JADR

The 72nd Annual Meeting
of Japanese Association for Dental,
Oral, and Craniofacial Research

第 72 回　国際歯科研究学会日本部会総会・学術大会

Progressive Spirits in Dental Research: Advancing Oral Health

2024 年 11 月
16 日 (土)・17 日 (日)

November
16 (Sat) - 17 (Sun), 2024

鹿児島県 カクイックス交流センター

Kakuix Koryu Center
Kagoshima, Japan

歯周病の予防研究から生まれた「つまようじ法」歯ブラシ

pmj V7 ブイセブン

V7(ブイセブン)
コンパクトヘッド

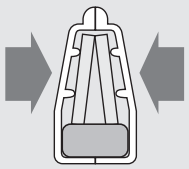
V7(ブイセブン)
レギュラーヘッド

V7(ブイセブン)
ミニヘッド

音波振動歯ブラシ
V7(ブイセブン)

2列V型植毛

長持ちキャップ



V7歯ブラシ
動画で解説

「つまようじ法」歯ブラシ
V7(ブイセブン)

★希望患者様価格(税別、商品写真左から)
レギュラーヘッド/コンパクトヘッド/
ミニヘッド各1本250円
音波振動歯ブラシ本体セット2,700円

pmj 株式会社ピー・エム・ジェー
TEL.086-244-1251 https://www.pmjv7.co.jp

PROGRAM AND ABSTRACTS OF PAPERS

JAPANESE ASSOCIATION FOR DENTAL, ORAL, AND CRANIOFACIAL RESEARCH

IADR INTERNATIONAL ASSOCIATION FOR DENTAL, ORAL, AND CRANIOFACIAL RESEARCH

72nd ANNUAL MEETING

November 16-17, 2024

Kakuix Koryu Center

Kagoshima, Japan

CONTENTS

Message from the Congress Chairman
Congress President: Tetsuya Goto

72nd Annual Meeting of the Japanese Association for Dental, Oral, and Craniofacial Research in Kagoshima.
Main theme: Progressive Spirits in Dental Research: Advancing Oral Health

Dear Craniofacial and Dental Scientists,

On behalf of the Organizing Committee, I am pleased to welcome you to the 72nd Annual Meeting of the Japanese Association for Dental, Oral, and Craniofacial Research, which will be held in the historic city of Kagoshima on November 16 and 17. This year's conference theme is "Progressive Spirits in Dental Research: Advancing Oral Health".

”Progressive Spirits" ("Shinshu-no-Kifu" in Japanese) means to inherit the will of our predecessors who played an active role in the process of change and modernization of Japan and to take on new and complex challenges willingly and boldly, without being bound by conventional practices. This progressive spirit is the very symbol of the Japanese Association for Dental, Oral, and Craniofacial Research, which has been leading dental research in Japan and around the world for about 70 years as a pioneer in dental research.

This year's Congress will celebrate the inauguration of Professor Satoshi Imazato of Osaka University as President of the International Association for Dental, Oral, and Craniofacial Research (IADR). In the conference program, there are plans for special lectures by IADR President, Professor Satoshi Imazato, a special lecture by the Editor-in-Chief of JDR, Professor Nicholas S. Jakubovics, by Chief Executive Officer of IADR, Dr. Christopher H. Fox, and by President of Korean Division of IADR (KADR), Professor Youngnim Choi. In addition, we have confirmed that Professor Makoto Michikawa, a renowned researcher in the field of dementia, and Professor Wilian Wade, a leading expert in the oral microbiome, will be giving special lectures. Furthermore, there will be symposiums held by internationally recognized experts on a wide range of topics, including dental materials, digital dentistry, regeneration, and oral sensation, as well as a Rising Scientist Session on “The Frontiers of Neuroscience in Dentistry” by up-and-coming young researchers. We hope that through lively discussions, sharp questions, and the exchange of opinions, ambitious researchers, graduate students, and undergraduate students responsible for the future of dental medicine will gain valuable experience and knowledge at this conference.

Kagoshima has an abundance of natural hot springs, so please relax after the conference. There are also historic sightseeing spots such as Senganen Garden and Kirishima Shrine. There are also many specialty products, such as Kagoshima shochu (distilled spirits made from sweet potatoes) and Kagoshima's special beef and pork, and we hope that many people will attend the conference. May your time at this wonderful conference be filled with greatest achievements and utmost delight.

Best regards,

Tetsuya Goto

Tetsuya Goto, D.D.S., Ph.D.
President of the 72nd Annual Meeting of The Japanese Association for Dental, Oral, and Craniofacial Research
Dean, Faculty of Dentistry, Kagoshima University
Professor and Chair, Department of Oral Anatomy and Cell Biology
Graduate School of Medical and Dental Sciences, Kagoshima University

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OF
JAPANESE ASSOCIATION FOR DENTAL, ORAL, AND CRANIOFACIAL RESEARCH

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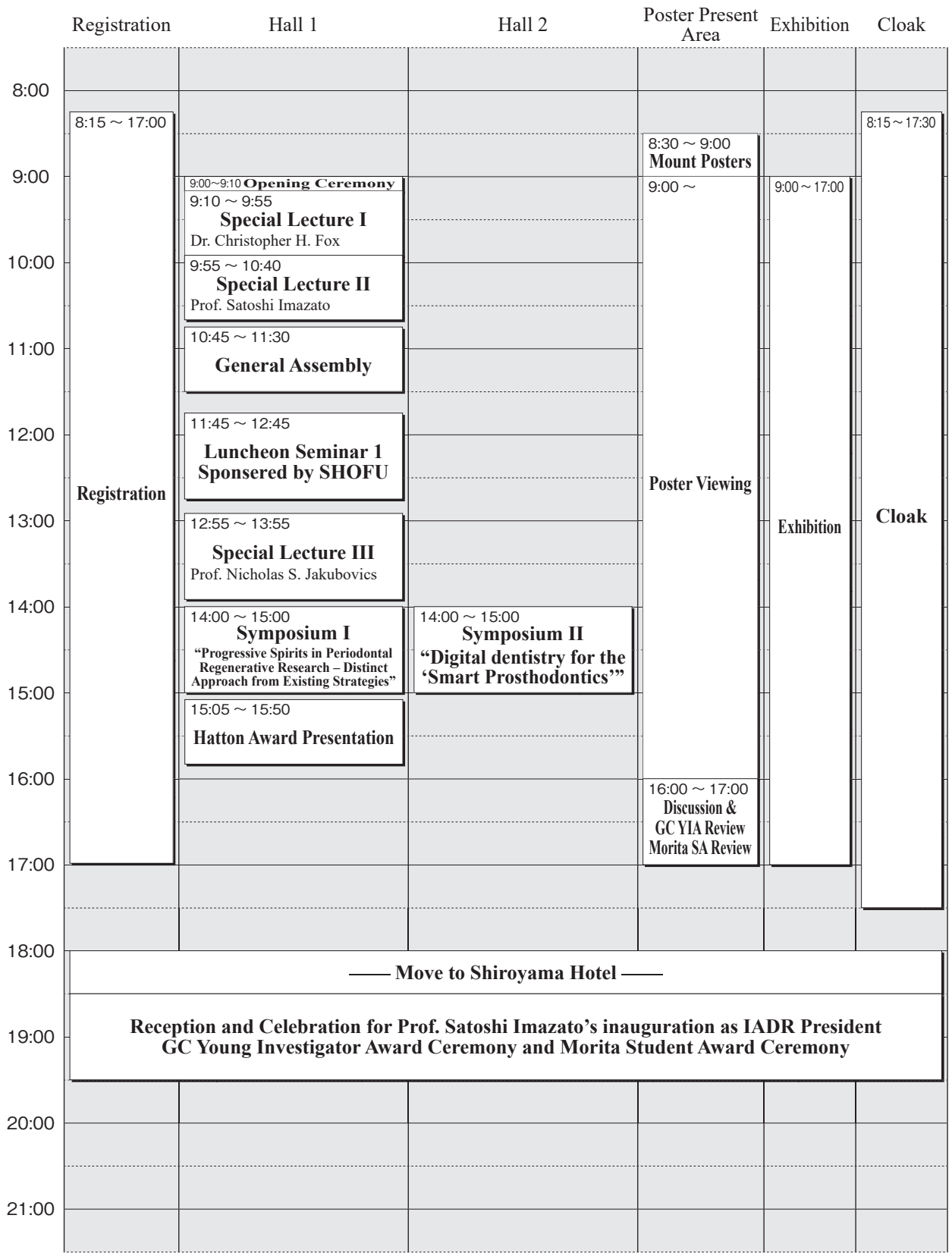
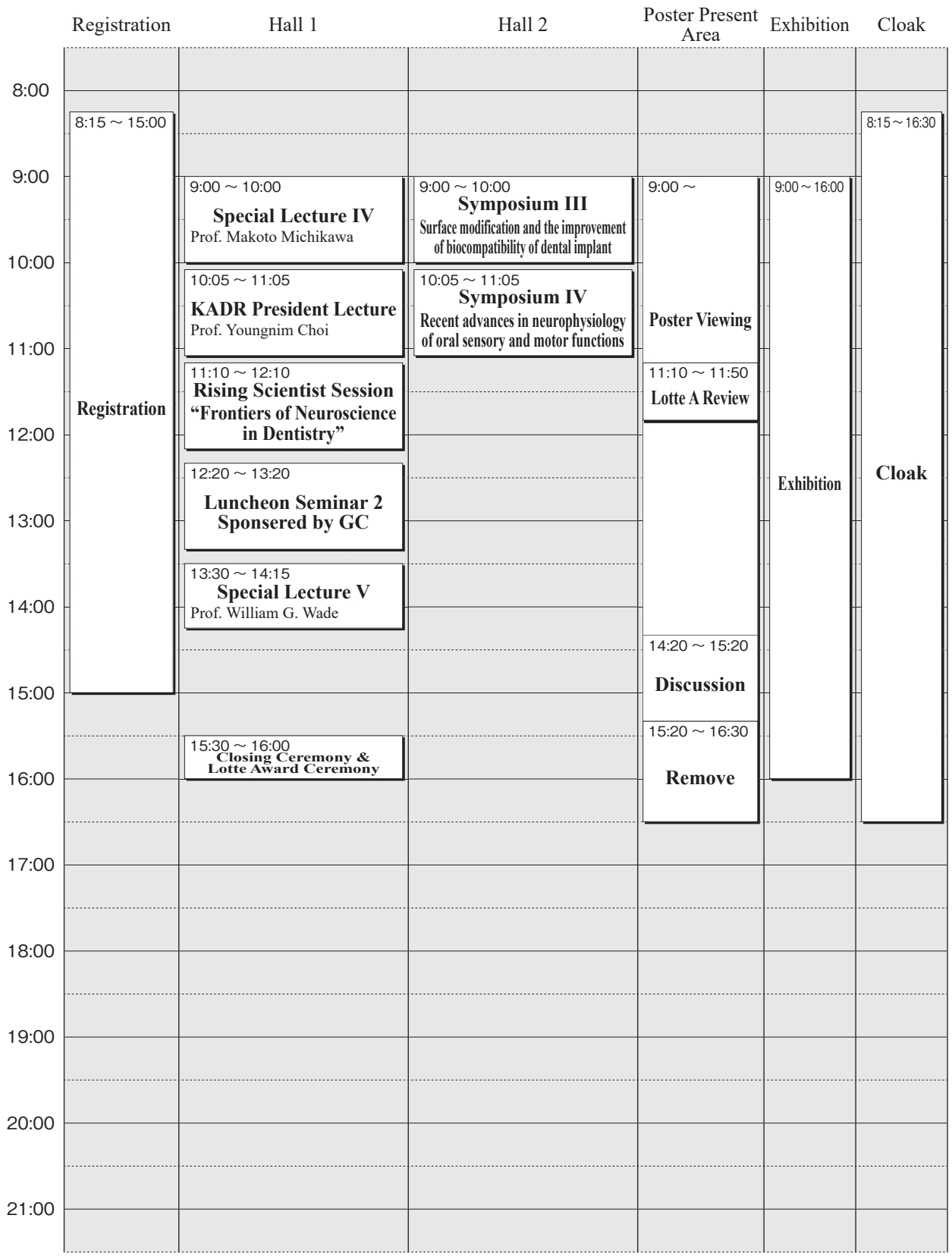
JADR Timetable November 16, 2024



JADR Timetable November 17, 2024



Information for participants

Thank you for your attendance and participation at our meeting. Following are some important points and information for you to be aware of.

1. Registration Desk

The Registration Desk is in front of the entrance to Hall 1 on the 2nd floor of the Kakuix Koryu Center.
On-site registration will be handled at the registration desk.
The registration hours during the conference are as follows.

Saturday, November 16th: 8:15 - 17:00.
Sunday, November 17th: 8:15 - 15:00.

(1) For pre-registered participants

・Please come to the Registration Desk. You will be given a name tag and a program booklet.
・Entry will be refused to those without a name tag (if you have not brought your name tag or have not received the program booklet, please visit the Registration Desk).

(2) For on-site participants

・If you are registering on the day, please do so at the Registration Desk.
・Payment can be made in cash or online by credit card.

【On-site registration fee】

JADR members :
(General 12,000 yen / Graduate student 8,000 yen / Undergraduate student 2,000 yen)
JADR temporary members :
(General 14,000 yen / Graduate student 10,000 yen / Undergraduate student 3,000 yen)
*Graduate and undergraduate students must show their student ID at the Reception Desk.
・Please, wear your name tag at all times during the conference.

(3) For participants in the reception

・apply online in advance (reception fee 10,000 yen).
・The members' reception will be held at the Shiroyama Hotel on Saturday, November 16th, from 18:30.
・On Saturday, November 16, around 5:30 p.m., a chartered bus will run from the Kakuix Koryu Center to the Shiroyama Hotel.
・From Shiroyama Hotel, two free buses will run every hour, providing access to Kagoshima Chuo Station, the Tenmonkan, and other downtown areas.
・On-the-day registration will be accepted only if the maximum number of participants has not been reached.

2. Cloak

・A cloakroom will be set up on the second floor of the Kakuix Koryu Center West Wing, behind Hall 1.
・You will be able to leave your personal items, except for valuables, personal computers and umbrellas in the cloak.
Saturday, November 16th: 8:15 - 17:30.

Sunday, November 17th: 8:15 - 16:30.

3. Luncheon Seminars

・On Saturday, November 16th and Sunday, November 17th, tickets for the luncheon seminars will be distributed from the ticket distribution counter next to the Registration Desk from the time the registration desk opens.

Information for Session Chairs and Speakers

Information for Chairs of Special Lectures and Symposiums

・Session chairs should arrive at the Registration Desk at least 20 minutes before the start of their session to confirm their attendance.
・Please arrive at the next chair's seat in your session room at least 10 minutes before the session starts and inform the staff at the Operating Desk (front of the room) that you have arrived.
Hall 1: Kakuix Koryu Center West Wing 2nd Floor
Hall 2: Kakuix Koryu Center East Wing 3rd Floor
・The chair has the right and obligation to end the presentation when the speaker's time is up. Please check the timer and make sure to finish your session on time.

Information for Presenters of Special Lectures and Symposiums

[PC Center]
・The OS of the computer prepared by the organizer will be Windows 11 and the software is PowerPoint 2021.
・We recommend a slide size of 16:9 for your presentation data.
・Please submit your presentation data and check the output at the PC Center at least 20 minutes before your presentation.
・If you are bringing your own PC, please check that your presentation is working properly at the PC Center at least 20 minutes before your presentation.
・Please make a backup copy of your data in advance to avoid data loss.
・Please note that due to the time constraints of the session schedule, it is not possible to make any changes to your presentation in the presentation room or at the PC Center, so please check your presentation in advance.
・The location and opening hours of the PC Center are as follows.
【Location】 Front of the entrance to Hall 1 on the 2nd floor of the Kakuix Koryu Center West Wing.
【Opening hours】 Saturday, 16th: 8:15 to 15:30　　Sunday, 17th: 8:15 to 13:30

[For presenters bringing data]
・The operating system of the PCs used in Hall 1 and Hall 2 is Windows 11 and the software is PowerPoint 2021.
・Please prepare your presentation in Microsoft PowerPoint.
・Please copy your presentation file onto a USB memory stick and bring it.
・Please set the presenter's name as the file name for your presentation file.
・If your presentation includes audio or video data, please be sure to bring the original data with you.
・There have been cases of virus infection via media, so please scan your data with the latest virus check software.
・The data you provide for your presentation will be deleted by the secretariat after the academic meeting.

[For presenters bringing their PC]
・There are no restrictions on the type of PC, OS, or applications you can use, but external

output is limited to the monitoring of output via HDMI. Some laptop computers may require a conversion adapter, so please make sure you bring your own conversion adapter.
・Even if you are bringing your own PC, please make sure to check that it works at the PC Center.
・Please make sure to disable screen savers, power-saving settings, and virus checks in advance.
・Please make sure to bring your own power cable. Using a battery can cause problems.
・Please make sure to bring backup data (USB memory).

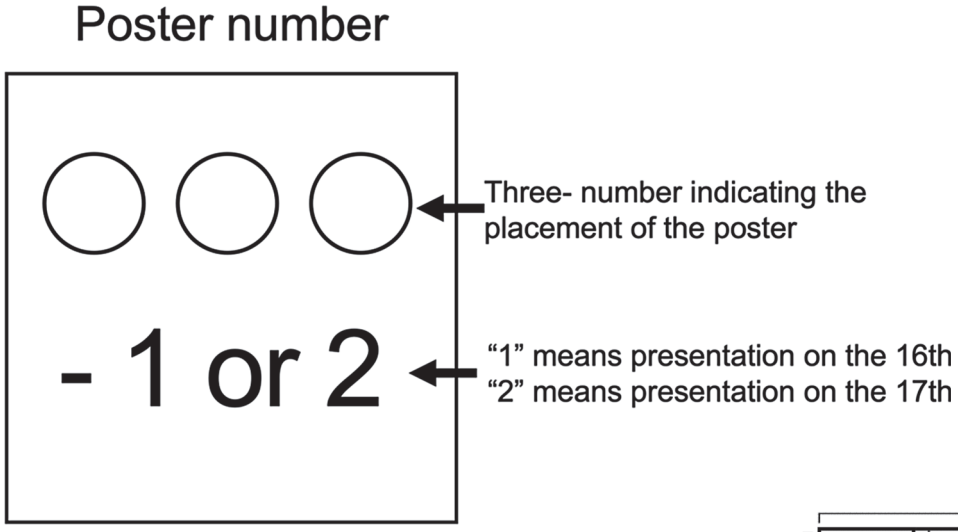
[Presentation]
・The time for each symposium presentation has been set in advance by the chairperson (organizer), so please ask the chairperson (organizer) for details.
・The language will be English.
・Please operate your PC by yourself during your presentation.
・Please arrive at the next speaker's seat at least 10 min before your presentation.

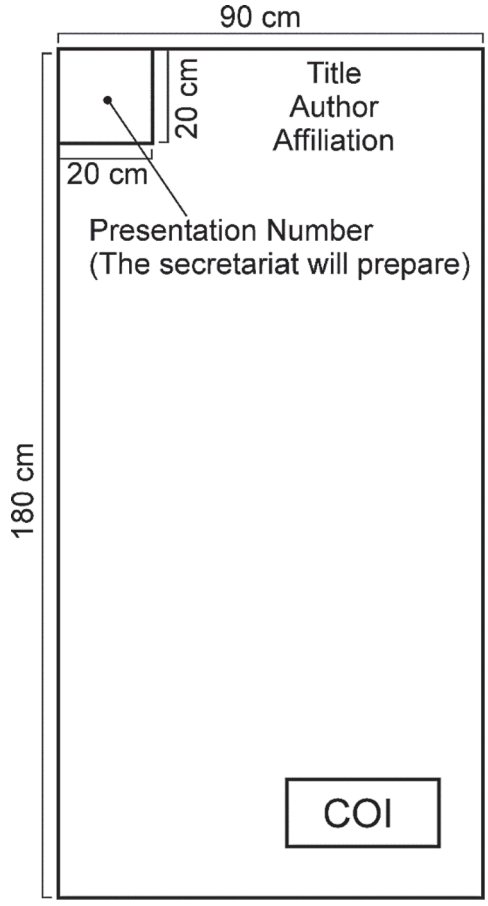
Information for Poster Presenters (Travel Award, Undergraduate Student Presentation, General Presentations)

Poster presentations will be held on the 3rd floor of the Kakuix Koryu Center East wing.

・Please attach your poster to the board using the pushpins provided by the secretariat. Tape is not allowed.
・The secretariat will have already attached the poster numbers (20cm x 20cm) to the panels.
・Please mount your poster on numbered boards using push pins provided by the on-site congress staff within the time limit (8:30 - 9:00 on November 16 (Sat.)).
・The maximum size of the poster is 90cm (width) x 180cm (height). Please display the title of the presentation, the name of the presenter, and all co-presenters in the space at the top of the panel (70cm (width) x 20cm (height)).
・During the discussion and award reviewing periods, please stand in front of your poster and answer questions from participants and reviewers.
Please hold your poster discussion during the following schedule.
・Please present the necessary information on your poster regarding the disclosure of conflicts of interest and research involving human subjects.
・The posters must be removed from 15:20 to 16:30 on November 17 (Sun.). Posters left after 16:30 will be removed and discarded by the meeting staff.

Date	Time		Poster Number
Sat. 16	16:00 -17:00	Discussion and Review of Morita SA/ GC YIA	001, 002; Travel Award posters 003-010; Undergraduate Student Posters (including Morita SA nominator) Poster with 1 at the end; General Poster (including GC YIA nominator)
San. 17	11:10- 11:50	Review of Lotte Award	012, 030, 034, 036, 080, 090, 096, 102; Lotte Award nominator
	14:20- 15:20	Discussion	Poster with 2 at the end; General Poster





Disclosure of Conflicts of Interest and Research Involving Human Subjects

[Disclosure of Conflicts of Interest]

- All presenters (including co-presenters and non-members) are required to disclose their own conflicts of interest (COI).
- Please indicate your COI status on your presentation slides or poster.

[For research involving human subjects]

- Please indicate the source of human-derived samples (including human remains) used in the relevant research on your presentation slides or poster.
- If the research (including questionnaires, etc., involving human subjects) requires approval from the facility's ethics committee, please indicate on your presentation slides or poster that the research has been approved by the facility's ethics committee.
- If you have the approval number from the facility's ethics committee, please indicate this on your presentation slides or poster.

