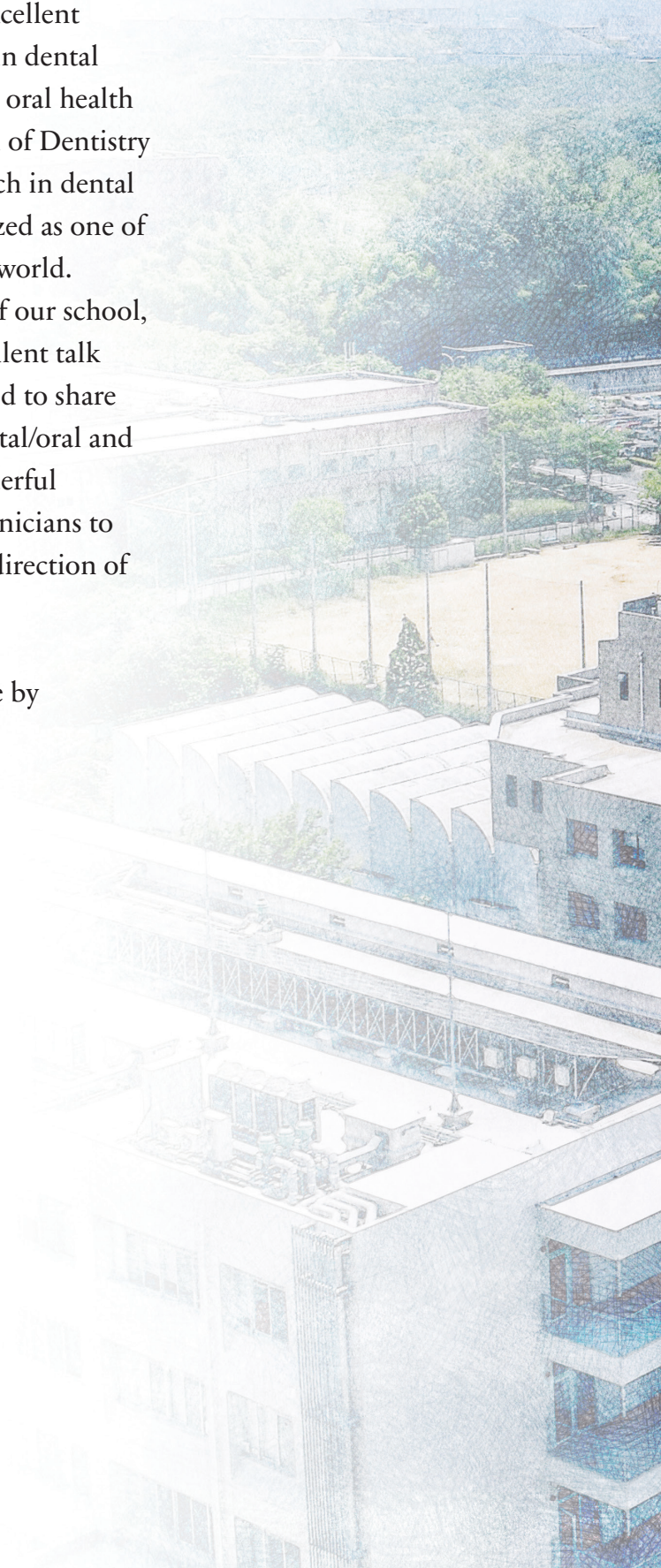
On this occasion to celebrate 70th anniversary of our school, the commemorative symposium, consisting of excellent talk given by prominent researchers in our school, is held to share our research achievements in various aspects of dental/oral and craniofacial sciences. I hope that this can be a wonderful opportunity for researchers, students, and dental clinicians to learn cutting-edge knowledge and consider future direction of dental science.

I wish all to have a very pleasant and enjoyable time by attending this symposium!!