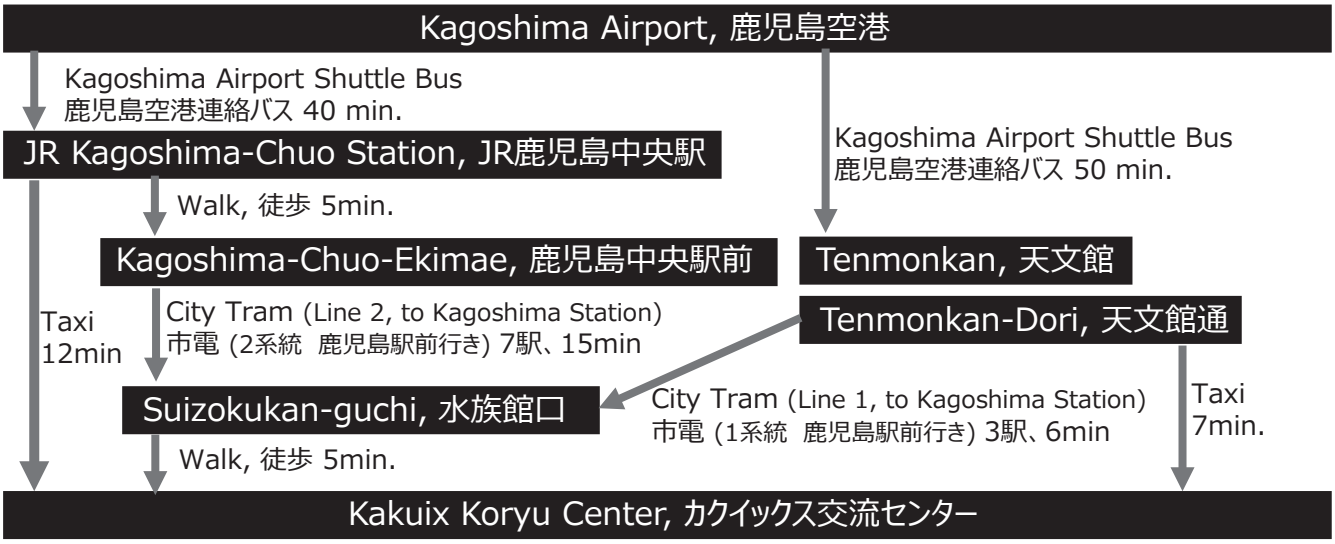
Access to the venue

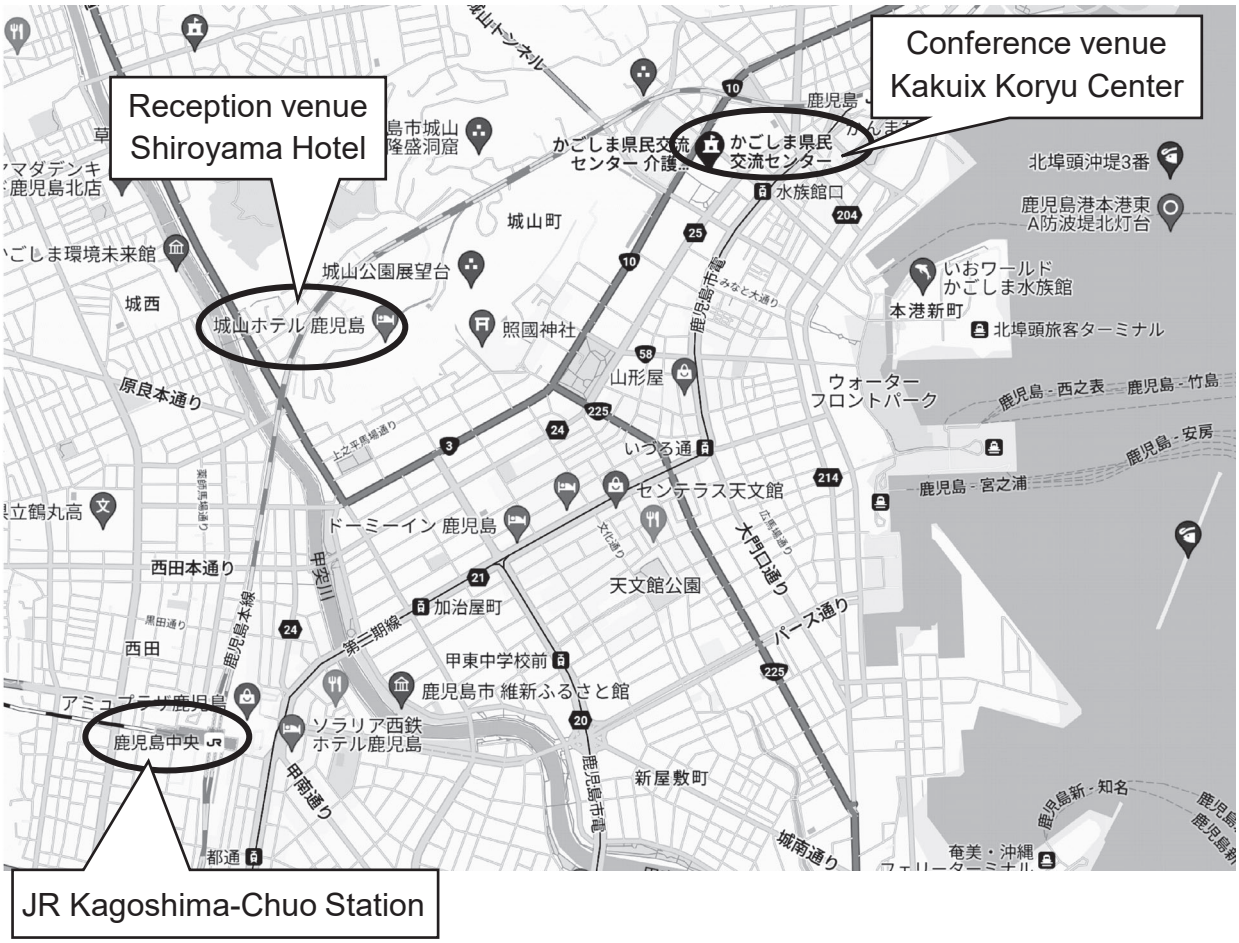
Kakuix Koryu Center カクイックス交流センター
(Kagoshima Kenmin Koryu Center かごしま県民交流センター)

•Address: 14-50 Yamashita-cyo, Kagoshima 892-0816, Japan

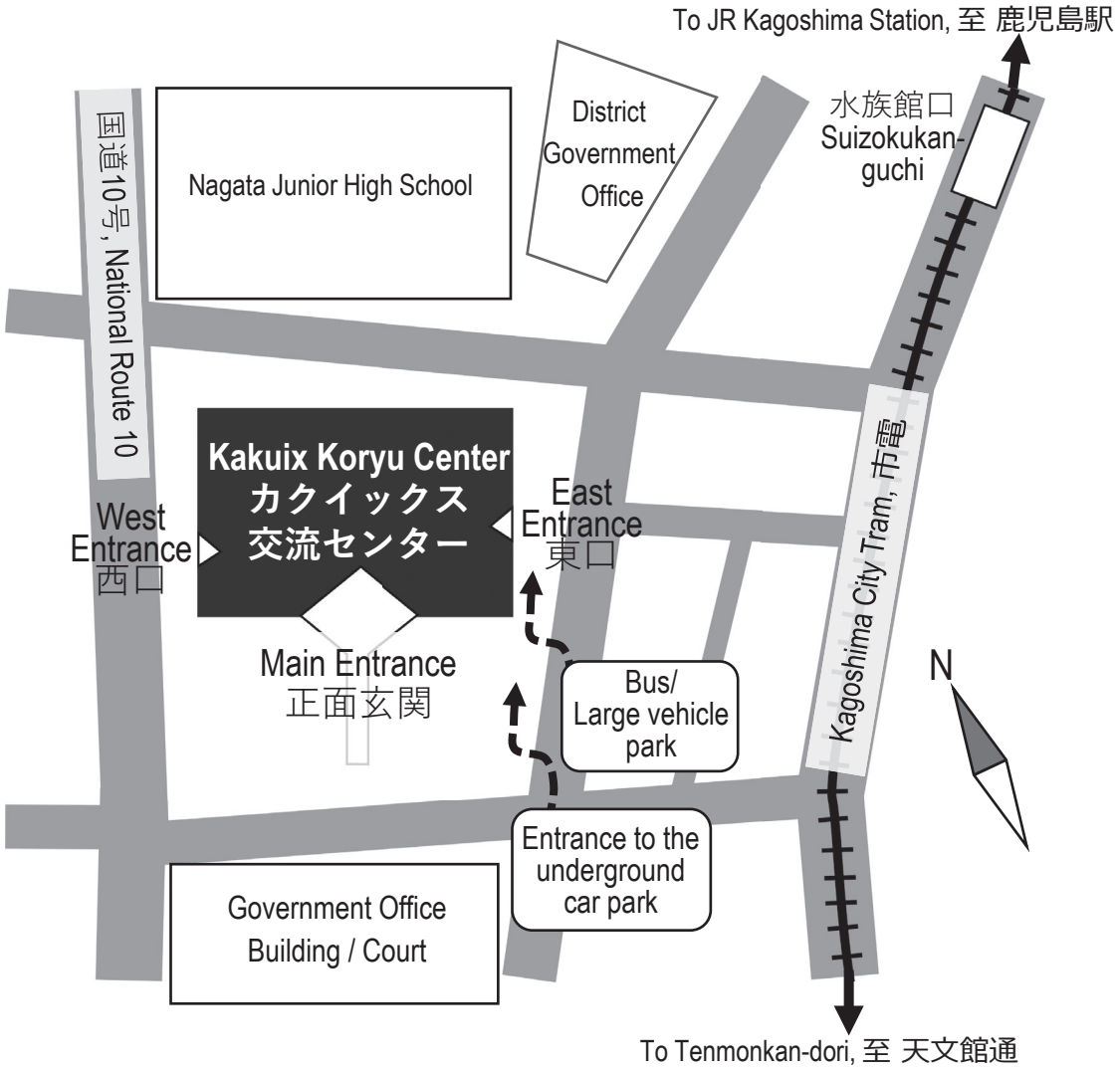
〒892-0816 鹿児島市山下町14-50

•TEL: +81-99-221-6600 / FAX: +81-99-221-6640





Around the venue



• From “Kagoshima Chuo Ekimae”, which is right next to JR Kagoshima-Chuo Station, take the Line No. 2 City Tram (bound for Kagoshima Station) and get off at the 8th stop, “Suizokukan-guchi”, which is a 4-minute walk from there.

•JR 鹿児島中央駅すぐ近くの「鹿児島中央駅前」から市電2系統（鹿児島駅前行）に乗車して、８駅目の「水族館口電停」で下車、徒歩4分

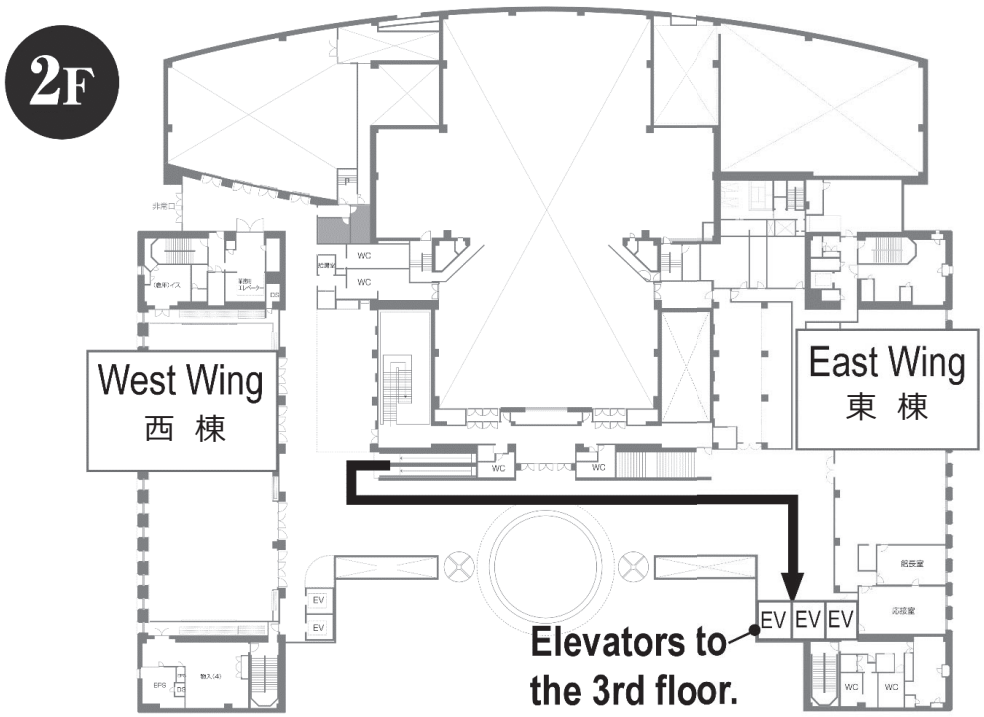
• It takes 12 minutes by taxi from Kagoshima-Chuo Station to the Kakux Koryu Center.

•鹿児島中央駅からカクイックス交流センターまで、タクシーで12分

•As there are only a limited number of accommodation options near the Kakuix Koryu Center, we recommend staying in the area around Kagoshima Chuo Station or Tenmonkan, which are both well-connected to public transport.

•カクイックス交流センター付近の宿泊施設は数が限られるため、交通の便が良い、鹿児島中央駅または天文館の周辺に宿泊するのがお薦めです。

Floor Map


2F
West Wing
西 棟
East Wing
東 棟
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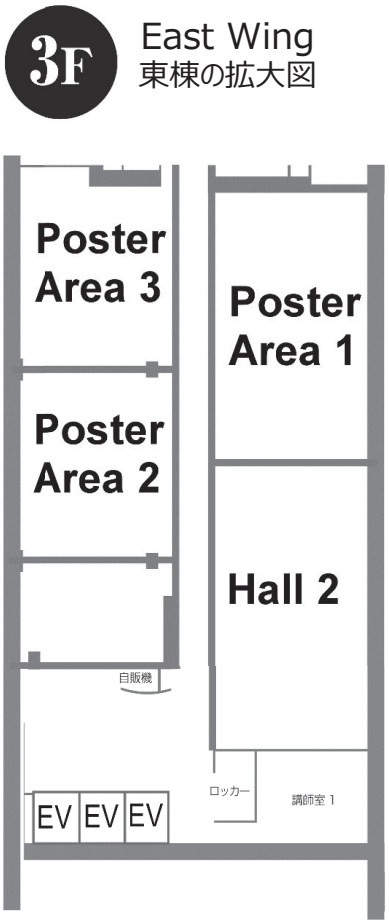
Elevators to
the 3rd floor.


2F
West Wing
西棟の拡大図
Exhibition
Cloak
Registration
総合受付
Hall 1
PC
center


3F
East Wing
東棟の拡大図
Poster
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Area 1
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Area 2
Hall 2
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November 16th, Saturday, Hall 1

9:10-9:55 Special Lecture I

Moderator: Prof. Satoshi Imazato
(President of IADR, Osaka University Graduate School of Dentistry)

SL-1 Meeting the Moment in Global Oral Health Research

Dr. Christopher H. Fox
(Chief Executive Officer, International Association for Dental, Oral, and Craniofacial Research/ American Association for Dental, Oral, and Craniofacial Research)

9:55-10:40 Special Lecture II

Moderator: Prof. Keiji Moriyama
(Department of Maxillofacial Orthognathics, Division of Maxillofacial and Neck Reconstruction, Institute of Science Tokyo)

SL-2 Trends shaping the future of dental, oral, and craniofacial research: Overview of scientific presentations at IADR General Session

Prof. Satoshi Imazato
(President of IADR, Osaka University Graduate School of Dentistry)

11:45-12:45 Luncheon Seminar 1

Sponsered by SHOFU

LS-1 GIOMER effects in the oral cavity

Prof. Emer. Junji Tagami
(Faculty of Dentistry, Chulalongkorn University/ Institute of Science Tokyo/ Aoyama Quartz Dental Clinic)

12:55-13:55 Special Lecture III

Moderator: Prof. Keiji Moriyama
(Department of Maxillofacial Orthognathics, Division of Maxillofacial and Neck Reconstruction, Institute of Science Tokyo)

SL-3 The art of publishing science: An editor's perspective

Prof. Nicholas S. Jakubovics
(Oral Microbiology, Newcastle University, and Editor-in-Chief of the *Journal of Dental Research*)

14:00-15:00 Symposium I

"Progressive Spirits in Periodontal Regenerative Research – Distinct Approach from Existing Strategies"

Moderator: Prof. Fusanori Nishimura
(Department of Periodontology, Division of Oral Rehabilitation Faculty of Dental Science Kyushu University)

SI-1 Current advances and controversies in biological molecule-based in situ periodontal tissue engineering approaches

Dr. Yoshinori Shirakata
(Department of Periodontology, Kagoshima University Graduate School of Medical and Dental Sciences)

SI-2 Development of Periodontal Tissue Regenerative Therapy Using Mesenchymal Stem Cells and Bio-3D Printer

Prof. Mikihito Kajiya
(Department of Innovation and Precision Dentistry, Hiroshima University Hospital)

SI-3 Exosomal miRNAs from gingival tissue-derived stem cells as a therapeutic strategy for periodontitis

Dr. Takao Fukuda
(Section of Periodontics, Kyushu University Hospital)

SI-4 Elucidation of Oral Aging Mechanisms and Development of Bone Regeneration Reagent

Dr. Tomoki Maekawa
(Center for Advanced Oral Science, Graduate School of Medical and Dental Sciences, Niigata University)

15:05-15:50 Hatton Award Presentation

Moderator: Prof. Takeshi Nomura
(Department of Oral Oncology, Oral and Maxillofacial Surgery, Tokyo Dental College)

Competitors of the JADR divisional second selection for Hatton Award 2025

1. The role of tumor-infiltrating B cells in oral cancer

Dr. Junsei Sameshima
(Kyushu University)

2. The Protective Effect of Amelogenin in Allogenic Skin Transplantation Model.

Dr. Miyu Shida
(Kyushu University)

3. 3D-engineered osteogenic cellular constructs for bone regenerative therapy by Direct Conversion

Dr. Mai Yoshino
(Hiroshima University)

4. The role of *Chst11*-mediated sulfation of chondroitin sulfate during palatogenesis

Dr. Mika Yokoyama
(Osaka University)

5. Interaction of two organelles via Tbc1d15 regulates mineralization

Dr. Phan Bhongsatiern
(Osaka University)

6. A novel host-pathogen interactions related to *Fusobacterium nucleatum*

Dr. Masayoshi Morita
(Osaka University)

7. Unbiased Dentin Remineralization Analysis Using X-ray Scattering Post SDF+GIC Therapy.

Dr. Xuefei Chen
(Institute of Science Tokyo)

8. Functional Analysis of *Mohawk homeobox* during Orthodontic Tooth Movement.

Dr. Suzu Chida
(Institute of Science Tokyo)

9. Bone sialoprotein regulates neutrophil homeostasis through the integrin-binding RGD domain.

Dr. Karin Nagasaki
(Tohoku University)

10. Creation of bioactive hydroxyapatite nanocrystals using topographically hierarchical titanium nano-surfaces

Dr. Takayuki Ohtake
(Tohoku University)

November 16th Saturday, Hall 2

14:00-15:00 Symposium II

“Digital dentistry for the ‘Smart Prosthodontics’”

Moderator: Prof. Hiroshi Egusa
(Molecular and Regenerative Prosthodontics Tohoku University Graduate School of Dentistry)

SII-1 Present and future of Digital Complete Denture

Prof. Manabu Kanazawa
(Gerodontology and oral rehabilitation, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo)

SII-2 The effectiveness of digital workflow in implant dentistry

Dr. Chihiro Masaki
(Division of Oral Reconstruction and Rehabilitation, Kyushu Dental University)

SII-3 AI for future prosthodontic treatment

Dr. Satoshi Yamaguchi
(AI Research Unit, Osaka University Graduate School of Dentistry
Department of Dental Biomaterials, Osaka University Graduate School of Dentistry)

November 17th Sunday, Hall 1

9:00-10:00 Special Lecture IV

Moderator: Prof. Tetsuya Goto
(Department of Oral Anatomy and Cell Biology, Graduate School of Medical and Dental Sciences, Kagoshima University)

SL-IV "Aggressive dental care" aimed at preventing the onset and progression of dementia

Prof. Makoto Michikawa
(Department of Geriatric Medicine School of Life Dentistry at Niigata, The Nippon Dental University)

10:05-11:05 KADR President Lecture

Moderator: Prof. Mikako Hayashi
(Department of Restorative Dentistry and Endodontology, Osaka University Graduate school of Dentistry)

SL-KA Why should we consider potential roles of oral dysbiosis in the pathogenesis of Sjögren's Syndrome?

Prof. Youngnim Choi
(President of KADR, Immunology and Molecular Microbiology Program
Department of Dental Science School of Dentistry Seoul National University)

11:10-12:10 Rising Scientist Session

"Frontiers of Neuroscience in Dentistry "

Moderator: Prof. Takahiro Furuta
(Department of Oral Anatomy and Neurobiology, Osaka University Graduate School of Dentistry)

RS-1 Neuronal pathway in the higher brain and function of the proprioceptive signals from jaw-closing muscle spindle

Dr. Yumi Tsutsumi
(Department of Systematic Anatomy and Neurobiology, Osaka University Graduate School of Dentistry)

RS-2 Elucidation of the receptor mechanism of masticatory muscle pain using a rat model of masticatory muscle pain.

Dr. Daisuke Ikutame
(Department of Stomatognathic Function and Occlusal Reconstruction, Graduate School of Biomedical Sciences, Tokushima University)

RS-3 The brain activity of sweet taste intensity in older adults.