**Prof. Satoshi Imazato**

Dean of Osaka University  
Graduate School of Dentistry/School of Dentistry

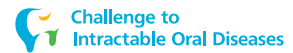








# Osaka University School of Dentistry 70th Anniversary International Symposium



## Landmark for Next-generation Dental BioScience

Date: Saturday, May 28, 2022

Venue: RIHGA Royal Hotel Osaka

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### 13:00–13:05 **Opening Remarks**

**Prof. Satoshi Imazato**

(Dean, Osaka University School of Dentistry/  
Graduate School of Dentistry)

### 13:05–13:35 **Part I**

Chair: Prof. Kazuhiko Nakano

(Vice Dean, Osaka University School of Dentistry/Graduate School of Dentistry)

### **Congratulatory Messages from Partner University Leaders**

Prof. Laurie K McCauley

(Dean, School of Dentistry, University of Michigan, USA)

Prof. Justin Durham

(Head, School of Dental Sciences, Newcastle University, UK)

Assoc. Prof. Pornchai Jansisyanont

(Dean, Faculty of Dentistry, Chulalongkorn University, Thailand)

Prof. Li-Deh Lin

(Dean, School of Dentistry, National Taiwan University, Taiwan)

Prof. Ho-Beom Kwon

(Dean, School of Dentistry, Seoul National University, Korea)

### 13:35–13:45 **Break**



**13:45–14:35**   **Part II**

Chair: Prof. Shigetada Kawabata  
(Department of Oral and Molecular Microbiology)

**13:45–14:10**   **Prof. Kazuhiko Nakano**  
**(Department of Pediatric Dentistry)**

*Streptococcus mutans* and cerebrovascular disease  
- Information update and future perspectives

**14:10–14:35**   **Prof. Riko Nishimura**  
**(Department of Molecular and Cellular Biochemistry)**

Transcriptional network in bone and cartilage development

**14:35–14:45**   **Break**

**14:45–16:00**   **Part III**

Chair: Prof. Takashi Yamashiro  
(Department of Orthodontics and Dentofacial Orthopedics)

**14:45–15:10**   **Prof. Satoshi Imazato (Department of Biomaterials Science)**

Next generation dental biomaterials  
– Material design to exhibit “bio-active” functions

**15:10–15:35**   **Prof. Atsuo Amano (Department of Preventive Dentistry)**

Gingival epithelial barrier breakdown by periodontal pathogen

**15:35–16:00**   **Prof. Shinya Murakami (Department of Periodontology)**

Future outlook of regenerative dentistry

**16:00–16:05**   **Closing Remarks**

**Prof. Mikako Hayashi**  
**(Director, Osaka University Dental Hospital)**



# *Streptococcus mutans* and cerebrovascular disease

## – Information update and future perspectives



### **Kazuhiko Nakano, DDS, PhD**

Professor and Chair  
Department of Pediatric Dentistry  
Osaka University Graduate School of Dentistry

2014-Present Professor and Chair, Department of Pediatric Dentistry, Osaka University Graduate School of Dentistry  
2011-2014 Associate Professor, Department of Pediatric Dentistry, Osaka University Graduate School of Dentistry  
2007-2011 Associate Professor, Department of Pediatric Dentistry, Osaka University Dental Hospital  
2003-2007 Assistant Professor, Department of Pediatric Dentistry, Osaka University Dental Hospital  
1997-2003 Clinical Instructor, Osaka University Dental Hospital  
1996 Resident, Osaka University Dental Hospital

### **Abstract**

*Streptococcus mutans*, a major pathogen of dental caries, is occasionally isolated from the blood of patients with bacteremia and infective endocarditis (IE). An approximately 120-kDa collagen-binding protein (Cnm protein) located on the bacterial cell surface has been reported to be an important factor for IE onset, as animal experiments using genetically engineered *S. mutans* strains have clearly demonstrated Cnm as a major factor for its development. In addition, Cnm-positive *S. mutans* strains have been more frequently identified in saliva obtained from patients with cerebral hemorrhage, a major complication of IE, as compared to that from healthy subjects. An animal model of cerebral hemorrhage revealed aggravation of cerebral hemorrhage following infection with Cnm-positive *S. mutans* via the jugular vein. Interestingly, Cnm-positive *S. mutans* strains are also often revealed in patients with cerebral micro-bleeding. Furthermore, various analyses performed using *in vitro* experiments have indicated that Cnm of *S. mutans* may inhibit hemostasis of impaired blood vessel endothelium. Although large-scale human studies are needed to better elucidate the relationship of Cnm-positive *S. mutans* with cerebrovascular disease, oral health approaches used to control this specific type of *S. mutans* may also improve the overall health of affected individuals.