Dr. Hirotaka Wada
(Department of Oral and Maxillofacial Radiology, Tokyo Dental College)

12:20-13:20 Luncheon Seminar 2

Sponsered by GC Corporation

LS-2 Biomimetics in Dentistry: Fiber-Reinforced Composite Resin for Dentin Replacement

Dr. Akram Al-Wahabi
(GC Corporation, Dental Information Center)

13:30-14:15 Special Lecture V

Moderator: Prof. Nobuhiro Takahashi
(Oral Ecology & Biochemistry Tohoku University Graduate School of Dentistry)

SL-V The resilience of the oral microbiome

Prof. Emer. William G. Wade
(Centre for Host-Microbiome Interactions, King's College London)

November 17th Sunday, Hall 2

9:00-10:00 Symposium III

Surface modification and the improvement of biocompatibility of dental implant

Moderator: Prof. Yasunori Ayukawa
(Section of Implant & Rehabilitative Dentistry, Division of Oral Rehabilitation, Kyushu University Faculty of Dental Science)

SIII-1 Surface modification and the improvement of biocompatibility of dental implant-History and perspectives of surface modification-

Prof. Yasunori Ayukawa
(Section of Implant & Rehabilitative Dentistry, Division of Oral Rehabilitation, Kyushu University Faculty of Dental Science)

SIII-2 Physical bioregulation by biomimetic titanium nanosurfaces to achieve biohybrid dental implants

Dr. Masahiro Yamada
(Division of Molecular and Regenerative Prosthodontics, Tohoku University Graduate School of Dentistry)

SIII-3 Assessment of the soft-tissue seal at the interface between the implant and the oral mucosa

Prof. Ikiru Atsuta
(Division of Advanced Dental Devices and Therapeutics, Faculty of Dental Science, Kyushu University)

10:05-11:05 Symposium IV

Recent advances in neurophysiology of oral sensory and motor functions

Moderator: Prof. Takafumi Kato
(Department of Oral Physiology, Osaka University Graduate School of Dentistry)

SIV-1 Substances leading to enhancement of the swallowing reflex and their neural mechanisms

Dr. Kiyomi Nakayama
(Department of Oral Physiology, Showa University School of Dentistry)

SIV-2 Insular cortex plays facilitative roles in nociceptive information processing

Prof. Masayuki Kobayashi
(Department of Pharmacology, Nihon University School of Dentistry)

SIV-3 Odontoblast mechanosensory/hydrodynamic receptor model explains dentinal sensitivity via the Piezo1-PANX1-P2X3 axis

Prof. Yoshiyuki Shibukawa
(Department of Physiology, Tokyo Dental College)

Poster Presentation

Travel Award Poster Presentation

Dental Materials

001-1: Efficacy of Novel Bioactive Restorative Material in Secondary Caries Prevention
Y. FU, D. LEE, N. W. SIDUP, E. YU, K. C. LI, M. EKAMBARAM, Z. MORSE, M. MEI
Faculty of Dentistry, University of Otago, Dunedin, New Zealand

002-1: Anti-inflammatory Nanoparticles Enhance Alveolar Bone Healing in Compromised Extraction Sockets.
K. SUBRAMANIAN, J. H. YUN
Department of Periodontology, College of Dentistry, Jeonbuk National University, Republic of Korea

Undergraduate Student Poster Presentation

Microbiological studies

003-1: Identification of regulating signals in *Streptococcus mutans* for oral dysbiosis
T. UEMATSU, H. SEMPUKU
School of Dentistry at Matsudo, Nihon University, Chiba, Japan

Oral Health Research

004-1: Encouraging Young Adult's Flossing In East Asia: The Hello-Floss Project
S. SONG[1], N. TAKEUCHI[1], T. SHIDARA[1], Y. OKAWAGUCHI[1], M. HIRATA[2], D. TADOKORO[3], T. KOSEKI[4]
[1]School of Dentistry, Tohoku University, Sendai, Miyagi, Japan, [2]Sendai Dental Association, Sendai, Miyagi, Japan, [3]Health and Welfare Bureau, Sendai City, Sendai, Miyagi, Japan, [4]Division of Preventive Dentistry, Tohoku University Graduate School of Dentistry, Sendai, Miyagi, Japan

Dental Materials

005-1: In vivo and in vitro studies of epithelial cell behavior around titanium, zirconium, and PEEK implant superstructures
K. KUROKI[1], K. TANAKA[2], Y. AYUKAWA[3], F. NISHIMURA[4], I. ATSUTA[2]
[1]Kyushu University, School of Dentistry, Fukuoka, Japan, [2]Section of Fixed Prosthodontics, Division of Oral Rehabilitation, Faculty of Dental Science Kyushu University, [3]Section of Implant and Rehabilitative Dentistry, Division of Oral Rehabilitation, Faculty of Dental Science Kyushu University, [4]Section of Periodontology, Faculty of Dental Science Kyushu University

006-1: Classification of calcium phosphate using SVM based on NIR spectra
T. SUZUKI[1], Y. OTSUKA[2], H. KONO[2], M. KIKUCHI[2]
[1]School of Dentsitry, Faculty of Dentistry Kagoshima University, Kagoshima, Japan, [2]Department of Biomaterials Science, Graduate School of Medical and Dental Sciences, Kagoshima University, Kagoshima, Japan.

Pediatric Oral Health Research

007-1: Trends and Determinants of Inequalities in Caries Prevalence Among 3-Year-Olds and 12-Year-Olds in Japan: An Ecological Study
Y. SHIBATA, J. AIDA
Institute of Science Tokyo, Faculty of Dentistry, Department of Dentistry,4th Year

Neuroscience

008-1: Mastication modulates ATP signaling from the mesencephalic trigeminal nucleus to the locus coeruleus
K. TAMURA[1], E. KURAMOTO[1], K. SHIMA[2], T. GOTO[1]
[1]Department of Oral Anatomy and Cell Biology, Kagoshima University, Kagoshima, Japan, [2]Department of Molecular Oral Pathology and Oncology, Kagoshima University, Kagoshima, Japan

Oral Health Research

009-1: Roles of nuclear translocation of stress-resistant transcription factor in the aging-related decrease in microvascular density
Q.Y. GUAN
The Fifth Department of Dentistry, Institute of Science Tokyo, Tokyo, Japan

Nutrition Research

010-1: Glycosaminoglycans in chicken-vegetable bone broth delay the progression of osteoporosis
Y. SEKI[1], R. OHKUMA[2], T. KARAKIDA[2], R. YAMAMOTO[2], Y. YAMAKOSHI[2]
[1]The Fifth-Grade Dental Student of Tsurumi University, Yokohama, Japan, [2]Department of Biochemistry and Molecular Biology

General Poster Presentation

Immunology

011-1: Pretreatment with alendronate augments lipid A-induced IL-1β release by ASC-deficient RAW264 cells
R. TAMAI, Y. KIYOURA
Department of Oral Medical Science, Ohu University School of Dentistry, Fukushima, Japan

012-2: Interaction of Collagen-binding Protein Cnm with Human Immunoglobulins
S. NAKA[1], D. MATSUOKA[1], K. SUEHARA[1], T. MISAKI[2], Y. NAGASAWA[3], S. ITO[4], R. NOMURA[5], Y. SUEHIRO[6], K. NAKANO[6], M. MATSUMOTO -NAKANO[1]
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013-1: Preparation of NMT1 vector for study of protein myristoylation
H. KAMOHARA[1], G. SUGIYAMA[1], T. KOMIYAMA[1], S. KUTSUNA[1], M. MATSUDA[2], M. MORIYAMA[1]

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014-2: HIF-1α increases LPS-induced IL-13 and IL-33 expression in mast cells

N. CHIBA, T. OHNISHI, T. MATSUGUCHI
Department of oral biochemistry, Kagoshima University Graduate School of Medical and Dental Sciences, Kagoshima, Japan

Microbiological studies

015-1: Effect of hematopoietic stem cell transplantation on antimicrobial resistance of Streptococcus mutans

H. OGAWA, K. GOTO, K. HIRANO, M. NAKANO
Department of Pediatric Dentistry, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Japan

016-2: Comprehensive analysis of oral bacteria related to red complex species

M. KAMETANI[1], Y. NAGASAWA[2], M. USUDA[1], A. KANEKI[1], K. SHOJIMA[2], H. YAMAZAKI[2], K. TOKUMOTO[3], D. MATSUOKA[4], K. SUEHARA[4], Y. SUEHIRO[5], T. AKITOMO[1], C. MITSUHATA[1], T. MISAKI[6,7], S. ITO[8], S. NAKA[4], M. MATSUMOTO-NAKANO[4], K. NAKANO[5], H. KISHIMOTO[3], K. SHINMURA[2], R. NOMURA[1]
[1]Department of Pediatric Dentistry, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan, [2]Department of General Medicine, Hyogo Medical University, Nishinomiya, Hyogo, Japan, [3]Department of Dentistry and Oral Surgery, Hyogo Medical University, Nishinomiya, Hyogo, Japan, [4]Department of Pediatric Dentistry, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Okayama, Japan, [5]Department of Pediatric Dentistry, Division of Oral infection and Disease Control, Osaka University Graduate School of Dentistry, Suita, Osaka, Japan, [6]Division of Nephrology, Seirei Hamamatsu General Hospital, Hamamatsu, Shizuoka, Japan, [7]Department of Nursing, Faculty of Nursing, Seirei Christopher University, Hamamatsu, Shizuoka, Japan, [8]Department of Internal Medicine, Japan Self-Defense Force Iruma Hospital, Iruma, Saitama, Japan

017-1: Acid Production of *Candida* Species and Its Resistance to Fluoride

H. RAAFAT FATHI MOUSA[1, 2], Y. ABIKO[1], J. WASHIO[1], N. TAKAHASHI[1]
[1]Division of Oral Ecology and Biochemistry, Tohoku University Graduate School of Dentistry, [2]Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Ain Shams University, Egypt

018-2: Evaluation of binding ability of specific Streptococcus mutans strains to fatty acids

K. TABATA, S. NAKA, S. NAKANO, M. MATSUMOTO-NAKANO
Department of Pediatric Dentisrty, Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences, Okayama, Japan

019-1: Elucidation of functional characteristics of membrane vesicles produced by *Streptococcus mitis*

A. MATSUMOTO[1], Y. OOGAI[1], T. SUMITOMO[2], A. TABATA[3], M. NAKATA[1]
[1]Dept. Oral Microbiol., Grad. Sch. Med. & Dent. Sci., Kagoshima Univ. Grad. Sch., [2]Dept. Oral Microbiol., Grad. Sch. Biomed Sci., Tokushima Univ. Grad. Sch., [3]Dept. Bioeng. Div. Biosci. & Bioind., Grad. Sch. Tech., Indust. & Soc. Sci., Tokushima Univ. Grad. Sch.

020-2: Bacterial-Mediated Formation of Artificial Dental Calculus

Z. LIANG[1], H. AOYAGI[1], M. NAKANO[2], T. MATSUMOTO[1]
[1]Okayama University Faculty of Medicine Dentistry and Pharmaceutical Sciences Department of Biomaterials, [2]Okayama University Faculty of Medicine Dentistry and Pharmaceutical Sciences Department of Pediatric Dentistry

021-1: Properties of Streptococcus mutans for binding to type III collagen

Y. SUEHIRO[1], M. OTSUGU[1], R. NOMURA[2], K. NAKANO[1]
[1]Department of Pediatric Dentistry, Osaka University Graduate School of Dentistry, Japan, [2]Department of Pediatric Dentistry, Graduate School of Biomedical and Health Sciences, Hiroshima University, Japan

022-2: Analysis of biological functions of Streptococcus mutans ABC transporter-related genes associated with biofilm formation

S. MATSUURA, H. ASAUMI, K. GOTO, M. MATSUMOTO-NAKANO
Department of Pediatric Dentistry, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Japan

023-1: The Klebsiella mannose phosphotransferase system promotes intestinal colonization and the production of extracellular polymeric substances from mannose

S. MIKI[1], H. KUWATA[2], H. FUKAMACHI[3]
[1]Department of Conservative Dentistry, Division of Endodontology, Showa University Graduate School of Dentistry, Tokyo, Japan, [2]Department of Oral Microbiology and Immunology, Showa University Graduate School of Dentistry, Tokyo, Japan, [3]Department of Oral Microbiology and Immunology, Showa University Graduate School of Dentistry, Tokyo, Japan

024-2: The relationship between colonization by opportunistic Candida species and local factors in patients undergoing perioperative oral function management

K. FUJISHIMA[1], T. SAKUTA[2], N. TAMAKI[3]
[1]Department of Developmental Dental Center, Oral Health Department, Kagoshima University Hospital, [2]Department of General Dental Practices, Kagoshima University Hospital, [3]Department of Preventive Dentistry, Kagoshima University Graduate School of Medical and Dental Sciences

025-1: Analysis of iron-induced biological changes in Streptococcus mutans associated with development of nonalcoholic steatohepatitis

S. NAKANO, K. TABATA, S. NAKA, M. MATSUMOTO-NAKANO
Department of Pediatric Dentistry, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama City, Japan,

026-2: Effects of chitosan properties on its antimicrobial activity against *Candida albicans*.

K. MIURA[1], M. NAKATA[2], Y. NISHITANI[1]
[1]Department of Restorative Dentistry and Endodontology, Research Field in Dentistry, Medical and Dental Science Area, Research and Education Assembly, Kagoshima University, Kagoshima, Japan, [2]Department of Oral Microbiology Kagoshima University, Kagoshima, Japan

Periodontal Research

027-1: Combined Effects of FGF-2 and Carbonate Apatite: A Preclinical Study

N. MIYATA[1], S. MORI[1,2], T. MURAKAMI[1], D. MATSUGAMI[1], W. YOSHIDA[1], T. BIZENJIMA[3], K. IMAMURA[1,2], F. SESHIMA[1], A. SAITO[1,2]
[1]Department of Periodontology, Tokyo Dental College, [2]Oral Health Science Center, Tokyo Dental College, [3]Chiba Dental Center, Tokyo Dental College

028-2: miR-1260b Promote Anti-inflammatory M2 Macrophage by Targeting NFAT5

C. HAYASHI, T. FUKUDA, M. SHIDA, M. TOYODA, K. KAWAKAMI, M. XIAO, Z. WANG, J. LI, A. MWANNES, T. SHINJO, T. SANUI, F. NISHIMURA
Department of Periodontology, Division of Oral Rehabilitation, Faculty of Dental science, Kyushu University, Fukuoka, Japan

029-1: Fatty-acid-based ionic liquids with high biocompatibility for subgingival biofilm therapy

M. YANAGAWA, M. NAKAJIMA, Y. CHUNYANG, L. ZEGARRA CACERES, K. TABETA
Division of Periodontology, Department of Oral Biological Science, Niigata University Graduate School of Medical and Dental Sciences, Niigata, Japan

030-2: Periodontal ligament modulates osteoclast dynamics in periodontitis

T. IWAYAMA, Y. YOSHIDA, Y. KOKETSU, S. MATSUMOTO, P. BHONGSATIERN, E. TSUBOI, S. MURAKAMI, M. TAKEDACHI
Periodontology and Regenerative Dentistry, Osaka University Graduate School of Dentistry

031-1: Single Intrapalatal injection erythromycin-loaded microparticle mitigate alveolar bone loss and enhances bone regeneration in periodontitis

M. SURBOYO[1, 2], K. SIRISEREEPHAP[1,3], P. FADHLALLAH[2,4], F. MEIWEN[1], A. ROSENKRANZ[1], T. MAEDA[1], R. TAKABATAKE[5], T. MAEKAWA[1]
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032-2: Metformin suppresses inflammation-induced VCAM-1 expression on endothelial cells

T. ZEZE, T. SHINJO, N. RYO, H. OTSUKA, A. AL-KAFEE, G. DILIMULATI, K. SATO, M. IMAGAWA, Y. NISHIMURA, A. YAMASHITA, F. NISHIMURA
Section of Periodontology, Division of Oral Rehabilitation, Faculty of Dental Science, Kyushu University

033-1: Senescent cells in severe periodontitis with occlusal trauma

Y. WANG[1], M. NAKAGAWA[1], A. NISHIURA[2], R. KANDA[3], Z. DENG[1], S. ZHENG[1], Y. MATUSHIMA[1], L. YU[1], Y. HONDA[1]
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034-2: MAIT Cells Drive Periodontitis Associated With Leukocyte Adhesion Deficiency Type1

T. KAJIKAWA[1], S. YAMADA[1], G. HAJISHENGALLIS[2]
[1]Department of Periodontology and Endodontology, Tohoku University Graduate School of Dentistry, Sendai, Miyagi, Japan, [2]Department of Basic and Translational Sciences, Laboratory of Innate Immunity and Inflammation, Penn Dental Medicine, Philadelphia, PA, United States

035-1: Periodontal disease related gene *SIGLEC5* is involved in barrier function of the gingival epithelial cell layer via a transcription factor HMX3

Y. KATO
Department of Preventive Dentistry, Graduate School of Dentistry, Osaka University, Japan

036-2: Glomerular HPGDS-PGD2 axis may contribute to periodontitis-related exacerbation of diabetic nephropathy

T. SHINJO[1, 2], K. SATO[1], T. ZEZE[1], M. IMAGAWA[1], H. OTSUKA[1], A. AL-KAFEE[1], M. IWASHITA[3], A. YAMASHITA[1], H. YOKOMIZO[4], F. NISHIMURA[1]

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037-1: Gingipain plays crucial roles in preterm birth caused by *P. gingivalis*-odontogenic infection

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[1]Department of Oral and Maxillofacial Pathobiology, Graduate School of Biomedical and Health Sciences, Hiroshima University, [2]Collaborate Research Laboratory of Oral Inflammation Regulation, Graduate School of Biomedical and Health Sciences, Hiroshima University

Oral Health Research

038-2: Immunohistochemical study on the abnormal expression of tubular SGLT2 in diabetes model mice with malocclusion-induced hyperglycemia

K. KOICHIRO[1], Y. SAWA[2]

[1]Division of Orthodontics, Fukuoka Dental College, Fukuoka, Japan, [2]Deparment of Oral Function & Anatomy, Okayama University, Okayama, Japan

039-1: The Osteocyte Epitranscriptome in Hyperglycemia

A. MARAHLEH[1, 3], R. JIAYI[1], S. RASHAD[2], F. OHORI[1], H. KITAURA[1]

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040-2: Mediating Effect of Dental Prosthetics on Chewing Ability Recovery

M. HARADA[1], S. UMEMORI[1], Y. MATSUYAMA[2], H. NITTA[1], J. AIDA[2]

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041-1: Chewing Difficulty and Inequalities in Dementia

S. SHIMADA, Y. MATSUYAMA, J. AIDA

Department of Oral Health Promotion, Institute of Science Tokyo

042-2: Oral Condition of Older Adults Experiencing Cognitive Decline

R. CHAICHIT[1], S. CHATA[2]

[1]Preventive Dentistry, Faculty of Dentistry, Khom Kaen University, Muang, Khon Kaen, Thailand, [2]Department of Dental Public Health, Ban Phang Hospital, Muang, Khon Kaen, Thailand

043-1: Factors associated with nutritional status in patients with removable dentures: a cross-sectional study

R. KAWATA[1], H. SAKO[1], Y. ABE[1], Y. KUSUMOTO[2], T. YOKOI[2], T. MATSUMOTO[1], S. YOKOYAMA[2], K. BABA[1]

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Tokyo, Japan

044-2: A case report of suspected Erdheim-Chester disease in the mandible

A. HAGIMOTO[1], H. ABE[1], Y. KAWABATA[2], Y. KAWASHIMA[2], H. INDO[1], T. SASAHIRA[3], T. TANAKA[1]

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045-1: Factors associated with masticatory performance in patients with removable dentures after oral tumor surgery

T. KOSAKA, K. IKEBE

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Nutrition Research

046-2: Rhyolite Particles as Lipid Digestion Emulsifier, Suppressing Weight Gain

P. SUNG[1], A. BIKHARUDIN[1], A. OTAKA[1], M. OKADA[2], T. MATSUMOTO[1]

[1]Department of Biomaterials Faculty of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Okayama, Japan, [2]Department of Dental Biomaterials, Tohoku University

047-1: Impact of complete denture treatment and dietary counseling on nutritional status: a randomized controlled trial

H. SAKO[1], R. KAWATA[1], Y. ABE[1], Y. KUSUMOTO[2], T. MATSUMOTO[1], T. YOKOI[2], Y. HATANAKA[3], T. MUKAI[4], M. HARA[1], S. YOKOYAMA[2], J. FURUYA[3], K. BABA[1]

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Health Services Research

048-2: Disgust ratings of visual dental stimuli in dental patients

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Department of Pediatric Dentistry, School of Life Dentistry at Tokyo, Nippon Dental University

Education Research

049-1: The Effect of Voluntary Training with Real-Time Monitoring on the Quality of Cardiopulmonary Resuscitation

S. YOSHIMINE, K. YAMASHITA, Y. HIGA, A. UTO, M. SUGIMURA

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Dental Anesthesiology

050-2: A new adhesive tape designed for secure nasotracheal tube in dental treatment under general anesthesia : a randomization trial of efficacy

J. MUNSIL, R. KAEWKUNLAYA, P. PHENGKLANG, D. RUMMASAK, K. SAISO, A. SANOMSRI, P. ADNONLA
Anesthesia Unit, Faculty of Dentistry Mahidol University, Ratchathewi, Bangkok, Thailand

051-1: Autonomic nervous system evaluation of a patient prior to extraction of the impacted mandibular third molar

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Dental Materials

052-2: Storage Stability Of Neutral Electrolyzed Water By Two-stage Electrolysis

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[1]Division of Biomaterials, Department of Oral Functions, Kyushu Dental University, [2]Division of Comprehensive Dentistry, Department of Oral Functions, Kyushu Dental University

053-1: A novel porcine-derived 3D collagen scaffold enhancing osteoblastic like cells behavior

T.Y. LINN[1], T. RENN[1], E. SALAMANCA[1], W. CHANG[1, 2]
[1]School of Dentistry, Taipei Medical University, Taipei, Taiwan, [2]Dental Department, Shuang-Ho Hospital, Taipei Medical University, Taipei, Taiwan

054-2: Impact of Silver Diamine Fluoride on Resin Composite Bond Strength: An In Vitro Study with Various Adhesive Systems.

M. S. SEHAT
Dental Implants Research Center, Dental Research Institute, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran

055-1: Li/Sr-releasing bioactive glasses exerting anti-inflammatory effects and promoting odontoblastic differentiation

H. SAKAI[1], J. SASAKI[1,2], G. ABE[2], N. FUNAYAMA[2], T. KOHNO[2], H. KITAGAWA[1,2], S. IMAZATO[1,2]
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056-2: Impact of Crown and Core Materials Combination on Thermal Behavior

N. MURAKAMI, K. KOMINE, J. WADA, T. YAMAZAKI, S. ZOU, N. WAKABAYASHI
Advanced Prosthodontics, Institute of Science Tokyo, Tokyo, Japan

057-1: Shaping Ability of Heat-treated Nickel Titanium Rotary Instrumentsin Simulated S-Shaped Canal

T. SAMAKSAMARN
Department of Restorative Dentistry, Faculty of Dentisstry, Khon Kaen, Khon Kaen, Thailand

058-2: Effect of SDF on Bond Strength of Glass Ionomer to Demineralized Dentin

E. SHIDA, K. TANAKA, T. SATO

GC Corporation R&D Department

059-1: An effective recycling approach for residual dental zirconia

H. YANG[1], K. YAMANAKA[2], J. R. VANEGAS SÁENZ[1], G. HONG[1]
[1]Division for Globalization Initiative, Liaison Center for Innovative Dentistry, Tohoku University, Sendai, JAPAN, [2]Institute for Materials Research, Tohoku University, Sendai, Japan

060-2: Dental resins incorporating NucB-releasing particles for controlling oral biofilm

T. WU[1], H. KITAGAWA[1,2], N.S. JAKUBOVICS[2], K. TSUIKI[1], M. GERMAN[2], S. IMAZATO[1]
[1]Department of Dental Biomaterials, Osaka University Graduate School of Dentistry, Suita, Osaka, Japan, [2]School of Dental Sciences, Faculty of Medical Sciences, Newcastle University, Newcastle, UK

061-1: Structural Transformations in Strontium-Doped Hydroxyapatite Synthesized via Mechanochemistry

Y. OTSUKA[1], A. RAWAL[2], B. BEN-NISSAN[3], K. PRAMOD[4], H. KONO[1], M. KIKUCHI[1]
[1]Department of Biomaterials, Kagoshima University, Kagoshima, Japan, [2]Nuclear Magnetic Resonance Facility, University of New South Wales, NSW, Australia., [3]School of Life Sciences, University of Technology Sydney, NSW, Australia., [4]School of Materials Science and Engineering, University of New South Wales, NSW, Australia.

062-2: Flexural Strength Of Layered Resin Composite Restoration

S. WONGKHANTEE
Restorative Dentistry, Khon Kaen University, Meung, Khon Kaen, Thailand

063-1: Development of a new denture material cleaning method using agar particle blasting

N. HARAKAWA[1], H. SATO[1], A. MIYAKE[2], Y. KAMEYAMA[1], Y. TASHIRO[3], S. KODAMA[1], S. KOMASA[4]
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064-2: Magnesium Oxide-Coated Porcine Bone Graft Enhances Osteoblast Differentiation: In vitro study

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[1]Department of Biomedical Engineering, Ming-Chuan University, Taoyuan, Taiwan, [2]School of Dentistry, Taipei Medical University, Taipei, Taiwan, [3]School of Dental Technology, Taipei Medical University, Taipei, Taiwan

065-1: Strontium-releasing bioactive glass particles for dentin remineralization

Y.-S. FAN[1], T. KOHNO[2], H. KITAGAWA[1,2], N. FUNAYAMA[2], L. XIAO[2], R. KITAGAWA[1,3], J.-I. SASAKI[1], Y.-C. CHIANG[4], S. IMAZATO[1,2]
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066-2: Effect of Touch-Cured Resin Cement and Bioceramic Sealer on Pull-Out Bond Strength.

P. EAMSA-ARD[1], P. YODMANOTHAM[2], J. BOONSOD[3], N. SAISUEB[3], T. ROONGTHITITHUM[3], M. KANJANAPRAPAS[3], S. NIDPIROM[3], V. WORAPAIBOON[3], W. KAEWCHUEN[3]

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067-1: Sodium alginate bonded mounted wheels with gelatine to increase bond strength for dry precision polishing of pure titanium

K. TAGAMI[1], H. SATO[1], Y. KAMEYAMA[1], H. ISHIHATA[4], Y. TASHIRO[2], S. KODAMA[1], A. MIYAKE[3], Y. KOMASA[3], S. KOMASA[5]

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Lasers & Bio-photonics Group

068-2: Quantitative Analysis of the Effect of Er;Cr;YSGG Laser on the Microhardness of Human Root Dentin

N. NGUYEN

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Mineralized Tissue

069-1: Cementocytes under mechanical environments promote osteo/cementogenesis via Piezo1 signaling pathway

E. NEMOTO[1], X. KAI[1,2], C. LIYING[1,2], F. MUHAMMAD[1], Y. SAKISAKA[1], S. SUZUKI[1], T. TENKUMO[3], S. YAMADA[1]

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070-2: Identification of Key Genes Involved in Root Resorption

S. ABE

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071-1: Innate Lymphoid Cells Promote Alveolar Bone Formation

Y. SATO[1], T. KONDO[1,2], H. EGUSA[1]

[1]Devision of Molecular & Regenerative Prosthodontics, Tohoku University Graduate School of Dentistry, Sendai, Japan, [2]Department of Next-generation Dental Material Engineering, Tohoku University Graduate School of Dentistry, Sendai, Japan

072-2: Femur bone Marrow Formation: Enzyme and Macrophage Roles

N. MAHMOUD, R. MUSA, K. FUJITA, A. OTAKA, T. MATSUMOTO

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University of Okayama, Okayama, Japan

073-1: Chemo-dynamic perspective on bone formation in ligature mouse model

R. MUSA[1], P. SUNG[1], N. NAGAOKA[2], T. MATSUMOTO[1]
[1]Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences Department of Biomaterials, [2]Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences Department of ARCOCS

074-2: Spatiotemporal expression patterns of Msx2 and CEBPA during mouse amelogenesis

M. NAKATOMI
Dept. of Human, Information and Life Sciences, Sch. of Health Sciences, Univ. of Occupational and Environmental Health

075-1: 3D-engineered osteogenic cellular constructs for bone regenerative therapy by Direct Conversion

M. YOSHINO, T. YOSHIMOTO, M. KAJIYA
Center for Oral Clinical Examination, Hiroshima University Hospital, Hiroshima, Japan

Cariology Research

076-2: Enhanced dentin remineralisation by fluoride-containing varnish and SDF

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[1]OSAKA UNIVERSITY GRADUATE SCHOOL OF DENTISTRY Department of Restorative Dentistry and Endodontology, [2]Northwestern University Department of Materials Science and Engineering.

077-1: Comparative Evaluation of the Remineralizing Effect of Fluoride Varnish, Clinpro™ 5000, and Remin Pro cream, on the Remineralization of Primary Teeth Enamel: An In Vitro Study

K. SALEM[1,2], M.L. BAGHAL[2], K. SAATI[3], A.R. DEHKORDI[4]
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Salivary Research

078-2: Cariogenic potential of hyperglycemia-induced migration of circulating metabolites into the oral cavity

A. SAKANAKA[1], S. MAYUMI[1], M. INOUE[1], M. KUDO[1], D. KURITA[1], A. AMANO[1], I. SHIMOMURA[2], E. FUKUSAKI[3], M. KUBONIWA[1]
[1]Department of Preventive Dentistry, Osaka University Graduate School of Dentistry, [2]Department of Metabolic Medicine, Osaka University Graduate School of Medicine, [3]Department of Biotechnology, Osaka University Graduate School of Engineering

Digital Dentistry

079-1: Calculating the levels of dental plaque in multiple zones of the teeth based on a 3D intraoral scanner

S. ON[1], K. LIN[1], H. KO[2], K. CHIN[2], E. SO[3,4]
[1]Deptment of Informationl Management, National Formosa University, Yulin, Taiwan, [2]Metal Industries Research & Development Centre, [3]Kaohsiung Medical University Hospital, [4]Kaohsiung

Municipal Cijin Hospital

080-2: Adhesion of *Streptococcus mutans* to additive-manufactured occlusal splint materials

J. WADA[1, 2], K. WADA[2,3], M. GIBREEL[2], S. GAROUSHI[2], N. WAKABAYASHI[1], T. IWAMOTO[3], P. K. VALLITTU[2,4], L. LASSILA[2]

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081-1: Integrating Transformers with Probabilistic Diffusion for Enhanced Digital Inlay Restoration

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082-2: Transformer-Based Deep Learning for Automatic Tooth Arrangement in Clear Aligner Therapy: A Predictable Constraint Approach

C. TENG[1], Y. LIN[1], H. HSU[2,3]

[1]Deptment of Informationl Management, National Formosa University, Yulin, Taiwan, [2]Department of Oral and Maxillofacial Surgery, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan, [3]School of Oral Hygiene, College of Dental Science, Kaohsiung Medical University, Kaohsiung, Taiwan

083-1: Development of database for dental implant surgery using MR devices

M. MUKAI[1], M. KANAZAWA[1], M. IWAKI[2], E. MARUKAWA[3], M. SHIMOGISHI[3], Y. KOMAGAMINE[1], T. HADA[2], C. CHANG[1], M. KANAUCHI[4], Y. MORINAGA[4], Y. ASAI[4], A. KOHAMA[4]

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084-2: Computer-assisted accurate tumor resection and functional reconstruction of mandibular defects

K. NISHI[1], K. YAMASHIRO[1], H. HIJIOKA[2], M. BEPPU[1], Y. GOTO[1], K. KUME[1], T. OKUI[1]

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085-1: Esthetically restorative design and treatment via digital dentistry for spaced and conical-shaped dentition

P. UASUWAN

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086-2: Evaluation of automatically generated crown designs based on occlusion types

N. H. M. M. HLAING, J. LEE

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Dentistry, Seoul, Korea (THE REPUBLIC OF KOREA)

087-1: Enhancing Full Arch Implant Restorations Using Digital Technology: A Case Study on the Application of the PIC Camera®

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Diagnostic Sciences

088-2: Melting curve analyses in the quantitative real-time polymerase chain reaction of methylated/non-methylated DNA, toward the detection of oral cancer using gargle fluid

Y. NOMA[1], H. SAWAYAMA[2], K. YAMASHIRO[1], K. NISHI[1], H. YOSHINAGA[1], R. TAKAOKA[1], T. SUGIURA[3], T. SASAHIRA[4], T. HAMADA[5], Y. SUDA[2], T. OKUI[1]
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089-1: Association of vitamin D and related biomarkers with temporomandibular disorders

J. CHUNG[1, 2], J. HONG[1], H. KIM[1], J. JANG[1,2]
[1]Department of Oral Medicine and Oral Diagnosis, School of Dentistry, Seoul National University, Seoul, Korea, [2]Department of Oral Medicine, Seoul National University Dental Hospital, Seoul, Korea

090-2: What causes joint effusion, disc displacement or degenerative bone changes?

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091-1: Consideration of the optimal solution when analyzing the trade-off between the contribution rate of image observations and the number of imaging types in orthodontic diagnosis

N. IKEDA, C. TANIKAWA, T. YAMASHIRO
Department of Orthodontics and Dentofacial Orthopedics, Graduate School of Dentistry, Osaka University, Osaka, Japan

Pediatric Oral Health Research

092-2: Alveolar bone density evaluations in child odonto-hypophosphatasia patients using orthopantomography

M. TAKAGI[1], Y. SUEHIRO[1], R. OKAWA[1], T. NAKAMOTO[2], N. KAKIMOTO[2], K. NAKANO[1]
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Oral Medicine and Pathology

093-1: MCTP2 induced epithelial mesenchymal transition and invasion via TGFb1 in oral squamous cell carcinoma

Y. SHIMOJUKKOKU[1, 2], A. TOMISHIMA[1], K. SHIMA[1], Y. OKU[1], K. KAWAGUCHI[1], Y. KAJIYA[1], T. TSUCHIYAMA[3], T. ISHIDA[2], K. ISHIHATA[2], T. SASAHIRA[1]
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094-2: Combined effects of butyrate and calcitriol on oral host cells

N. ELSAYED, J. WASHIO, N. TAKAHASHI
Division of Oral Ecology and Biochemistry, Tohoku University Graduate School of Dentistry

095-1: Comparative analysis of zoledronic acid administration routes and periodontitis on the development and severity of bisphosphonate-related osteonecrosis of the jaw in mice

P.M.E. FADHLALLAH[1,2], M.D.C. SURBOYO[2,3], M. KOGA[1], A. ROSENKRANZ[3], T. MAEDA[3], K. TOMIHARA[1], T. MAEKAWA[3]
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096-2: Primary Human Oral Cancer Organoid-Derived Air-Liquid Interface Cultures: A Novel Model for Studying Oral Squamous Cell Carcinoma Invasion

T. NGUYEN, Y. KAJIYA, Y. SHIMOJUKKOKU, K. SHIMA, T. SASAHIRA
The Department of Molecular Oral Pathology and Oncology, Kagoshima University, Kagoshima, Japan

097-1: Single-nucleotide polymorphisms in *FTO*, *GNL3*, and *DOT1L* could be associated with the development of temporomandibular joint osteoarthritis: Clinical and *in silico* study

E. ONO[1], R. TAKAOKA[1], M. ONO[2,3], Y. UEDA[1], S. MORIOKA[1], R. YAMAMOTO[1], Y. TAKAHARA[1], A. AIHARA[1], K. NOMURA[1], K. HATA[1], M. NISHIMURA[1]
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098-2: YAP/TAZ hyperactivation enhances PD-L2 transcription to promote immune evasion of oral squamous cell carcinoma

T. ANDO[1], K. OKAMOTO[2], N. KATAOKA[1], Y. UEDA[2], T. YOSHIMOTO[1], T. SHINTANI[1], S. YANAMOTO[2], M. MIYAUCHI[3], M. KAJIYA[1]
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Orthodontics Research

099-1: Roles of TEAD1 during orthodontic tooth movement in rats

Y. LIU[1], Y. KOBAYASHI[1], Y. NIKI[1], H. KAMIMOTO[1], W. SODSOOK[1,2], K. MORIYAMA[1]
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100-2: bFGF affects human periodontal ligament fibroblasts during orthodontic tooth movement

S. RIKIMARU[1], K. KUROISHI[1], K. GUNJIGAKE[1], M. MIZUHARA[1], T. TOYONO[2], K. ONO[3], T. KAWAMOTO[1]
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101-1: Exacerbating Orthodontic Tooth Movement in Mice with Salt-Sensitive Hypertension

Z. FAN[1], H. KITAURA[1], F. OHORI[1], T. NOGUCHI[1], A. MARAHLEH[2], J. MA[1], J. REN[1], M. MIURA[1], K. NARITA[1], A. LIN[1], I. MIZOGUCHI[1]
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Stem Cell Biology

102-2: Neural tissue engineering using dental pulp stem cell constructs

J.I. SASAKI[1, 2], H. SAKAI[1], H. TOYODA[3], G. ABE[2], T. KATO[3], S. IMAZATO[1,2]
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103-1: A New 3D Culture Model for Bone Regeneration with Controlled Morphology

H. MAI THI, S. ITOH, T. KAGIOKA, M. HAYASHI
Department of Restorative Dentistry and Endodontology, Graduate School of Dentistry, Osaka University

104-1: Bioactivity of PDGF-BB on bone marrow-derived mesenchymal stem cells

Y. OURA[1], M. ISHII[1], F. SUEHIRO[1], N. KOMABASIHRI[1], R. HORINOUCHI[1], N. IKEDA[1], T. SAKURAI[1], H. MIYATA[1], Y. YAMADA[1], M. NISHIMURA[2]
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105-1: Exosomes from iPS-Derived PDL Cells Promote Osteogenic and Anti-Inflammatory Properties

Y. TANIGUCHI, J. JO, K. IWASAKI, Y. HASHIMOTO, Y. MOMOTA
Osaka Dental Univresity, Osaka, Japan

106-2: Pathological JAG1-NOTCH-TGFB3 pathway is crucial for abnormal skeletal development in Alagille syndrome

L. DAI, S. SONODA, Y. KYUMOTO-NAKAMURA, L. YU, T. YAMAZA
Department of Molecular Cell Biology and Oral Anatomy, Graduate School of Dental Science, Kyushu University, Fukuoka, Japan

107-1: Peripheral clock gene, *Npas2* in BMSC maintenance and bone regeneration

H. OKAWA[1, 2], A. HOKUGO[2], H. EGUSA[1], I. NISHIMURA[2]

[1]Division of Molecular and Regenerative Prosthodontics, Tohoku University, Miyagi, Japan, [2]University of California, Los Angeles, CA, United States

108-2: Effect of CD10-positive cells on the osteogenic differentiation of human maxillary/mandibular bone marrow-derived mesenchymal stem cells

T. SAKURAI[1], M. ISHII[1], F. SUEHIRO[1], N. KOMABASHIRI[1], R. HORINOUCHI[1], N. IKEDA[1], Y. OURA[1], H. MIYATA[1], Y. YAMADA[1], M. NISHIMURA[2]
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109-1: Potential of dental pulp cells in periodontal ligament regeneration

K. YOSHIDA, D. ARIWANSA, Y. ABIKO
Division of Oral Medicine and Pathology, Department of Human Biology and Pathophysiology, School of Dentistry, Health Sciences University of Hokkaido

110-2: Efficient Fabrication of Human Induced Pluripotent Stem Cells-derived Osseous-like Constructs

Y. OHORI[1], Y. YUMISASHI[1], H. OKAWA[1], H. EGUSA[1,2]
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Pulp Biology and Regeneration

111-1: A Model for Analyzing Pulpal Cellular Dynamics After Cavity Preparation

L. YU[1], M. NAKAGAWA[1], H. LIU[2], Y. MATSUSHIMA[1], Y. WANG[1], S. ZHENG[1], Z. DENG[1], K. QIN[1], H. KISHIDA[2], K. YAMAMOTO[2], Y. HONDA[1]
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112-2: Identification of a dental pulp stem cell population essential for reparative dentin formation.

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113-1: Localization of MSCs after Pulp Revascularization Procedures in Mice.

K. TASHIRO[1], T. IKARASHI[1], M. HAKETA[1], S. ITO[2], K. MITOMO[1], T. MIZOGUCHI[3], A. YAMAGUCHI[3], T. MURAMATSU[1]
[1]Department of Operative Dentistry, Cariology and Pulp Biology, Tokyo Dental College, [2]Department of Pharmacology, Tokyo Dental College, [3]Oral Health Science Center, Tokyo Dental College

114-2: Efficacy of Colloidal Platinum Nanoparticle with MTA after pulp capping

B. QI, Y. TOIDA, R. ISLAM, M. ISLAM, K. TSUCHIYA, H. SANO, A. TOMOKIYO
Department of Restorative Dentistry, Faculty of Dental Medicine, Hokkaido University, Sapporo, Japan

Craniofacial Biology

115-1: Effects of Hypoxia on the Murine Embryonic Cranial Base Development

Y. LU, Y. KOBAYASHI, K. MORIYAMA
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116-2: Relationship between trabecular structure of the mandibular condyle and tooth placement

H. RASHID, A. ASHA, Y. TAMATSU
Kagoshima University Graduate School of Medical and Dental Sciences, Kagoshima, Japan

117-1: SLC26A2-mediated sulfate metabolism is essential for the tooth development

S. YOSHIDA[1], T. INUBUSHI[1], M. YOKOYAMA[1], J. SASAKI[2], A. OKA[1], H. KUROSAKA[1], Y. TAKAHATA[3,4], R. NISHIMURA[3], S. IMAZATO[2], T. YAMASHIRO[1]
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118-2: Oral and craniofacial morphology in Japanese patients with achondroplasia

Y. KOBAYASHI, M. TSUJI, K. MORIYAMA
Department of Maxillofacial Orthognathics, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo

Neuroscience

119-1: Analysis of the effect of oxytocin analogues on a mouse model of dental phobia

K. IGARASHI[1], M. HEIMA[2], S. NAKANO[1], T. SATO[1]
[1]Department of Applied Pharmacology, Kagoshima University, Kagoshima, Japan, [2]Department of Social and Behavioral Medicine

120-2: Low concentrations of menthol suppress TRPV1-mediated pain related behavior

M. FUKUZAKI[1, 2], C. NAKATOMI[2], C. HSU[2], T. KAWAMOTO[1], K. ONO[2]
[1]Division of Orofacial Functions and Orthodontics, Kyushu Dental University, [2]Division of Physiology, Kyushu Dental University

121-1: Optogenetic strategies to investigate the role of projections from the insular cortex to the parabrachial nucleus in pain-related behaviors of rats

Y. NAKAYA[1], K. HIROSE[2], S. KOBAYASHI[3], H. OSAKI[4], M. KOBAYASHI[1]
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122-2: Severe periodontitis denervates the mesencephalic trigeminal nucleus and promotes an increase in $A\beta_{1-42}$ oligomers.

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123-1: Rats discriminate the texture of gel foods

T. WAKAO[1, 2], C. NAKATOMI[2], C. HSU[2], T. KAWAMOTO[1], K. ONO[2]
[1]Division of Orofacial Functions and Orthodontics, Kyushu Dental University, Fukuoka, Japan,
[2]Division of Physiology, Kyushu Dental University, Fukuoka, Japan

124-2: Morphological analysis of dendritic spines of thalamic neurons receiving sensory input from the orofacial region.

E. KURAMOTO, T. GOTO
Department of Oral Anatomy and Cell Biology, Kagoshima University, Kagoshima, Japan

125-1: Long-term plasticity in GABAergic synapses of the rat cerebral cortex

K. YAMAMOTO[1], S. KOBAYASHI[1,2], M. KOBAYASHI[1]
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SPECIAL LECTURES

Special Lecture I
(IADR President Lecture)

Special Lecture II

Special Lecture III

Special Lecture IV

Special Lecture V

KADR President Lecture

Special Lecture I
November 16th, Saturday 9:10-9:55
Hall 1

SL I

Meeting the Moment in Global Oral Health Research

Christopher H. Fox, DMD, DMSc
Chief Executive Officer
International Association for Dental, Oral, and Craniofacial Research
American Association for Dental, Oral, and Craniofacial Research

Dr. Fox will review recent developments in global oral health research and overall health from the World Health Organization, the United Nations, and the United Nations Environmental Program. Background data will be presented that is driving these developments. In addition, a country specific example will be provided. The role of IADR in each of these developments will be highlighted and ways all IADR Divisions can become involved to drive dental, oral, and craniofacial research for health and well-being worldwide.