# Transcriptional Network in Bone and Cartilage Development



## Riko Nishimura, DDS, PhD

Professor and Chair  
Department of Molecular & Cellular Biochemistry  
Osaka University Graduate School of Dentistry

2017-Present Council Member, Science Council of JAPAN  
2015-Present Vice Dean, Osaka University Graduate School of Dentistry  
2012-Present Professor and Chair: Osaka University Graduate School of Dentistry  
2018-2021 Assistant to President of Osaka University  
2016-2020 Program Officer, JSPS  
2015-2018 Associate Elective Director, Osaka University  
1998-2012 Associate Professor, Osaka University Graduate School of Dentistry  
1994-1997 Faculty Associate, University of Texas Health Science Center at San Antonio  
1992-1994 Instructor, New York University Medical Center  
1995 The Young Investigator Award in The American Society for Bone and Mineral Research

## Abstract

In vertebrates, the skeleton is a very dynamic organ formed by two different fashions, intramembranous and endochondral ossification. Intramembranous ossification, which starts from differentiation of mesenchymal stem cells into osteoblasts, requires two critical transcription factors, Runx2 and Osterix/Sp7. Although we demonstrated that Runx2-Osterix axis is a major transcriptional network during bone development, important transcriptional targets of Runx2 and/or Osterix is still elusive. To address this, we performed screening systems in combination with RNA-sequencing and mouse genetic approaches, and identified the target genes that are responsible for osteogenic function of Runx2. On the other hand, endochondral ossification is a unique biological event, which is sequentially and harmoniously regulated by critical transcription factors, Sox9, Runx2 and Osterix. We recently identified a transcription factor that functions as a transcriptional platform for Runx2 and Osterix at the late stage of cartilage development.

In this symposium, I would like to share and discuss our recent results and findings.

# Next Generation Dental Biomaterials

## – Material design to exhibit “bio-active” functions



### Satoshi Imazato, DDS, PhD

Professor and Chair  
Department of Biomaterials Science  
Osaka University Graduate School of Dentistry

2019-Present Dean, Osaka University Graduate School of Dentistry/School of Dentistry

2011-Present Professor, Department of Biomaterials Science, Osaka University Graduate School of Dentistry

2008-2009 President of Dental Materials Group, IADR

1999-2010 Associate Professor, Department of Restorative Dentistry and Endodontology, Osaka University Graduate School of Dentistry

1993-1994 Visiting Researcher, Department of Oral Biology, Newcastle University, UK

1991-1999 Assistant Professor, Department of Operative Dentistry, Osaka University Faculty of Dentistry

2020 IADR, Distinguished Scientist Award (Wilmer Souder Award)

2020 International Union of Societies for Biomaterials Science and Engineering, Fellow

### Abstract

Due to great advancements in materials technology, many of recent dental materials on the market demonstrate excellent clinical performance. Hence, innovation of dental materials are being directed toward a new dimension, focusing on the design to exhibit “bio-active” functions such as promotion of mineralization/hard tissue formation, control of bacterial infection, prevention of inflammation, or promotion of tissue regeneration.

We have been working on development of antibacterial restorative materials, and recently, were successful to achieve antibacterial resins with high-dense immobilized bactericide to show anti-biofilm effects in the oral environment by using a QAC-based monomer METAC. We are also developing inorganic pH-responsive glass which releases antibacterial components according to decrease in environmental pH. Those technologies enable “smart antibacterial restoratives” which show antibacterial effects *on demand*.

Based on our study to develop biodegradable polymer membrane for bone regeneration therapy, new poly(lactic acid/caprolactone) membrane with bilayered structure was successfully commercialized. This membrane is useful for GBR application due to its slower degradation, prolonged support to bone regeneration, and blocking of undesirable tissue and bacteria. Usage of this membrane in combination with gentamicin-loaded bone substitutes or large-sized stem cell constructs possessing osteogenic differentiation ability, which we are investigating, will open up new perspectives for regenerative medicine.

In this presentation, our research on those novel materials will be summarized, introducing the concept of next generation dental biomaterials with the design to exhibit “bio-active” functions.