Brief CV

Christopher H. Fox, DMD, DMSc

International Association for Dental, Oral, and Craniofacial Research and American Association for Dental, Oral, and Craniofacial Research
(IADR/AADOCR)

Education:

1982	BA University of Rochester, Rochester, NY Biology and Psychology
1987	DMD Harvard University School of Dental Medicine General Dentistry
1987	MSc Harvard University School of Public Health Epidemiology
1991	DMSc Harvard University Faculty of Medicine Oral Biology/Epidemiology

Professional Experience:

1992 – 1993	Technical Manager Colgate Hoyt/Gel-Kam
1993 – 1995	Manager, Professional Relations Colgate Oral Pharmaceuticals
1995 – 1999	Director, Global Professional Relations Colgate Palmolive
1999 – 2003	Director, Professional Relations Europe Colgate Palmolive
2003 – 2018	Executive Director IADR/AADOCR
2018 –	Chief Executive Officer (title change) IADR/AADOCR

Awards and Honors:

1987	Academic Excellence in Periodontology
1989	AADR Bloc Travel Grant Recipient
1991	Joseph L. Henry Award Overall Achievement in Clinical and Research Training
1994	Quarterly and Annual Colgate Oral Pharmaceuticals' *You Can Make a Difference* Award
1994	Epi Forum of AADR: Recognition for Annual Support
1996	National Dental Association: Recognition for Support of Women's Health Symposium
2007	Distinguished Alumnus Award, Harvard School of Dental Medicine
2012	American Dental Association Presidential Citation
2016	Fellow, American Association for Dental Research
2017	Fellow, American Association for the Advancement of Science
2018	Alan J. Davis/SCADA Achievement Award

Special Lecture II
November 16th, Saturday 9:55-10:40
Hall 1

SL II

Trends shaping the future of dental, oral, and craniofacial research: Overview of scientific presentations at IADR General Session

Satoshi Imazato, D.D.S., Ph.D.
President of IADR
Professor and Chair, Department of Dental Biomaterials, Osaka University Graduate School of Dentistry

Since establishment of IADR in 1920, General Session has been functioning as the splendid platform for researchers in dental field all over the world to present research outcome, to exchange cutting-edge scientific information, and to stimulate the connection between the people. Due to the pandemic of COVID-19, General Session in 2020 was cancelled and held virtually for 2 years thereafter. After experiencing such an unusual situation, the meeting format was put back to the previous in-person style and 2,633 abstracts were presented at 2024 General Session in New Orleans with 4,317 meeting registrants.

IADR has altogether 36 Scientific Groups and Networks (SGN; 25 Scientific Groups and 11 Networks), and the scientific program of General Session are organized based on these grouping. Therefore, it is possible to grasp the current status of dental, oral and craniofacial research at world level by looking over those programs. In this lecture, scientific presentations at IADR General Session for the past several years are summarized and research trends of whole society including JADR members are discussed.

Brief CV

Satoshi Imazato, D.D.S., Ph.D.

Professor and Chair, Department of Dental Biomaterials
Professor, Joint Research Laboratory of Advanced Functional Materials Science
Director, Center for Innovative Dentistry
Osaka University Graduate School of Dentistry

EDUCATION and QALIFICATIONS:

1986	DDS, Osaka University, School of Dentistry
1992	PhD, Osaka University

PROFESSIONAL APPOINTMENTS:

1991-1999	Assistant Professor, Department of Operative Dentistry, Osaka University Faculty of Dentistry
1993-1994	Visiting Researcher, Department of Oral Biology, Newcastle University, UK
1999-2010	Associate Professor, Department of Restorative Dentistry and Endodontology, Osaka University Graduate School of Dentistry
2011-present	Professor and Chair, Department of Dental Biomaterials, Osaka University Graduate School of Dentistry
2018-present	Professor (Concurrent), Joint Research Laboratory of Advanced Functional Materials Science, Osaka University Graduate School of Dentistry
2019-2023	Dean, Osaka University Graduate School of Dentistry/School of Dentistry
2023-present	Director, Center for Innovative Dentistry, Osaka University Graduate School of Dentistry

ACTIVITIES at INTERNATIONAL ORGANIZATIONS:

IADR, President (2024 March -present)
IADR, President Elect (2023 June -2024 March)
IADR, Vice President (2022 June -2023 June)
IADR, Dental Materials Group, President (2008-2009)
Japanese Division of IADR, President (2019-2020)
ISO TC106 Dentistry/ SC1 WG11 (Adhesion test methods) Convenor

AWARDS:

IADR, Distinguished Scientist Award (Wilmer Souder Award), 2020
International Union of Societies for Biomaterials Science and Engineering, Fellow, 2020
Prize of Japanese Society for Dental Materials and Devices, 2020

Special Lecture III
November 16th, Saturday 12:55-13:55
Hall 1

SL III

The art of publishing science: An editor's perspective

Nick S. Jakubovics, D.D.S., Ph.D.
Professor of Oral Microbiology, Newcastle University, and Editor-in-Chief of the *Journal of Dental Research*

Publishing in leading journals can seem like a dark art, accessible only to those who have insider knowledge of the process. What do journal editors look for in a submission? How can you maximise your chances of getting a paper sent for peer review? What is the best way to respond to reviewers' comments? Here, I will attempt to demystify the process of scientific publishing by providing insights into the editorial processes at the *Journal of Dental Research*. While the underlying science is the key to a strong paper, the chances of successful publication can be improved through clear and attractive presentation of the work. Papers should tell a story, developing the rationale for the study and leading the reader clearly through the results. Analysis and interpretation need to be presented in a balanced way that considers the limitations of the study in addition to the strengths. It is important to articulate the impact of the work without overstating it. This talk will cover key elements of preparing work for scientific publication, from selection of a journal to preparing responses to comments from reviewers and editors. I will highlight some of the potential pitfalls along the way and how to avoid them. The talk will be delivered from the perspective of the *JDR* but will be relevant to publishing in any scientific journal.

Brief CV

Nicholas S. Jakubovics, D.D.S., Ph.D

Editor in Chief, The Journal of Dental Research
Professor of Oral Microbiology
School of Dental Sciences and Biosciences Institute, Faculty of Medical Sciences, Newcastle University,

Employment History

2022-present: **Professor of Oral Microbiology, Newcastle University.**
2014-22: Senior Lecturer in Oral Microbiology, Newcastle University.
2007-14: Lecturer in Oral Microbiology, Newcastle University.
2004-7: Research Fellow, National Institutes of Health/NIDCR, USA.
1998-2004: Post-Doctoral Research Assistant, University of Bristol, UK.

Qualifications

1994-8: PhD University of Warwick – Microbiology (BBSRC CASE award).
1991-4: BSc (Hons) University of Cambridge - Natural Sciences, Biochemistry (1st class).

Esteem Indicators and Awards

2022-present: Honorary Professor of Restorative Dental Sciences, Hong Kong University.
2020-present: Editor-in-Chief, *Journal of Dental Research.*
2020-present: Board of Directors, International Association for Dental Research.
2020-present: Board of Directors, American Association for Dental, Oral, and Craniofacial Research.
2017-20: Associate Editor, *Journal of Dental Research.*
2016-17: Associate Editor, *Oral Diseases.*
2016: International Association for Dental Research, Innovation in Oral Care Award.
2011-15: Trustee and Executive Committee member, Society for Applied Microbiology.
2010: Society for Applied Microbiology, New Lecturer Award.

Postgraduate examining

Masters': 3 external (UK and Malaysia); 2 internal (Newcastle)
PhD: 23 external (UK, USA, Australia, Spain, Denmark); 7 internal (Newcastle)

Keynote talks

Last 5 years: More than 20 invited keynote or plenary talks, including in Hong Kong (Asian Academy of Preventive Dentistry, 2023), the US (University of Iowa, 2023), India (Indian Society for Dental Research, 2023), Belgium (KU Leuven, 2022) and UK (British Society for Oral and Dental Research, Birmingham, 2021).

Newcastle University Leadership Roles

2023-present: Deputy Director of Research, School of Dental Sciences
2018-present: Director, Translational Oral Biosciences Research Strand
2013-19: Course lead for BDS Stage 2 Microbiology for Dentistry
2015-18: Stage 2 Director, BDS
2011-15: Stage 1 Director and Senior Tutor, BDS.
2008-present: School of Dental Sciences (SDS) Biological Safety Supervisor/GM Chair.

Special Lecture IV
November 17th Sunday 9:00-10:00
Hall 1

SL IV

“Aggressive dental care” aimed at preventing the onset and progression of dementia

Makoto Michikawa, M.D., Ph.D.
Professor, Department of Geriatric Medicine
School of Life Dentistry at Niigata, The Nippon Dental University

In Japan, a super-aging society, the number of dementia patients is estimated to reach 5.84 million by 2040, and there is an urgent need to address Alzheimer's disease, which accounts for more than 60% of the total. Because anyone can develop this disease, it is important to develop treatments as well as effective methods to prevent its onset and progression.

Many epidemiological studies have long pointed out the relationship between periodontal disease and tooth loss and dementia, but the molecular basis of the causal relationship between the two remains unclear. For the past 13 years, we have been using Alzheimer's disease model mice to elucidate the molecular mechanisms that link Alzheimer's disease molecular pathology with periodontal disease, tooth loss, and masticatory dysfunction. As a result, we found that periodontal disease, tooth loss, and masticatory dysfunction all exacerbate cognitive dysfunction, and that the molecular mechanisms involved are different. In mice with periodontal disease, inflammation in the oral cavity spreads to the brain, and brain inflammation exacerbates Alzheimer's disease molecular pathology (production and deposition of amyloid-β protein). It has been shown that it reduces hippocampal neurons without affecting the molecular pathology of Alzheimer’s disease. These results demonstrate that a dental disease-specific approach is effective when considering prevention of the onset and progression of dementia, and that prevention and treatment of periodontal disease and tooth loss, as well as oral care, can prevent Alzheimer's disease in humans.

We believe that it would be of great significance if we could demonstrate that it is effective in preventing the onset and slowing the progression of cancer.

Brief CV

Makoto Michikawa, M.D., Ph.D.

Professor, Department of Geriatric Medicine
School of Life Dentistry at Niigata, The Nippon Dental University

1985-3	Graduate from Tokyo Medical and Dental Univ, School of Medicine
1985-5	Resident, Tokyo Medical and Dental Univ
1986-1	Resident, Musashino Red Cross Hospital
1987-4	Internal Medicine Doctor, Kanto Central Hospital
1988-5	Internal Medicine Doctor, Komagome Metropolitan Hospital
1990-5	Assistant Professor, Tokyo Medical and Dental Univ., Dept of Neurology
1990-12	University of British Columbia (Vancouver, Canada), Post Doc Fellow
1994-9	Assistant Professor, Tokyo Medical and Dental Univ., Dept of Neurology
1996-3	Lab Chief, Dept of Alzheimer's Disease, National Center for Geriatrics and Gerontology
2005 10	Head of the Dept of Alzheimer's Disease, National Center for Geriatrics and Gerontology
2012-4	Professor, Dept of Biological Chem, Nagoya City Univ, Graduate School of Medical Sciences
2017-4	Dean, Nagoya City Univ, Graduate School of Medical Sciences
2022-4	Vice President of Nagoya City Univ
2023-4	Professor, Dept of Geriatric Medicine, Nippon Dental Univ at Niigata

Special Lecture V
November 17th Sunday 13:30-14:15
Hall 1

SL V

The resilience of the oral microbiome

William G. Wade, D.D.S., Ph.D.
Professor Emeritus, Centre for Host-Microbiome Interactions, King's College London, London, United Kingdom

The microorganisms of the human mouth are organised as communities where species interact and cooperate. The primary substrates for oral bacterial growth are saliva and gingival crevicular fluid which are ever-present and thus provide a consistent source of nutrients. Food is only in the mouth for short periods during the day and, as a result, albeit with some important exceptions, has relatively little influence on oral bacterial composition. Because salivary flow is constantly bathing the mouth, only bacteria which can attach to surfaces as biofilms can persist there. Oral bacterial communities are therefore complex and resilient and have shown a high degree of conservation throughout evolution. There are several core taxa found in all primates although each host species has its own characteristic microbiota at species level. One reason for this is that the host immune system limits the range of bacteria that can colonise the mouth with both innate and adaptive immune components delivered by saliva. The greatest perturbation of the oral microbiota is seen in patients with dry mouths. Without saliva, the nutritional and immune control of the bacterial community is lost and colonisation by a range of non-oral environmental bacteria and fungi occurs. Caries and the periodontal diseases are associated with modifications in bacterial community composition because of the ecological changes induced by excessive acid production and inflammation, respectively. Antimicrobials delivered systemically have only a minor impact on oral bacterial composition and although locally delivered antimicrobials can be clinically useful, the impact on bacteria in oral biofilms is relatively limited. Nitrate in the diet is returned to the mouth by an entero-salivary circuit and is converted to nitrite by nitrate-reducing oral bacteria, with cardiovascular benefits. The oral microbiota thus exhibits resilience in several ways, particularly in comparison to the distal gut.

Brief CV

William G. Wade, D.D.S., Ph.D.

William Wade is Emeritus Professor of Oral Microbiology within the Centre for Host-Microbiome Interactions, King's College London and Adjunct Faculty at the ADA Forsyth Institute, Cambridge, USA. His first degree was in Biological Sciences from the University of East Anglia, followed by a PhD in Microbiology at the University of Wales. He has held academic appointments at the Universities of Wales, Bristol and Queen Mary University of London. He has been a central figure in the development and application of methods for the characterisation of the oral microbiome in health and disease and is a curator of the Human Oral Microbiome Database (www.homd.org). He has particular interests in the cultivation of previously uncultivated bacteria and the development and evaluation of antimicrobials and pre- and pro- biotics for the prevention and treatment of oral diseases. He has published extensively in peer-reviewed journals and obtained grant funding from UK Research Councils, the US National Institutes of Health and major charities including the Wellcome Trust. He has also worked closely with Industry on translational projects to develop new oral care products.

KADR President Lecture
November 17th Sunday 10:05-11:05
Hall 1

SL-KA

Why should we consider potential roles of oral dysbiosis in the pathogenesis of Sjögren's Syndrome?

Youngnim Choi, D.D.S., Ph.D.
Professor
Program in Immunology and Molecular Microbiology, Dept. of Dental Science
Seoul National University School of Dentistry

Sjögren syndrome (SS) is a chronic autoimmune disorder that primarily targets the salivary and lacrimal glands. The pathology of these exocrine glands is characterized by periductal focal lymphocytic sialadenitis (FLS), and both T cell-mediated tissue injury and autoantibodies that interfere with the secretion process underlie glandular hypofunction. In addition to these adaptive mechanisms, multiple innate immune pathways are dysregulated, particularly in the salivary gland epithelium. Our understanding of the pathogenetic mechanisms of SS has substantially improved during the past decade. In contrast to viral infection, bacterial infection has never been considered in the pathogenesis of SS. Our recent studies have shown that oral dysbiosis, characterized by increased bacterial load and diversity, may contribute to the development of SS. Several SS-associated bacteria, including *Prevotella melaninogenica* (Pm), can invade epithelial cells. Ductal cells and FLS areas in the labial salivary glands from SS patients are heavily infected with bacteria. Furthermore, correction of oral dysbiosis alleviated FLS in IκB-ζ-deficient mice. Pm also has an aquaporin (AQP) protein homologous to human AQP5, which is targeted in SS. Repeated immunization of mice with a PmE-L peptide derived from Pm AQP induces anti-AQP5 autoantibodies via molecular mimicry, resulting in reduced salivary flow rates. These findings suggest a link between oral dysbiosis, FLS, and autoantibody production in SS. The added roles of bacteria may extend our understanding of the pathogenetic mechanisms and therapeutic approaches for this autoimmune exocrinopathy.

Brief CV

Youngnim Choi, D.D.S., Ph.D.

Immunology and Molecular Microbiology Program
Department of Dental Science
School of Dentistry
Seoul National University

Education:

3/85-2/87	Seoul National University, Seoul, Korea. Pre-dentistry.
3/87-2/91	Seoul National University, Seoul, Korea. Dentistry, Degree: D.D.S.
8/91-6/95	Division of Roswell Park Cancer Institute, State University of New York at Buffalo. Microbiology/ Immunology, Degree: Ph.D Mentor: Dr. Steven J. Greenberg Development of a molecular genetic strategy to study Ig-VDJ rearrangement in normal, infectious, and heme-oncologic states

Experience:

6/95-1/96:	Postdoctoral Fellow Department of Neurology, Laboratory of Neuroimmunology and Neurovirology, Roswell Park Cancer Institute Supervisor: Dr. Steven J. Greenberg
2/96 - 2/98:	Visiting Fellow Laboratory of Gene Transfer, National Human Genome Research Institute, National Institute of Health, U. S. A. Supervisor: Dr. Jeniffer M. Puck
3/98 – 2/03	Assistant and Associate professor, Kangnung National University
3/03-present	Assistant, Associate, and Full professor, Seoul National University
3/10-2/11:	Guest Scientist in the Laboratory of Cellular and Molecular Immunology, National Institute of Allergy and Infectious Diseases, National Institute of Health, U. S. A. Supervisor: Dr. Polly Matzinger

Membership:

98 -	A member of Korean Association of Oral Biology
2003 -	A member of International Association of Dental Research
2004 -	A member of Korean Association of Immunologists

SYMPOSIUM

Symposium I
Progressive Spirits in Periodontal Regenerative Research – Distinct Approach from Existing Strategies

Symposium II
Digital dentistry for the “Smart Prosthodontics”

Symposium III
Surface modification and the improvement of biocompatibility of dental implant

Symposium IV
Recent advances in neurophysiology of oral sensory and motor functions

Rising Scientist Session
Frontiers of Neuroscience in Dentistry

Luncheon Seminar 1
GIOMER effects in the oral cavity

Luncheon Seminar 2
Biomimetics in Dentistry: Fiber-Reinforced Composite Resin for Dentin Replacement

Symposium I
November 16th, Saturday 14:00-15:00
Hall 1

SI-1

Current advances and controversies in biological molecule-based *in situ* periodontal tissue engineering approaches

Yoshinori Shirakata, D.D.S., Ph.D.
Department of Periodontology, Kagoshima University Graduate School of Medical and Dental Sciences, Kagoshima, Japan

Periodontal regeneration is the ultimate goal of periodontal therapy because of the potential to change the prognosis of questionable or even hopeless teeth to one of retention and long-term maintenance, thus preventing tooth loss and reducing dental care costs. In recent decades, periodontal regenerative/reconstructive procedures such as bone grafting, application of barrier membranes, and the use of structured biological molecules (BMs) (e.g., enamel matrix derivative, platelet-derived growth factor, basic fibroblast growth factor) have been performed alone or in various combinations as in situ periodontal tissue engineering approaches. Despite some successful results, several studies have demonstrated inconsistent and/or unfavorable outcomes following these approaches, possibly due to factors such as the different natures of the biomaterials/BMs employed, the combinations used, and post-operative complications. New biologics with much better biocompatibility, easier handling, and lower initial costs thus need to be developed to achieve further improvements in periodontal wound healing/regeneration and increase the predictability of clinical outcomes. This presentation reviews the controversies associated with current periodontal tissue engineering approaches and also the potential for novel biologic agents (i.e., liquid formulations of enamel matrix derivative, fully synthetic cross-linked hyaluronic acid, etc.) in the development of more predictable periodontal regenerative therapies based on scientific evidence from in vitro, preclinical, and clinical studies.

Brief CV

Yoshinori Shirakata, D.D.S., Ph.D.

Department of Periodontology, Kagoshima University Graduate School of Medical and Dental Sciences

Education

Undergraduate 1992-1998 Faculty of Dentistry, Kagoshima University, Kagoshima, Japan, D.D.S.
Graduate 1998- 2002 Tokyo Medical and Dental University, Tokyo, Japan, Ph.D.

Research and Professional Experience

2002-2003	Clinical fellow, Periodontology, Department of Hard Tissue Engineering, Tokyo Medical and Dental University
2003-2010	Assistant professor, Department of Periodontology, Kagoshima University Graduate School of Medical and Dental Sciences
2011- 2012	Research Fellow, School of Dental Medicine, University of Bern, Switzerland
2011- 2015	Lecturer, Department of Periodontology, Kagoshima University Hospital
2015 -	Associate professor, Department of Periodontology, Kagoshima University Graduate School of Medical and Dental Sciences

Awards

2015	Excellent Clinical Poster Award, Japanese Society of Periodontology
2016	Best Poster Award, 2nd International Symposium Regeneration and Esthetics in Periodontology and Implant Dentistry
2016	Education Award, Japanese Society of Periodontology
2018	Distinguished Scientist Award, Japanese Society of Periodontology

Symposium I
November 16th, Saturday 14:00-15:00
Hall 1

SI-2

Development of Periodontal Tissue Regenerative Therapy Using Mesenchymal Stem Cells and Bio-3D Printer

Mikihito Kajiya, D.D.S., Ph.D.
Department of Innovation and Precision Dentistry, Hiroshima University Hospital

Periodontitis is an inflammatory disease caused by host immune responses to periodontal pathogenic bacteria, characterized by the destruction of periodontal tissue. If left untreated, periodontitis can lead to tooth loss. Existing regenerative procedures using cytokines promote tissue regeneration by activating endogenous cells; however, they are not effective in cases of severe periodontal tissue destruction, where the number of endogenous cells is significantly reduced. Therefore, a cell therapy approach that provides a sufficient number of multipotent stem cells is required.

We have developed clumps of mesenchymal stem cells (MSCs)/extracellular matrix (ECM) complexes (C-MSCs), using bone marrow-derived MSCs. These C-MSCs, which are 1 mm in diameter, consist of cells and self-produced ECM, and are designed for scaffold-free cell transplantation therapy. Notably, the use of intact type I Collagen (COL1), which is a component of C-MSCs, allows the donor cells to maintain their multipotency and directly contribute to periodontal tissue reconstruction.

In addition, to address the most severe periodontal tissue defects in humans, we have collaborated with CYFUSE Biomedical K.K. to generate 3D grafting tissue using a Bio-3D printer and C-MSCs. As a result, we successfully developed a human bio 3D grafting tissue measuring 3mm×4mm×1mm, which fits a nude rat model with severe periodontal defects. The implantation of this bio 3D grafting tissue, which contains no artificial materials, resulted in successful periodontal tissue regeneration. Furthermore, the healing mechanism was similar to that of C-MSCs: human donor cells grafted with intact COL1 directly reconstructed the periodontal tissue.

In this presentation, I will introduce the Bio-3D printing culture technologies and discuss how we can implement this bio 3D grafting tissue into clinical practice as a promising cell therapy for periodontal tissue regeneration.

Brief CV

Mikihito Kajiya, D.D.S., Ph.D.

Department of Innovation and Precision Dentistry, Hiroshima University Hospital

Education

Undergraduate 1999-2005 Hiroshima University School of Dentistry, Hiroshima, Japan, D.D.S.
Graduate 2005-2009 Hiroshima University Graduate School, Hiroshima, Japan, Ph.D.

Research and Professional Experience

2009-2012	Postdoctoral Fellow, Department of Immunology, The Forsyth Institute
2012-2021	Assistant Professor, Department of Periodontal Medicine, Hiroshima University
2022-	Professor, Department of Innovation and Precision Dentistry (Center for Oral Clinical Examination), Hiroshima University Hospital

Award

2008	IADR/Unilever Hatton Travel Award Japan Division
2009	Encouraging Prize, The Japanese Society of Periodontology
2015	Encouraging Prize, The Japanese Society of Conservative Dentistry
2020	Distinguished Scientist Award, The Japanese Society of Periodontology

Symposium I
November 16th, Saturday 14:00-15:00
Hall 1

SI-3

Exosomal miRNAs from gingival tissue-derived stem cells as a therapeutic strategy for periodontitis

Takao Fukuda, D.D.S., Ph.D.
Section of Periodontics, Kyushu University Hospital

Dental tissue-derived mesenchymal stem cells (MSCs) have the advantage of being easily obtained through routine dental procedures and have shown superior results in both regenerative and immunoregulatory therapeutic applications. Emerging evidence have focused much attention to MSC-derived exosomes which play an important role in intercellular communication through their contents including cytokines, growth factors, mRNAs, and regulatory miRNAs with diverse combinations. Specifically, exosomal miRNAs are capable of transferring genetic information, thereby inducing phenotypic changes in the recipient cells and enhancing the therapeutic effects of MSC-derived exosomes.

Gingival tissue-derived MSCs (GMSCs) are characterized by their prominent immunomodulatory and proliferative capacities. More importantly, GMSCs secrete a large amount of exosomes compared to other somatic MSCs. Based on a strategy to enhance the anti-inflammatory properties of MSC-derived exosomes by priming MSCs with cytokines, we demonstrated that TNF-α-primed human GMSC-derived exosomes significantly enhanced the therapeutic effects in a murine periodontal model. By screening novel TNF-α-inducible exosomal miRNAs, we identified miR-1260b as a critical regulator of periodontal bone loss. However, the precise molecular mechanism underlying miR-1260b-mediated inhibition of osteoclastogenesis has not been fully elucidated.

In this presentation, we focused on novel miR-1260b-targeting genes via database analysis and found that they could be associated with endoplasmic reticulum (ER) stress. Our study revealed that miR-1260b inhibits osteoclastogenesis via ATF6β-mediated regulation of ER stress. Accordingly, our findings may provide a novel therapeutic strategy for patients with periodontitis and other inflammatory osteoimmune disorders by targeting ATF-mediated ER stress.

Brief CV

Takao Fukuda, D.D.S., Ph.D.

Section of Periodontics, Kyushu University Hospital

Education

Undergraduate 1994-2000 School of Dentistry, Kyushu University, Fukuoka, Japan, D.D.S.
Graduate 2000-2004 Graduate School of Dental Science, Kyushu University, Fukuoka, Japan, Ph.D.

Research & Professional Experience:

2000-2004	Department of Medical Biochemistry, Graduate School of Medical Sciences, Kyushu University
2004-2014	Department of Periodontology, Division of Oral Rehabilitation, Kyushu University Hospital
2014-2019	Assistant Professor, Department of Periodontology, Faculty of Dental Science, Kyushu University
2016	Research fellow, Department of Anatomy and Cell Biology, Penn Dental Medicine, University of Pennsylvania
2019-	Lecturer, Section of Periodontics, Kyushu University Hospital

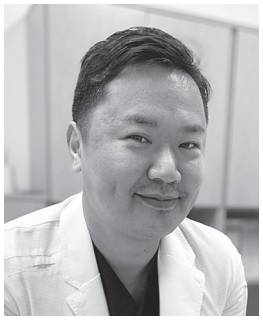
Award:

2014	Young Investigators Award, The Japanese Society of Conservative Dentistry
2021	Distinguished Scientist Award, The Japanese Society of Periodontology

Symposium I
November 16th, Saturday 14:00-15:00
Hall 1

SI-4

Elucidation of Oral Aging Mechanisms and Development of Bone Regeneration Reagent



Tomoki Maekawa, D.D.S., Ph.D.
Center for Advanced Oral Science, Graduate School of Medical and Dental Sciences, Niigata University

The aging of the oral cavity is accompanied by a loss of flexibility and regenerative capacity. The integrin-binding secreted protein DEL-1 is involved in the regulation of both the initiation and resolution of inflammation in different diseases. Recently, we demonstrated that the anti-inflammatory action of erythromycin (ERM) is mediated through the upregulation of DEL-1. Induced DEL-1 can promote alveolar bone regeneration during the resolution of experimental periodontitis. DEL-1 also regulates osteoclastogenesis and decreases inflammatory bone resorption. Although DEL-1 promotes resolution of inflammation and removal of senescent cells, its expression declines with aging, and it has been shown to lose flexibility for tissue repair and regeneration. However, increased expression of DEL-1 by ERM was observed not only in young mice but also in old mice (77w old). Normally, regeneration is challenging in aging mice, but erythromycin induces DEL-1, which can lead to bone regeneration, and it works as senolytic compound. These findings suggest that the ERM-DEL-1 axis may be therapeutically exploited to restore bone loss due to periodontitis and aging.
In this presentation, I will introduce several drugs in development as a strategy to counteract the weakening of regenerative capacity associated with aging, and provide an example from basic research to clinical application. I would also like to explain how induced DEL-1 eliminates senescent tissue stem cells and induces activation of regenerative capacity in aging.

Brief CV

Tomoki Maekawa, D.D.S., Ph.D.

Center for Advanced Oral Science, Graduate School of Medical and Dental Sciences, Niigata University

Education

2006: D.D.S. Niigata University, School of Dentistry
2011: Ph.D. Niigata University, Graduate School of Medical and Dental Sciences

Research & Professional Experience:

2011-2012 Clinical Fellow at Niigata University Hospital
2012-2013 University of Pennsylvania, Postdoctoral fellow (Hajishengallis Lab)
2013-2015 JSPS Postdoctoral Fellowship for Research Abroad
2015-2016 Assistant professor, Niigata University, Japan
2016-2018 Research Associate Professor, Niigata University, Japan
2019- Associate Professor, Niigata University, Japan
2019- Research Professor, Niigata University, Japan

Award:

Catalyst Award, US National Academy of Medicine (NAM) (2021)
Encouragement Award, Japanese Association for Oral Biology (2021)
Interstellar Initiative-Healthy Longevity Award-1st prize, AMED/NYAS (2021)
Distinguished Scientist Award, Japanese Society of Periodontology (2020)
Young Scientist Award, The Commendation for Science and Technology by the MEXT (2020),
IADR Sigmund Socransky Young Investigator Award (2018)
ASBMR Travel award (2018), Iwadare foundation award (2017)
Incentive award, Japanese Society of Periodontology (2016)
Niigata University President Award (2015)
The incentive award, Japanese Society of Conservative Dentistry, (2011)

Symposium II
November 16th Saturday 14:00-15:00
Hall 2

SII-1

Present and future of Digital Complete Denture

Manabu Kanazawa, D.D.S., Ph.D.
Gerodontology and oral rehabilitation, Graduate School of Medical and Dental Sciences
Institute of Science Tokyo

Japan is the most rapid aging country in the world, with an aging rate currently reaching 29.0%, and it is projected to 38.7% by 2070. This sharp rise in the aging population lead to an increase in healthcare costs and more complex and difficult-to-treat cases in the field of dentistry. As a result, improving the efficiency and standardization of dental treatment will be required. With advancements in digital technology, various digital devices and programs have been introduced into the field of dentistry. In our department, we have been conducting research on the digital dentures. In this lecture, we will present the outcomes of our research in super aged society.
Currently, in the fabrication of complete dentures, digital technology can be applied to almost all chairside and labside processes. Compared to conventional methods, the fabrication of digital dentures simplifies the process and allows for the numerical quantification of morphological characteristics. Additionally, from a cost-effectiveness perspective, options such as milled dentures and 3D-printed dentures expand the range of choices available, allowing for broader selection based on patient needs and case specifics. The application of AI in denture design and the full digitization of partial dentures, which have been more complex in terms of materials and morphology, is anticipated. This lecture will explain the current advantages of digital dentures.

Brief CV

Manabu Kanazawa, D.D.S., Ph.D.

2002-2006	Ph.D Tokyo Medical and Dental University, Graduate School of Medical and Dental Sciences
1996-2002	D.D.S. Tokyo Medical and Dental University, School of Dentistry
2006-2008	Clinical staff (University Hospital of Dentistry, TMDU)
2008-2020	Assistant professor (Gerodontology and oral rehabilitation, TMDU)
2013-2014	Visiting professor, Oral Health and Society, Faculty of Dentistry, McGill University
2008-2020	Junior associate professor (Gerodontology and oral rehabilitation, TMDU)
2021-	Professor and chair (Digital Dentistry, TMDU)
2024-	Professor and chair (Gerodontology and oral rehabilitation, TMDU)

Symposium II
November 16th Saturday 14:00-15:00
Hall 2

SII-2

The effectiveness of digital workflow in implant dentistry

Chihiro Masaki, D.D.S., Ph.D.
Division of Oral Reconstruction and Rehabilitation, Kyushu Dental University

Currently, advances in digitalization in various fields of dental treatment are greatly advantageous for both patients and dentists. In particular, all processes of implant treatment, including preoperative diagnosis, treatment planning, implant placement, and subsequent superstructure fabrication, are covered by digital technology.
For diagnosis, it has recently become possible to perform detailed implant simulation in consideration with the gingival thickness and final emergence profile by overlapping the STL data from an oral scanner with DICOM CT data. In addition, guided surgery with a surgical guide has facilitated implant placement in the planned position. However, even if guided surgery is performed, an implant cannot be placed with a precision of 100%. Therefore, it must be considered that there may be errors unless this procedure is used based on the understanding of the characteristics of each surgical guide.
On the other hand, in the superstructure fabrication, custom abutments primarily consisting of titanium or zirconia and monolithic crowns containing lithium disilicate or zirconia are also used with CAD/CAM. However, there are no criteria on the type of patients or materials to be used. It is necessary to carefully select an abutment or superstructure while understanding the properties of respective materials.
In this presentation, I would like to focus on digital workflow for implant treatment, and discuss the effectiveness and limitations of guided surgery, as well as those of CAD/CAM restorations.

Brief CV

Chihiro Masaki, D.D.S., Ph.D.

Division of Oral Reconstruction and Rehabilitation, Kyushu Dental University

Education

Undergraduate 1993-1999 Hiroshima University, Hiroshima, Japan, D.D.S
Graduate 1999-2003 Graduate School of Hiroshima University, Hiroshima, Japan, Ph. D.

Research & Professional Experience:

2003	Resident, Hiroshima University Hospital
2004	Research Associate, University of Iowa College of Dentistry, Iowa, U.S.A.
2005-2015	Assistant Professor, Kyushu Dental University, Kitakyushu, Japan
2015-	Associate Professor, Kyushu Dental University, Kitakyushu, Japan

Award:

2003	The Best Oral Presentation Award, The 109th Annual Meeting of the Japan Prosthodontic Society
2018	The Best Prize Award, Asian Academy of Osseointegration

Symposium II
November 16th Saturday 14:00-15:00
Hall 2

SII-3

AI for future prosthodontic treatment

Satoshi Yamaguchi, D.D.S., Ph.D.
AI Research Unit, Osaka University Graduate School of Dentistry
Department of Dental Biomaterials, Osaka University Graduate School of Dentistry

In dentistry, artificial intelligence (AI) is being used to diagnose caries, periodontal disease, or oral cancers. Our AI solutions bring advancements in prosthodontic treatments, making procedures more accurate and efficient. This leads to greater success in treatment, lower medical costs, and reduced workload for dental professionals.

Dental implants have become essential for restoring missing teeth, transforming oral rehabilitation for patients. Cone-beam computed tomography (CBCT) allows clinicians to view craniofacial structures in three dimensions, providing detailed images necessary for accurate treatment planning. However, determining the best drilling protocol to achieve primary stability -a key factor for implant success- remains difficult because bone quality cannot be fully assessed with CBCT alone. Our AI-driven model addresses this challenge by predicting the optimal drilling protocol based on image data of previous cases, supporting decision-making and improving long-term implant outcomes.

Restorative materials, such as resin composites (RCs), are widely used due to their aesthetics. The use of CAD/CAM technology for fabricating RC crowns in molar restorations is growing rapidly. Yet, these crowns often debond within a year when cemented to human dentin. Currently, there is no established method to prevent this debonding, which is critical for improving the longevity of CAD/CAM RC crown restorations. Our research introduces an AI system using convolutional neural networks (CNNs) to predict the likelihood of debonding from three-dimensional scanning of tooth preparation. This AI technology helps dentists make better decisions, reducing the risk of crown failure.

This presentation will explore our AI models for implant planning and CAD/CAM crown restoration. We will discuss development, performance, and potential impact of these AI models on clinical practice, highlighting how AI can transform prosthodontic care for better patient outcomes.

Brief CV

Satoshi Yamaguchi, D.D.S., Ph.D.

Research Professor
AI Research Unit, Osaka University Graduate School of Dentistry
Department of Dental Biomaterials, Osaka University Graduate School of Dentistry

Education

2004-2006	Ph.D. in Engineering. Osaka University Graduate School of Engineering Science, Osaka, Japan.

Research & Professional experience

2006.4-2008.3	Postdoctoral Fellowship in Research Organization of Science and Engineering, Ritsumeikan University
2008.4-2013.4	Assistant Professor in Department of Biomaterials Science, Osaka University Graduate School of Dentistry
2012.4-2012.11	Visiting scholar in Department of Biomaterials and Biomimetics, New York University College of Dentistry
2013.4-2017.5	Lecturer in Department of Biomaterials Science, Osaka University Graduate School of Dentistry
2018.6-	Associate Professor in Department of Biomaterials Science, Osaka University Graduate School of Dentistry
2021.4-	Vice Director in Center for Innovative Dentistry, Osaka University Graduate School of Dentistry
2024.7-	Research Professor, Osaka University Graduate School of Dentistry

Award (Last 10 years)

2014	Research Paper Awards, The Japanese Society for Dental Materials and Devices
2014	JADR/GC Research Awards for Young Scientists, Japanese Association for Dental Research
2015	Dean Awards, Osaka University Graduate School of Dentistry
2015	Oral Presentation Awards, The Japanese Society for Dental Materials and Devices
2018	Best Oral Presentation Awards for Young Scientists, Basic Biology Forum of Young Scientist, Osaka University Graduate School of Medicine
2019	Yumikura Awards, The Osaka University Dental Society
2021	Science Awards, The Japanese Society for Dental Materials and Devices

Symposium III
November 17th Sunday 9:00-10:00
Hall 2

SIII-1

Surface modification and the improvement of biocompatibility of dental implant-History and perspectives of surface modification-

Yasunori Ayukawa, D.D.S., Ph.D.
Section of Implant & Rehabilitative Dentistry, Division of Oral Rehabilitation,
Kyushu University Faculty of Dental Science

Modern dental implants have been made of pure titanium since the early days of Brånemark's development, and have had excellent biocompatibility since the beginning. This property, called osseointegration, is the direct contact between titanium and bone without any soft tissue intervention, and has enabled long-term function. On the other hand, the turned surface of the implants developed by Brånemark required 3-6 months to achieve osseointegration, and their fixation to bone was relatively weak, so better surfaces were expected. In the 21st century, it was reported that there is a certain value for the degree of surface roughness that is superior in obtaining osseointegration, and the surface roughness of implants from various companies is now almost always within this range. Since implants are placed into bone and protrude into the oral cavity through the gingiva, biocompatibility of implants must be considered separately for bone and gingiva, and for gingiva as well for connective tissue and epithelium. In particular, osteoblasts tend to adhere to rough surfaces, while epithelial cells prefer smooth surfaces, and surface roughness is completely different. In this presentation, I will review the history of surface properties of dental implants and discuss the future prospects of surface modification favorable to gingiva and bone.

Brief CV

Yasunori Ayukawa, D.D.S., Ph.D.

Section of Implant & Rehabilitative Dentistry, Division of Oral Rehabilitation, Kyushu University Faculty of Dental Science

Education

1987-1993	Kyushu University School of Dentitry, Japan	DDS	Dentistry
1993-1997	Kyushu University Graduate School of Dental Science, Japan	PhD	Dental Science

Academic positions

1997-1998	Kyushu University Hospital	Resident
1998-2004	Kyushu University Faculty of Dentistry	Assistant Professor
2004-2017	Kyushu University Hospital	Lecturer
2012	Dows Institute for Dental Research, University of Iowa, IA, USA	Visiting Assistant Professor
2017-2021 (Mar.)	Kyushu University Faculty of Dental Science	Associate Professor
2021 (Apr.)-	Kyushu University Faculty of Dental Science	Professor

Honors

2003	Oral Presentation Award, 11th Annual Scientific Meeting of Japan Prosthodontic Society
2004	Young Scientists Manuscript Award, Japan Prosthodontic Society
2004	Best Oral Award, 13th Meeting of European Association for Osseointegration (EAO)
2010	Senior Investigators Manuscript Award, Japan Prosthodontic Society

Symposium III
November 17th Sunday 9:00-10:00
Hall 2

SIII-2

Physical bioregulation by biomimetic titanium nanosurfaces to achieve biohybrid dental implants

Masahiro Yamada, D.D.S., Ph.D.
Division of Molecular and Regenerative Prosthodontics,
Tohoku University Graduate School of Dentistry

Demand is growing for a next-generation biohybrid dental implant technology that allows the induction of periodontal tissue around dental implants. Periodontal tissue regeneration requires the ability to regulate periodontal ligament (PDL) stem cell differentiation to form the trilamellar structure of the tooth root cementum-PDL-alveolar bone. In addition, the regeneration of peripheral nerves to innervate PDLs from alveolar bone is essential to recover the physiological functions of periodontal tissue.
Endogenous tissue regeneration, which activates the host's inherent regenerative ability by directly modulating endogenous stem cells, is the most efficient and effective approach to inducing target tissue regeneration. However, an edentulous ridge without endogenous PDL stem cells requires exogenous stem cell transplantation to induce periodontal tissue formation. Bio-three-dimensional (3D) printing technology can be used to create 3D cell constructs for adapting to tooth-shaped implants. The key to both approaches is to design biomaterials that provide an optimal microenvironment to guide the differentiation of target stem cells to facilitate target tissue regeneration. Physical cues of microenvironments, such as topographical and micromechanical properties can regulate stem cells by applying static mechanical stresses.
Biomimetics is used to functionalize biomaterials by mimicking the physicochemical properties of living tissues. Focusing on this concept, we developed a titanium nanosurface modification technology that mimics the surface topography and micromechanical properties of tooth root cementum. Biomimetic titanium nanosurface implants placed in alveolar bone harboring remaining PDL tissue induced endogenous regeneration of periodontal tissue. We also found that the biomimetic titanium nanosurface implant integrated with PDL cell 3D constructs fabricated with the Kensan Bio 3D printing technology could potentially serve as biohybrid dental implants in the edentulous alveolar ridge. Mechanoregulation of PDL cells with physical cues is involved in inducing periodontal tissue by biomimetic titanium nanosurfaces.
In this presentation, I will discuss the importance of the physical microenvironment at the implant-tissue interface for creating biohybrid dental implants.

Brief CV

Masahiro Yamada, D.D.S., Ph.D.

Division of Molecular and Regenerative Prosthodontics, Tohoku University Graduate School of Dentistry

Education:

Undergraduate 1996-2002 School of Dentistry, Hiroshima university, D.D.S.
Postgraduate 2002-2006 Oral Implantology and Regenerative Dental Medicine, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan, Ph.D.

Research & Professional Experience:

2006-2009	Postdoctoral fellow, Jane & Jerry Weintraub Center for Reconstructive Biotechnology, UCLA School of Dentistry
2009-2013	Assistant professor, Department of Removable Prosthodontics, Tokyo Dental College
2013-2015	Senior assistant professor, Department of Removable Prosthodontics, Tokyo Dental College
2015-2018	Senior assistant professor, Division of Molecular and Regenerative Prosthodontics, Tohoku University Graduate School of Dentistry
2018-Present	Associate professor, Division of Molecular and Regenerative Prosthodontics, Tohoku University Graduate School of Dentistry

Award:

2021	Academic Award, Tohoku University Dental Society
2020	JPR Best Paper Award, The Japan Prosthodontic Society
2016	Academic Paper Award, The Japan Prosthodontic Society
2014	Special Promotional Research Excellence Paper Award, The Japan Prosthodontic Society
2014, 2010	Best Oral Scientific Research Presentation, Academy of Osseointegration
2008	Pre-Prosthetic Regenerative Science Award, International Association for Dental Research
2007	One of six finalists for Arthur R. Frechette Research Awards in Prosthodontics, International Association for Dental Research

and others.

Symposium III
November 17th Sunday 9:00-10:00
Hall 2

SIII-3

Assessment of the soft-tissue seal at the interface between the implant and the oral mucosa

Ikiru Atsuta, D.D.S, Ph.D.
Section of Fixed Prosthodontics, Division of Oral Rehabilitation, Faculty of Dental Science, Kyushu University

In recent years, implant dentistry has evolved from merely restoring function at edentulous sites to a more comprehensive and esthetically demanding treatment modality. Achieving a high standard of esthetics, in addition to function, is now considered the hallmark of successful implant therapy. In other words, true success in implant treatment is defined not only by the restoration of masticatory function but also by the long-term maintenance of esthetics. Therefore, in addition to "osseointegration," which has traditionally been the primary focus of implant research, the "soft tissue seal" around implants is gaining increasing attention.Implants, by nature, penetrate the oral mucosa and are anchored in the alveolar bone, making the peri-implant mucosal seal a potential pathway for infection. However, most discussions on this issue have been based on clinical observations, and there is still a lack of evidence-based research demonstrating that compromised soft tissue sealing leads to peri-implantitis or mucosal recession.Moreover, the demand for high esthetic outcomes has led to the increased use of zirconia as an abutment material due to its tooth-colored appearance and its ability to mask the metallic shade of the underlying implant. Despite this trend, there is still limited research on the biological response of soft tissues to zirconia, making it a critical topic for future investigation.In this presentation, I will provide an overview of the current understanding of peri-implant soft tissue characteristics and their role in maintaining implant function from a perspective distinct from bone-related parameters. Additionally, I will demonstrate that zirconia exhibits soft tissue compatibility comparable to titanium and, due to its durability, may offer superior advantages during maintenance.By elucidating the role of peri-implant soft tissues from a fundamental standpoint, I hope to contribute to a better understanding of material selection in future implant treatments, where high esthetic outcomes are increasingly prioritized.

Brief CV

Ikiru Atsuta, D.D.S., Ph.D.