# Gingival epithelial barrier breakdown by periodontal pathogen



## Atsuo Amano, DDS, PhD

Professor and Chair  
Department of Preventive Dentistry  
Osaka University Graduate School of Dentistry

2021-Present President, Japanese Society for Oral Health

2015-2019 Dean, Graduate School of Dentistry and School of Dentistry, Osaka University

2011-Present Professor and Chair, Dept. of Preventive Dentistry, Graduate School of Dentistry, Osaka University

2000-2011 Professor and Chair, Dept. of Oral Frontier Biology, Graduate School of Dentistry, Osaka University

1997-2000 Associate Professor, Division of Special Care Dentistry, Osaka University Dental Hospital

1992-1994 Postdoctoral fellow, Dept. of Oral Biology, School of Dental Medicine, State University of New York at Buffalo

## Abstract

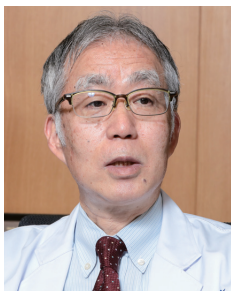
*Porphyromonas gingivalis* is one of keystone pathogens in severe and chronic manifestations of periodontal diseases. A central feature of *P. gingivalis* pathogenicity is dysregulation of innate immunity at the gingival epithelial interface; however, the molecular basis underlying *P. gingivalis*-dependent abrogation of epithelial barrier function remains unknown.

Human oral epithelial cells harbor a large intracellular bacterial load, resembling the polymicrobial nature of periodontal biofilm. *P. gingivalis* can enter gingival epithelial cells and pass through the epithelial barrier into deeper tissues. Subsequently, from its intracellular position, the pathogen exploits cellular recycling pathways to exit invaded cells, by which it is able to control its population in infected tissues, allowing for persistent infection in gingival tissues.

In addition, *P. gingivalis* has been shown to disrupt epithelial barrier function via degradation of junctional adhesion molecule (JAM1), a tight junction-associated protein, allowing bacterial virulence factors to penetrate into subepithelial tissues.

Here, I will outline the intracellular and intercellular strategies of *P. gingivalis* to disrupt epithelial barrier function and its effects on the pathogenesis of periodontitis.

# Future Outlook of Regenerative Dentistry



## Shinya Murakami, DDS, PhD

Professor and Chair  
Department of Periodontology  
Osaka University Graduate School of Dentistry

2020-Present Council Member, Science Council of JAPAN  
2019-Present Honorary Membership of American Academy of Periodontology  
2019-2020 President of Japanese Society of Periodontology  
2016-2019 Director of Osaka University Dental Hospital  
2012 President of Periodontal Research Group of the IADR  
2011-2012 President of Japanese Division of the IADR  
2002-Present Professor and Chair, Dept of Periodontology, Graduate School of Dentistry, Osaka University  
1988-1990 Visiting Fellow, National Cancer Institute, NIH, USA  
2013 IADR, Distinguished Scientist Award (Basic Research in Periodontal Research Award)  
2018 IADR/PRG, Award in Regenerative Periodontal Medicine

### Abstract

It is clinically possible to enhance the biological activities of mesenchymal stem cells within periodontal ligament and stimulate periodontal regeneration. Basic Fibroblast Growth Factor (FGF-2) is known to stimulate the proliferation, migration and differentiation of various cell types and induce angiogenesis. Through a series of clinical trials, we demonstrated that topical application of 0.3% FGF-2 into intraosseous alveolar bone defects stimulated significant periodontal regeneration and have finally established the world's first periodontal regenerative medicine (Regroth®). Interestingly, recent clinical studies have demonstrated that combination with Regroth® and osteoconductive scaffold enhanced the efficacy of this medicine. Furthermore, we found that Regroth® promoted new bone formation and subsequent osseointegration around dental implants and promoted the stability of implants with low primary stability. Another important approach for periodontal regeneration is stem cell transplantation therapy. We have tackled the auto-transplantation therapy using adipose-tissue derived multilineage progenitor cells (ADMPC). Preclinical and clinical studies confirmed that auto-transplantation of ADMPC into intraosseous alveolar bone defects stimulated periodontal regeneration in the application site. These results suggest that not only cytokine therapy using FGF-2 but also stem cell transplantation therapy using ADMPC are promising options to stimulate periodontal regeneration. In this symposium, action mechanism, efficacy and safety of these therapies are explained, and future prospect of regenerative dentistry using these therapies is discussed.





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