Division of Advanced Dental Devices and Therapeutics, Faculty of Dental Science, Kyushu University

Education

1995-2001	Student, Kyushu University, School of Dentistry
2011-2015	Postgraduate Student, Kyushu University, Graduate School of Dental Science

Research & Professional Experience:

2004-2010	Research Assistant, Kyushu University, Graduate School of Dental Science
2010-2012	Postdoctoral fellow, University of Southern California
2013-2017	Assistant Professor, Kyushu University Hospital
2017-2019	Lecturer, Faculty of Dental Science, Kyushu University
2019-2024	Associate Professor, Faculty of Dental Science, Kyushu University
2024-	Professor, Faculty of Dental Science, Kyushu University

Award:

2006	Best Poster Presentation Award, Spring Scientific Meeting of the Korean Academy of Prosthodontics and the 3rd International Joint Meeting with Japan Prosthodontic Society.
2006	Award for Thematic Oral Presentation, The 115th Annual Scientific Meeting of the Japan Prosthodontic Society.
2008	Outstanding Research Presentation Award, The 38th Annual Scientific Meeting of the Japanese Society of Oral Implantology.
2012	Dentsply Award, The 42nd Annual Scientific Meeting of the Japanese Society of Oral Implantology (JSOI).

Symposium IV
November 17th Sunday 10:05-11:05
Hall 2

SIV-1

Substances leading to enhancement of the swallowing reflex and their neural mechanisms

Kiyomi Nakayama, D.D.S, Ph.D.
Department of Oral Physiology, Showa University School of Dentistry, Tokyo, Japan

In the elderly, the risk of aspiration increases due to factors such as muscle weakness and stroke-induced paralysis, and aspiration pneumonia is a major cause of death. Therefore, increasing the contraction of the pharyngeal muscles and the activity of the innervating nerves during the swallowing reflex is expected to lead to improvements in dysphagia and help maintain the health of the elderly. Swallowing is a process that consists of the smooth transfer of a food bolus from the mouth to the stomach by the sequential contraction of the numerous muscles from the pharynx to the esophagus. It is known that this series of appropriate movements of the pharyngeal and esophageal muscles is generated by a neural circuit called the central pattern generator (CPG) in the brainstem. In addition, the activity of the swallowing CPG is regulated by somatosensory inputs from the pharyngeal mucosa and inputs from higher brain centers. We have been investigating whether various pharmaceutical agents used to improve swallowing and substances related to eating affect the neural circuits of swallowing and enhance neural activity during the swallowing reflex using an arterially perfused rat preparation. The results showed that acute administration of the ACE inhibitor imidapril or the feeding-promoting substance ghrelin enhanced the swallowing reflex induced by injection of distilled water into the oral cavity or electrical stimulation of the superior laryngeal nerve. The enhancement by imidapril was abolished by blocking the receptors for substance P and dopamine, suggesting the involvement of these neurotransmitters. On the other hand, the enhancement by ghrelin was mediated by the hypothalamus, and mediated via neuropeptide Y1 or Y5 receptors. In this presentation, I would like to focus on the effects of drugs that may improve swallowing function by enhancing the swallowing reflex and the neural mechanisms involved.

Brief CV

Kiyomi Nakayama, D.D.S., Ph.D.

Department of Oral Physiology, Showa University School of Dentistry

Education:

Undergraduate

1991-1995	School of Health Care Sciences, Faculty of Medicine, Tokyo Medical and Dental University, Tokyo, Japan

Graduate

1997-1999	Graduate School of Medical Sciences, University of Tsukuba, Tsukuba, Japan.
1999-2003	Graduate School of Medicine, University of Tsukuba, Tsukuba, Japan, Ph.D.

Research & Professional Experience:

1995-2001	Teaching Assistant, Ibaraki Prefectural University of Health Sciences
2001-2003	JSPS Research Fellowship for Yong Scientists (DC2)
2003-2004	Postdoctoral Researcher, National Institutes of Natural Sciences
2004-2006	JSPS Research Fellowship for Yong Scientists (PD)
2006-2017	Assistant Professor, Showa University School of Dentistry
2017-2023	Lecturer, Showa University School of Dentistry
2023-	Associate Professor, Showa University School of Dentistry

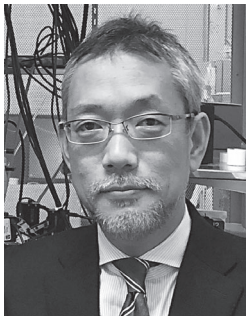
Award:

1995	Shimizu Academic Encouragement Award, Tokyo Medical and Dental University
2003	Young Investigator Award, University of Tsukuba
2021	Kamijo Scholarship Award, Showa University

Symposium IV
November 17th Sunday 10:05-11:05
Hall 2

SIV-2

Insular cortex plays facilitative roles in nociceptive information processing



Masayuki Kobayashi, D.D.S, Ph.D.
Department of Pharmacology, Nihon University School of Dentistry, Tokyo, Japan

The insular cortex (IC) processes orofacial nociceptive information and sends corticofugal projections to the brainstem nuclei such as the trigeminal spinal subnucleus caudalis (Sp5C). However, little is known about the roles of the descending projections from the IC. In this symposium, I summarize the functional roles of the IC in sensory information processing and introduce our recent progress.
First, using VGAT-Venus transgenic rats that received an AAV-ChR2-mCherry injection into the IC, we found that glutamatergic inputs from the IC induced comparable EPSCs in both excitatory and inhibitory Sp5C neurons. Paired whole-cell patch-clamp recordings demonstrated that IPSCs from inhibitory neurons to excitatory neurons, including projection neurons, were mediated via GABAA/glycinergic receptors with a high failure rate. These results suggest that IC projections to the Sp5C promote excitatory outputs from the Sp5C.
Second, we focused on the functional significance of parvalbumin (PV)-immunopositive neurons in the insular cortex on pain-related behavior. Using optogenetics, we induced long-term potentiation of inhibitory postsynaptic currents (IPSCs) to pyramidal neurons using LE-Tg(Pvalb-Cre)2Koba(+/m)PV rats. We found that pain-related behavior in response to nociceptive stimulation of the orofacial area was effectively suppressed by inducing LTP of IPSCs in the connection from PV neurons to pyramidal neurons in the insular cortex. We believe that the activation of PV neurons is superior to the inhibition of pyramidal neurons as a treatment for neuroplastic pain in the trigeminal system.

Brief CV

Masayuki Kobayashi, D.D.S., Ph.D.

Department of Pharmacology, Nihon University School of Dentistry, Tokyo, Japan

Education :

1987 - 1993	Faculty of Dentistry, Osaka University
1993 March	Awarded the degree of D.D.S.
1993 - 1997	Postgraduate school of Osaka University (Department of Oral Physiology, Faculty of Dentistry)
1997 March	Awarded the degree of Ph.D
1997 - 2000	Research Fellow in Osaka Bioscience Institute
2000 - 2006	Assistant Professor in Osaka University (Department of Oral Physiology, Faculty of Dentistry)
2006 - 2016	Associate Professor in Nihon University (Department of Pharmacology, School of Dentistry)
2016 -	Professor and Chair in Nihon University (Department of Pharmacology, School of Dentistry)

Membership of academic societies:

The Physiological Society of Japan
The Pharmacological Society of Japan
Japanese Society for Neuroscience
Society for Neuroscience
Japanese Association for Oral Biology
IBRO

Symposium IV
November 17th Sunday 10:05-11:05
Hall 2

SIV-3

Odontoblast mechanosensory/hydrodynamic receptor model explains dentinal sensitivity via the Piezo1-PANX1-P2X3 axis

Yoshiyuki Shibukawa, D.D.S, Ph.D.
Department of Physiology, Tokyo Dental College, Tokyo, Japan

When enamel lesions expose dentin, it becomes highly sensitive to various stimuli, including thermal (cold), mechanical (scraping/drilling), low-pH (sour), and hypertonic (sweet) triggers, resulting in intense tooth pain known as dentinal sensitivity or dentinal pain. This sensitivity can progress to dentin hypersensitivity. Dentin contains dentinal tubules filled with dentinal fluid, and when stimuli are applied to the dentin surface, they cause fluid/volume changes that create intratubular hydrodynamic forces, leading to the outward movement of dentinal fluid. This movement exerts mechanical force on the tubules at the dentin pulp interface, where odontoblasts reside. In this symposium, we will discuss a novel odontoblast mechanosensory/hydrodynamic receptor model to explain the mechanisms behind dentinal sensitivity. Mechanosensory transduction in odontoblasts facilitates intercellular signaling between odontoblasts and neurons via the Piezo1-PANX1-P2X3 axis, modulating the sensory mechanisms of dentinal pain.

Brief CV

Yoshiyuki Shibukawa, D.D.S., Ph.D.

Department of Physiology, Tokyo Dental College

Education

Undergraduate 1988-1995 Tokyo Dental College, Chiba, Japan, D.D.S.
Graduate 2000 Graduate School of Tokyo Dental College, Chiba, Japan, Ph.D.

Research and Professional Experience:

1995-2002	Research Associate, Department of Physiology, Tokyo Dental College
2002-2014	Assistant Professor, Department of Physiology, Tokyo Dental College
2003-2005	Postdoctoral Research Associate, Department of Physiology and Biophysics, Faculty of Medicine, University of Calgary, Canada
2014-2017	Associate Professor, Department of Physiology, Tokyo Dental College
2018-	Chairman, Department of Physiology, Tokyo Dental College
2018-	Professor, Department of Physiology, Tokyo Dental College

Award

2001	Young Investigator Award, The International Conference on Dentin/Pulp Complex 2001
2007	The Young Investigator Award, Second Research Conference for Transporters
2008	Japanese Association of Oral Biology

Rising Scientist Session
November 17th Sunday 11:10-12:10
Hall 1

RS-1

Neuronal pathway in the higher brain and function of the proprioceptive signals from jaw-closing muscle spindle

Yumi Tsutsumi, D.D.S., Ph.D.
Institute: Department of Systematic Anatomy and Neurobiology, Osaka University Graduate School of Dentistry

The proprioceptive signals from jaw-closing muscle spindles (JCMSs) are generated by stretching of the jaw-closing muscles during masticatory movements. This proprioceptive signals from JCMSs are well known to be conveyed to the brainstem by the trigeminal mesencephalic nucleus neurons, and then mainly transmitted monosynaptically to trigeminal motoneurons, resulting contraction of the jaw-closing muscles and the jaw-closing reflex. Generally, the information from JCMSs has been considered important as a reflex that regulates masticatory movements, but nothing was known about whether it is transmitted as peripheral sensory information to the central nervous system (i.e, the cerebrum and cerebellum), and what functions it is involved in. Peripheral sensory information is often integrated with other sensory information or with other brain information during the process of transmission to the central nervous system. This theory also applies to information of JCMSs, which is also integrated with information from periodontal ligament when transmitted to the brainstem, making it difficult to investigate the pathway of the information from JCMSs only. Then, we discovered that in rats, the neuronal nucleus (the supratrigeminal nucleus) in the brainstem receives only JCMSs proprioceptive signals. We clarified the pathway of information of the JCMSs from the supratrigeminal nucleus to the cerebrum and cerebellum by combining neuroanatomical techniques using neural tracers and electrophysiological techniques to record JCMSs proprioceptive signals in the brain. The insular cortex, which is the destination site to the cerebrum, is an area involved in emotion and autonomic functions. So, we obtained the surprising possibility that JCMSs proprioceptive signals are mainly involved in emotional function, not sensory or motor function. Furthermore, we also obtained the possibility that information from JCMSs is involved in emotional function from clinical study described below. In patients with Tourette's syndrome who exhibit tic symptoms, abnormal excitation is observed in the insular cortex. We have demonstrated that exciting JCMSs with a dental splint successfully reduced tic symptoms and the impulsive feelings that prior to tic symptoms in patients with Tourette's syndrome.
In this way, I would like to introduce our research which has found great potential for the role of proprioceptive signals from JCMSs in the brain, and to show you the prospects of our study.

Brief CV

Yumi Tsutsumi, D.D.S., Ph.D.

Department of Systematic Anatomy and Neurobiology, Osaka University Graduate School of Dentistry

Education

Undergraduate 2014-2019 Osaka University School of Dentistry, Suita, Japan, D.D.S.
Graduate 2020-2024 Osaka University Graduate School of Dentistry, Suita, Japan, Ph.D.

Research & Professional Experience:

2015	Adopted Osaka University Undergraduate Research Support Project "X-ray crystallography of the bacterial surface protein of group A streptococci." (Research in dept of Microbiology)
2015	Basic Research Training (Start research in dept of Systematic Anatomy and Neurobiology)
2016	Adopted Osaka University Undergraduate Research Support Project "Mechanism of onset of orofacial movement disorders in Parkinson's disease."
2019	Resident in Interdisciplinary Dentistry, Osaka University Dental Hospital
2021-2024	JSPS DC-1, Osaka University Graduate School of Dentistry
2024-	Postdoctoral Associate, Osaka University Graduate School of Dentistry

Award:

2018	Student Session Excellence Award, The 124th Annual Meeting of The Japanese Association of Anatomists
2022	Dean's Award, Osaka University Graduate School of Dentistry
2022	Domestic Travel Award, The 45th Annual Meeting of the Japan Neuroscience Society
2023	L'Oreal-UNESCO Japan Award for Women in Science
2023	MORITA Excellent Presentation Award, The 65th Annual Meeting of Japanese Association for Oral Biology
2024	Dean's Award, Osaka University Graduate School of Dentistry
2024	Toshihiko Tokizane Memorial Award for Excellent Graduate Study in Neuroscience, The 47th Annual Meeting of the Japan Neuroscience Society
2024	Excellent Research Encouragement Award, The Osaka University Dental Society

Rising Scientist Session
November 17th Sunday 11:10-12:10
Hall 1

RS-2

Elucidation of the receptor mechanism of masticatory muscle pain using a rat model of masticatory muscle pain.

Daisuke Ikutame, D.D.S., Ph.D.
Department of Stomatognathic Function and Occlusal Reconstruction,
Graduate School of Biomedical Sciences, Tokushima University

[Aim]
The main symptoms of masticatory muscle pain disorder are pain and movement disorders of the masticatory muscles. However, the mechanism of onset has not been elucidated, and an effective treatment has not yet been established. It has been reported that the interaction between neurons and satellite glial cells caused by TNF-α in the trigeminal ganglion is involved (Ito et al. J Oral Facial Pain Headache. 2018). However, the mechanisms underlying the onset of masticatory muscle pain remain unknown. This study aimed to investigate the mechanisms underlying masticatory muscle pain onset often encountered during dental treatment using a rat model of masticatory muscle pain.
[Materials and Methods]
In this study, we established reserpine-induced masticatory muscle pain in 5-week-old SD male rats. We performed a behavioral observation experiment by measuring the withdrawal reflex threshold in response to mechanical stimulation. Reserpine, which impairs the descending pain inhibitory system, was injected into the masseter muscle of 5-week-old male Sprague Dawley rats. These rats were designated as the reserpine group. In addition, minocycline, a glial cell function inhibitor, was directly administered to the trigeminal ganglion before reserpine injection; these rats were designated as the reserpine + minocycline group. The naive group was also included for comparison. The withdrawal reflex threshold of the masseter muscle was measured by using a digital von Frey instrument. Second, we performed an immunofluorescence analysis of cytokines in the trigeminal ganglion. After perfusion, the trigeminal ganglion was excised, tissue sections were prepared, and immunofluorescence staining was performed for the inflammatory cytokine CXCL2.
[Result]
The withdrawal reflex threshold was significantly lower in the reserpine group than in the naive group from the 3rd to the 10th day. Additionally, the reserpine group was considerably lower than the reserpine + minocycline group from the 5th to the 10th day. Analysis of CXCL2 immunohistochemical staining in the trigeminal ganglion showed a significant increase in the number of CXCL2 positive cells in the reserpine group compared to that in the naive group. Furthermore, the reserpine + minocycline group showed a trend toward a smaller increase in the number of CXCL2-positive cells compared to the reserpine group.
[Conclusion]
These results suggested that injection of reserpine into the masseter muscle may cause mechanical hyperalgesia and increase glial cell activation. In addition, the administration of minocycline to the trigeminal ganglion may alleviate hyperalgesia and attenuate the activation of glial cells. Therefore, glial cell function may be involved in the onset of masticatory muscle pain. In the future, we plan to conduct a pharmacological approach to the mechanism of the onset of masticatory muscle pain and perform a detailed analysis of the mechanism.

Brief CV

Daisuke Ikutame, D.D.S., Ph.D.

Department of Stomatognathic Function and Occlusal Reconstruction, Graduate School of Biomedical Sciences, Tokushima University

Education

Undergraduate 2007-2013 Nihon University School of Dentistry, Tokyo, Japan, D.D.S.
Graduate 2017-2021 Nihon University Graduate School of Dentistry, Tokyo, Japan, Ph.D.

Research & Professional Experience:

2021-2024 Assistant Professor, Tokushima University Graduate School of Dentistry

Award:

2019 JSOP Grand prize Poster Award (Basics), The 24th Annual Meeting of the Japanese Society of Orofacial Pain.
2024 JSTJ Outstanding performance Poster Award, The 37th Annual Meeting of the Japanese Society for Temporomandibular Joint.

Rising Scientist Session
November 17th Sunday 11:10-12:10
Hall 1

RS-3

The brain activity of sweet taste intensity in older adults.

Hirotaka Wada, D.D.S., Ph.D.
Department of Oral and Maxillofacial Radiology, Tokyo Dental College

Glucose is the primary fuel for life, and cellular uptake of glucose is a fundamental process for metabolism, growth, and homeostasis. Although the adult human brain generally constitutes about 2% of total body mass, it consumes approximately 25% of the glucose supply. Therefore, the cognitive requirement for glucose may not significantly decrease with aging, and older adults should consume an adequate amount of glucose daily. However, the intake of too much sugar increases the risk of obesity, diabetes, and dental caries. The WHO recommends reducing the intake of free sugar to less than 10% of total energy intake.

In a previous study of the time-intensity sensory evaluation of sweet taste, we found that older adults perceived sweetness more slowly than young adults and ultimately perceived almost the same intensity as young adults. However, it is still unclear whether the differences in sweet-taste intensity perception are caused by taste receptors and/or the central nervous system. To understand how older adults perceive the sweet taste intensity, we assumed both the mouth and brain should be investigated.

In this study, we performed the functional MRI of the same older adults using the same solution delivery system as in the time-intensity sensory evaluation study. The results showed that brain responses in the insular cortex (the primary taste cortex) were lower in older adults compared to controls (young adults). In this presentation, we demonstrate that sweet taste perceptions of older and young adults. In future studies, we will explore the association between sweet taste perceptions in the mouth and brain, and would like to discuss how the aging affect the sweet perception in humans.

Brief CV

Hirotaka Wada, D.D.S., Ph.D.

Department of Oral and Maxillofacial Radiology, Tokyo Dental College

Education

Undergraduate 2012-2018 Tokyo Dental College, Tokyo, Japan, D.D.S.
Graduate 2019–2023 Tokyo Dental College, Tokyo, Japan, Ph.D.

Research & Professional Experience

2018-2019	Resident, Tokyo Women's Medical University
2023-	Assistant Professor, Department of Oral and Maxillofacial Radiology, Tokyo Dental College

Award

2023	Röntgen award 2022 to Hirotaka Wada.
2024	Rising Scientist 賞 ., 日本口腔科学会 . (as a co-author)
2023	Rising Scientist 賞 ., 日本口腔科学会 . (as a co-author)
2023	Joseph Lister Award, Test-retest reliability on functional MRI for salty and umami taste., JADR The 71st Annual Meeting of Japanese Association for Dental Research. (as the supervisor).

Grant

2023	JSPS KAKENHI (JP23K19756)

Luncheon Seminar 1: SHOFU INC
Saturday, November 16th, 11:45am - 12:45pm
Hall 1 (Kakuix Koryu Center West Wing 2nd Floor)

LS1

GIOMER effects in the oral cavity

Junji Tagami, D.D.S., Ph.D.
Visiting Professor at Faculty of Dentistry, Chulalongkorn University
Prof. Emeritus at Institute of Science Tokyo
Director of Aoyama Quartz Dental Clinic

GIOMER is one of the examples of the so-called “Bioactive Dental Materials”, which utilizes S-PRG (Surface Pre-Reacted Glass Ionomer) technology. The S-PRG filler technology is widely used for restorative materials, dental adhesives, and tooth cleaning/pumicing materials. Various ions released from the S-PRG filler were investigated and confirmed to perform beneficial effects to the tooth substances and oral environment.

In this lecture, the beneficial effects brought about by GIOMER products in the oral cavity are described as GIOMER effects, which are as follows.

1. Acid buffering effect appears in the oral cavity and around the material,
2. Anti-bacterial effect appears on the surface of and around the material,
3. Anti-demineralization effect appears at the applied tooth surface and tooth substance around the material,
4. Accelerating effect of remineralization appears at the applied tooth surface and tooth substance around the material,
5. Enhancement effect of dentin bond durability of composite resin filling.

The lecture will explain the mechanism and clinical relevance of these GIOMER effects while considering and proposing ways to make use of them.

Luncheon Seminar 2: GC Corporation
Sunday, November 17th, 12:20am - 13:20pm
Hall 1 (Kakuix Koryu Center West Wing 2nd Floor)

LS2

Biomimetics in Dentistry: Fiber-Reinforced Composite Resin for Dentin Replacement

Akram Al-Wahabi, B.D.S., Ph.D.
GC Corporation, Dental Information Center

Biomimetics is the science of mimicking nature's strategies to solve human challenges, and in dentistry, it offers innovative solutions for restorative materials. One such advancement is fiber-reinforced composite resin, specifically designed for dentin replacement. Inspired by natural structures like bone and wood, which utilize fibers for enhanced strength and durability, this material incorporates short glass fibers to improve the mechanical properties of dental restorations. everX Flow, a flowable short-fiber reinforced composite, represents a breakthrough in this field, offering superior fracture resistance and toughness compared to conventional composites.
This presentation explores the biomimetic principles behind everX Flow and its clinical applications in restorative dentistry. By acting as a sub-layer beneath conventional composites, everX Flow strengthens large cavities and posterior restorations, particularly in high-stress areas. This allows for better long-term outcomes and reduced failure rates. The product's flowable nature ensures optimal adaptation to cavity walls, while its innovative fiber technology minimizes crack propagation, thereby enhancing the overall longevity of restorations. This presentation will cover the science behind fiber reinforcement, its practical use in dental procedures, and the significant benefits it offers for both clinicians and patients.

POSTER PRESENTATION

Travel Award Poster Presentation

001-1: Efficacy of Novel Bioactive Restorative Material in Secondary Caries Prevention

Y. FU, D. LEE, N. W. SIDUP, E. YU, K. C. LI, M. EKAMBARAM, Z. MORSE, M. MEI
Faculty of Dentistry, University of Otago, Dunedin, New Zealand

Background: Secondary caries is considered the most common reason for repairing or replacing direct dental restorations, and the leading cause of their failure. A new bioactive filling material has emerged recently, which claims to increase remineralisation ability due to active calcium and fluoride ion-releasing properties. Aim: (i) investigate the ion-releasing capacity and mechanical strength of the new bioactive restorative material Cention Forte (CF), and (ii) investigate changes in carious lesion mineral density and hardness of the restored tooth structure on the restorative interface. Methods: (i) A total of 108 material specimens of three groups (n=36), Filtek Z250 (FKZ), Fuji IX GP Extra (F9) and CF specimens underwent ion release measurements in neutral and acidic solutions, followed by mechanical testing. (ii) Cavities (3x3x2mm^3) were prepared in bovine specimens and restored with CF or F9 (n=12). The restored specimens were undergone pH cycling, followed by mechanical testing. Results: (i) F9 demonstrated the highest mean fluoride ion release overall, followed by CF. CF showed the greatest amount of calcium ion release. Under the acidic environment, CF exhibited higher microhardness compared to F9 and FKZ. CF demonstrated significantly higher flexural strength than F9, with FKZ yielding the highest flexural strength. (ii) After pH cycling with bovine specimens, there was a slight increase in cross-sectional microhardness from CF, whereas F9 showed an increase only after acidic cycling. Conclusion: Overall, CF demonstrated favorable initial ion release under acidic environments. CF yielded satisfactory flexural strength in acidic environments. CF had shown an increase in microhardness after carious cycling. Minimal changes of bovine cross-sectional dentine microhardness were seen in F9 and CF. Acknowledgement: This research was funded by New Zealand Dental Research Fund (NZDRF) RF.0003.2024.

002-1: Anti-inflammatory Nanoparticles Enhance Alveolar Bone Healing in Compromised Extraction Sockets.

K. SUBRAMANIAN, J. H. YUN
Department of Periodontology, College of Dentistry, Jeonbuk National University, Republic of Korea

This study aimed to evaluate tannic acid mineral particles (TMP) incorporated into collagen plugs for enhancing bone regeneration in compromised extraction sockets. Bilateral third and fourth premolars and first molars of four beagle dogs were hemisected, distal roots removed, and endodontic-periodontal lesions induced in mesial roots using silk wire ligatures, Porphyromonas gingivalis, pulp extirpation, and bacterial injection. After three months, mesial roots were extracted and randomized into groups: control (debridement); P0 (collagen plug); P1 (collagen plug with 1 mg TMP); and P5 (collagen plug with 5 mg TMP). Five months later, Micro-CT revealed lower bone surface density and structural model index in P5 compared to P1 and P0 ($p < 0.05$). Histomorphometry showed significantly more mineralized bone in P5 than in P0 ($p < 0.05$) with positive osteopontin expression at crestal reversal lines in P5. These findings suggest that a compromised extraction socket decelerates the healing process and that a high concentration (5 mg) of TMP enhances bone regeneration due to its osteoconductive and anti-inflammatory properties. This work was supported by the National Research Foundation of Korea (NRF) grant (MSIT) (RS-2024-00338812 and RS-2023-00207983).

Undergraduate Student Presentation

003-1: Identification of regulating signals in *Streptococcus mutans* for oral dysbiosis

T. UEMATSU, H. SEMPUKU
School of Dentistry at Matsudo, Nihon University, Chiba, Japan

[Objective]
Streptococcus mutans induces oral biofilm and is one of pathogens for the development of dental caries. *Staphylococcus aureus* induces oral dysbiosis as an opportunistic pathogen. Aspiration pneumonia and heart disease are associated with the infection of *S. aureus* under the colonization of commensal bacteria including *S. mutans* in the oral cavity. To investigate relationships between the infection of *S. aureus* and the regulation signals to synthesize various polysaccharides and to lead quorum sensing (QS) in *S. mutans*, the biofilm formation assay using *S. aureus* was performed with sonic extracts (SE) from *S. mutans* mutants.
[Methods]
SE from *S. mutans* mutants to glucosyltransferase genes (*gtfB*, *gtfC*) and genes (*comD*, *comR*, *comX*, *comY*, *luxS*) associated with QS due to bacterial aggregation and mutants of various other genes (*pknB*, *gbpC*, *sacB*, *SMU574*, *SMU833*, *SMU1009*, *SMU1013*) were added with *S. aureus* Cowan I and *S. mutans* UA159. *gtfBC*$^-$ in tryptic soy broth with 0.25% sucrose (TSBs) in 96-well polystyrene microtiter plates. After incubation, the biofilm cells were stained with 0.25% safranin for 15 min. After washing with DW, the biofilm formation was assessed by the absorbance of the extracted safranin at 492 nm.
[Result]
SE from mutants of the QS-related genes *comD*, *comX*, *luxS*, and *SMU833* involved in peptidoglycan synthesis could not induce biofilm formation of *S. aureus* and *S. mutans* and also lost the protein expression of glucosyltransferase.
[Conclusion]
It was concluded that QS-associated bacterial components were involved in GTF-dependent complex biofilm formation not only in *S. mutans* but also in the opportunistic pathogen such as *S. aureus*. Biofilm formation in *S. aureus* was dependent on glucan formation by *S. mutans* and QS-controlled killing by *S. mutans*.

Keywords : Biofilm, Quorum Sensing

004-1: Encouraging Young Adult's Flossing In East Asia: The Hello-Floss Project

S. SONG[1], N. TAKEUCHI[1], T. SHIDARA[1], Y. OKAWAGUCHI[1], M. HIRATA[2], D. TADOKORO[3], T. KOSEKI[4]
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In Sendai, Japan, one in three young people has periodontal disease, yet only 11% floss. Moreover, this issue is prevalent not only in Japan but across East Asia. To drive global change, Hello-Floss Project was launched by dental students from Tohoku University in collaboration with Sendai Dental Association and local health authorities. The purpose of this study is to evaluate how activities of Hello-Floss project led by dental students have impacted awareness of flossing. Survey on oral health awareness and flossing was conducted at two industrial college campuses in Japan and High school of South Korea. Based on results, original brochures including sample floss were created and distributed exclusively at one of the campuses in Japan. Six months later, follow-up survey was conducted at both campuses to assess impact of brochure. Initial survey revealed differing trends between Japan and Korea. In Japan (n=968), 31% of students were unaware of dental floss, and 56% didn't know how to floss, compared to just 2% and 20% in Korea (n=128). However, floss usage was low in both countries (10% in Japan, 14% in Korea). The most common reason for not flossing in Korea, was "not feeling the need" (53%), while in Japan, it was "unaware of dental floss" (44%) indicating different underlying reasons for not flossing. Follow-up survey revealed significant difference ($p < 0.01$) between the campus that received brochures and the one that did not. Among students who received brochures, only 3% remained unaware of dental floss, and 13% were unsure how to floss. Floss usage increased to 23%. We heard voices of young adults in Japan and Korea and successfully encouraged behavioral changes in flossing among Sendai's youth. Expanding Hello-Floss Project to other countries and collaborating with local youth could create significant synergy effect in improving oral hygiene across East Asia.

Keywords : Floss, Oral Hygiene, Health promotion, motivation (motivational effect), Target age: Adolescent (13-18 years old), Young adult (19, 20 years old)

005-1: In vivo and in vitro studies of epithelial cell behavior around titanium, zirconium, and PEEK implant superstructures

K. KUROKI[1], K. TANAKA[2], Y. AYUKAWA[3], F. NISHIMURA[4], I. ATSUTA[2]

[1]Kyushu University, School of Dentistry, Fukuoka, Japan, [2]Section of Fixed Prosthodontics, Division of Oral Rehabilitation, Faculty of Dental Science Kyushu University, [3]Section of Implant and Rehabilitative Dentistry, Division of Oral Rehabilitation, Faculty of Dental Science Kyushu University, [4]Section of Periodontology, Faculty of Dental Science Kyushu University

Objectives: Implant materials that can stimulate and integrate with the epithelial wound healing process may significantly enhance the efficacy of dental implants. This study aimed to compare the effects of different materials on the sealing of the peri-implant epithelium (PIE) using titanium (Ti), polyetheretherketone (PEEK, Pe), and zirconium (Zr) implant superstructures. Methods: (1) Maxillary first molars were extracted from rats and replaced with Ti, Zr, or Pe implants. (2) Additionally, we compared morphological changes in cultured rat oral epithelial cells (OECs) grown on Ti, Zr, or Pe plates.Results: (1) After 4 weeks, the PIE of all implants exhibited a structure similar to the junctional epithelium (JE). However, the Pe implant appeared to form a weaker epithelial seal at the tissue-implant interface compared to Ti or Zr implants, although the epithelial extension was longer than that observed with Ti or Zr. (2) We observed decreased expression of adhesion proteins in OECs cultured on Zr plates compared to those cultured on Ti plates. Few OECs adhered to the Pe plate. Additionally, cell adherence, migration, and proliferation on Zr plates were lower, while apoptosis was reduced on Ti plates.Conclusions: Although the Pe group demonstrated high mechanical strength, its biocompatibility with surrounding soft tissue was slightly lower than that of Ti and Zr. Therefore, caution is advised when considering its use as a superstructure material for implants.

Keywords : Dental implant, Epithelial cell, Adhesion molecule, PEEK

006-1: Classification of calcium phosphate using SVM based on NIR spectra

T. SUZUKI[1], Y. OTSUKA[2], H. KONO[2], M. KIKUCHI[2]

[1]School of Dentsitry, Faculty of Dentistry Kagoshima University, Kagoshima, Japan, [2]Department of Biomaterials Science, Graduate School of Medical and Dental Sciences, Kagoshima University, Kagoshima, Japan.

The characteristic methods of calcium phosphate such as XRD require a large amount of samples. There has been a demand for a non-destructive and rapid method of identifying crystal phases. In this study, we used SVM based on NIR spectra to characterize a wider variety of calcium phosphate crystal phases. 1.0 g each of Tetra Calcium Phosphate (TTCP), Hydroxyapatite (HAp), Dicalcium Phosphate Anhydrate (DCPA), Monocalcium phosphate anhydrous (P2Ca), Dicalcium Phosphate Dihydrate (DCPD), a- Tricalcium Phosphate (TCP), b-TCP was weighed and stored in a glass vial. The stored samples were measured by NIR spectroscopy from the bottom of the vial. The obtained NIR spectra were SNV normalized. SVM was applied based on the result of SNV-normalized NIR spectra. SVM was referenced from the Python library and classification was performed based on SNV normalized NIR spectra. Precision, recall, f1 score, and accuracy were calculated as classification evaluation methods to evaluate consistency. After validation, calibration, and testing, a confusion matrix was generated based on the test results. An SVM program written from scratch using Python ran successfully. The accuracy was 0.990, indicating SVM was effective for characterizing calcium phosphate.The result indicates the utility in the characterization of calcium phosphate using SVM based on SNV-normalized NIR spectra. The measurement time for NIR was less than 5 seconds, allowing for rapid component analysis. Compared to X-ray diffraction, the measurement time for diffraction was approximately 15 minutes, making it clear that NIR spectroscopy was more cost-effective for screening. In addition, it was suggested that this highly useful spectroscopy method is one in which no crushing is required and component analysis can be performed without contact without removing the sample from the glass bottle.

Keywords : Calcium phosphate, NIR spectroscopy, support vector machine

007-1: Trends and Determinants of Inequalities in Caries Prevalence Among 3-Year-Olds and 12-Year-Olds in Japan: An Ecological Study

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Institute of Science Tokyo, Faculty of Dentistry, Department of Dentistry, 4th Year

Objectives: Caries prevalence and its inequalities are still prominent in Japan. This study aimed to determine the temporal trends in absolute and relative inequalities in caries prevalence among 3–year–olds and 12–year–olds across the 47 prefectures of Japan. Additionally, determinants of inequalities were also analyzed.
Methods: In this ecological study, to measure health inequalities, we used the Slope Index of Inequality (SII) for absolute inequalities and the Relative Index of Inequality (RII) for relative inequalities. We used caries prevalence among 3–year–olds and 12–year–olds in all prefectures in Japan. To determine if there were statistical differences in the absolute and relative inequalities in caries prevalence among 3–year–olds and 12–year–olds, we conducted an F–test to check for homogeneity of variances, followed by Welch's t–test. Finally, to identify the factors associated with caries prevalence, we analyzed 3–year–olds and 12–year–olds data using multivariable linear regression. Stata 17.0, Python 3.10.12, and R version 4.4.0 were used for the analyses.
Results: Although the overall caries prevalence rate has decreased, health inequalities still exist. The absolute inequalities in caries prevalence among 3–year–olds and 12–year–olds showed a decreasing trend from 2006 to 2022, but there was no change in relative inequalities. The results of Welch's t–test indicated that the relative inequalities were greater for 12–year–olds than for 3–year–olds. The results of the linear regression analysis suggested that school–based fluoride mouth rinse in elementary schools was effective in reducing caries prevalence among 12–year–olds, and the public application of fluoride gel for 3–year–olds was also effective in reducing the prevalence.
Conclusions: Despite the decrease in average caries level, there have still been inequalities in caries prevalence among 3–year–olds and 12–year–olds in Japan. As part of public health policies, public application of fluoride gel and school–based fluoride mouth rinse would reduce caries inequalities.

Keywords : Caries Prevalnece, Health Inequalities, Fluoride Mouth Rinse, Public Health Policy, Ecological Study

008-1: Mastication modulates ATP signaling from the mesencephalic trigeminal nucleus to the locus coeruleus

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[1]Department of Oral Anatomy and Cell Biology, Kagoshima University, Kagoshima, Japan, [2]Department of Molecular Oral Pathology and Oncology, Kagoshima University, Kagoshima, Japan

Wearing a mouthpiece and chewing gum activates the brain and improves the efficiency of sports and study, but the mechanism is still unclear. We focused on the mesencephalic trigeminal nucleus (Vmes) in the midbrain, which receives sensations from the periodontal ligament and masticatory muscle spindle, and the locus coeruleus (LC) located near the Vmes. We hypothesized that mastication activates the Vmes, which releases adenosine triphosphate (ATP), a signaling molecule, and that ATP activates the LC, which in turn activates the entire brain. Thirty C57BL/6J male mice (2 months old) were used; they were kept on a 12-hour light/dark cycle, with lights on at 8 am and lights off at 8 pm. Mice could drink water anytime but were fed only between 8 p.m. and 8 a.m. (Active) and not at other times (Inactive). Vesicular nucleotide transporter (VNUT) was used as a marker of cells that use ATP as a signaling molecule, which takes up ATP in the cytoplasm into vesicles. The expression of mRNA and protein of VNUT and ATP receptors was analyzed by RT-PCR and quantitative PCR, and immunohistochemistry, respectively. In the midbrain, mRNA expression of VNUT and ATP receptors was confirmed. Immunoreactivities for VNUT and ATP receptors were observed in cell bodies of Vmes and LC neurons, suggesting that ATP signaling occurs between the Vmes and LC. Furthermore, the immunoreactivity intensity of VNUT in the cells of Vmes neurons was significantly lower in the Active period than in the Inactive period. It is suggested that Vmes neurons stimulated by chewing released VNUT-positive vesicles, resulting in the migration of intracellularly distributed VNUTs to the cell surface and a decrease in intracellular immunoreactivity. Our results suggest that mastication activates Vmes neurons, which release ATP from VNUT-positive vesicles, and excites LC neurons via ATP receptors.

Keywords : Mastication, Cell biology

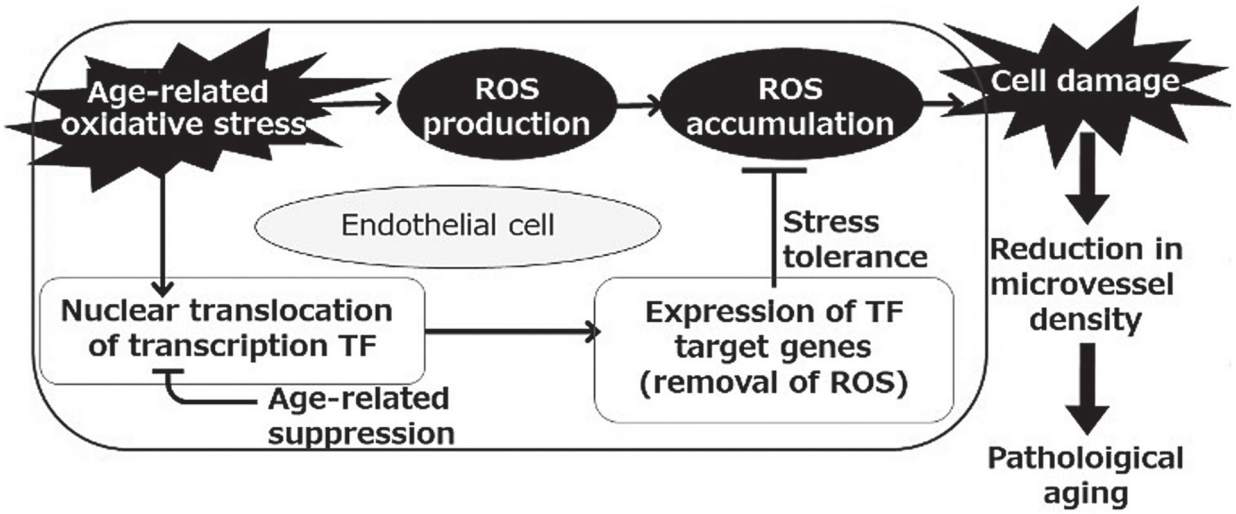
009-1: Roles of nuclear translocation of stress-resistant transcription factor in the aging-related decrease in microvascular density

Q.Y. GUAN

The Fifth Department of Dentistry, Institute of Science Tokyo, Tokyo, Japan

Problem: Aging has been linked to a reduction in microvessels in periodontal tissues, contributing to delayed wound healing. In our super-aged society, there is a high demand for treatments such as implant prosthetics and denture prosthetics among the elderly. Therefore, elucidating the mechanisms that control the homeostasis of microvessels in the oral region is of urgent importance. However, the molecular mechanisms behind this age-related reduction remain unclear. Hypothesis: In this laboratory, we have been conducting research on a transcription factor (TF) which contributes to cellular oxidative stress resistance and is highly expressed in vascular endothelial cells. Additionally, studies on centenarians suggest TF may contribute to human longevity. Therefore, we hypothesized that age-related declines in microvascular density are regulated by TF. Methods:1. Specimens: Lung tissues from 5 aged (24 months old) and 5 young (3 months old) mice. 2. Immunofluorescence staining using antibodies against TF, ERG, Hoechst 33342, and CellROX.3. Time-lapse observation of TF nuclear translocation in HEK293T cells transfected with GFP or GFP-labeled TF and stimulated with 0.1 mM hydrogen peroxide. 4. qRT-PCR using total RNA obtained from lung tissues of each mouse. Results:1. Microvascular density decreased with aging: To investigate the relationship between aging and tissue microvascular density, we measured the number of total cell nuclei and endothelial cell (ERG-positive) nuclei in the lungs of aged and young mice. The proportion of endothelial cells among all cells was calculated. The results indicated that microvascular density decreased with aging (Fig. 1). 2. TF translocated to the nucleus in response to oxidative stress: It has been reported that TF plays a crucial role in inducing the expression of target genes and acquiring resistance to oxidative stress by translocating to the nucleus. Therefore, we evaluated whether TF actually translocates to the nucleus in response to oxidative stress using time-lapse observation. HEK293T cells transfected with GFP alone showed no response to hydrogen peroxide stimulation, whereas cells transfected with TF-GFP showed a significant increase in TF nuclear translocation (Fig. 2). 3. Nuclear translocation of TF decreased with aging: Lung tissue is constantly exposed to oxidative stress, and the translocation of TF to the nucleus is essential for acquiring stress resistance. We examined the age-related changes in TF nuclear translocation in endothelial cells using fluorescence immunostaining. The results revealed that the proportion of TF translocated to the nucleus in endothelial cells significantly decreased in aged mice (Fig. 3). 4. Expression of TF target genes involved in stress resistance decreased with aging: To evaluate whether the decrease in TF nuclear translocation affects its transcriptional activity, we performed quantitative RT-PCR analysis on lung tissue. The results showed that the expression of TF target genes A, B, and C, which confer oxidative stress resistance to microvessels, decreased with aging (Fig. 4). This suggests that the age-related decrease in the expression of stress resistance factors leads to reduced oxidative stress resistance in endothelial cells. 5. Accumulation of oxidative stress products increased with aging: To investigate the impact of the age-related decrease in the expression of TF target genes on the accumulation of reactive oxygen species (ROS), an oxidative stress product, we analyzed the accumulation of ROS in endothelial cells using fluorescence immunostaining. The results indicated that ROS accumulation increased in the blood vessels of aged mice (Fig. 5). This suggests that with aging, the oxidative stress resistance of pulmonary endothelial cells decreases, leading to the accumulation of ROS, which causes cellular damage and a reduction in microvascular density. Conclusions:This study proposes a model where the nuclear translocation of TF, crucial for stress resistance, decreases with aging, leading to increased ROS accumulation, cellular damage, and reduced microvascular density (Fig. 6). In young individual, even lung tissue is constantly exposed to oxidative stress, because TF nuclear translocation induces the expression of target genes, conferring stress resistance to vascular endothelial cells. However, with aging, the ability of TF to translocate to the nucleus diminishes, leading to the accumulation of oxidative stress products, causing cellular damage and a subsequent decrease in microvascular density. This study is the first in the world to establish this new paradigm. Understanding this mechanism could lead to new therapies for maintaining microvascular density and improving tissue function, potentially improving periodontal wound healing and extending health span.

Keywords : stress-resistant transcription factor, aging-related decrease in microvascular density



010-1: Glycosaminoglycans in chicken-vegetable bone broth delay the progression of osteoporosis

Y. SEKI[1], R. OHKUMA[2], T. KARAKIDA[2], R. YAMAMOTO[2], Y. YAMAKOSHI[2]

[1]The Fifth-Grade Dental Student of Tsurumi University, Yokohama, Japan, [2]Department of Biochemistry and Molecular Biology

Bone broth (BB) has gained worldwide attention in recent years as a superfood that supplements many nutrients lacking in modern humans. Our **objectives:** are to identify components in chicken-vegetable BB (CVBB) that are associated with the prevention of osteoporosis and to verify these components in animal studies. **Methods:** CVBB was fractionated by ion exchange chromatography (IEC) and each fraction was added to the mouse macrophage-like cell line (RAW264 cells) to study its effect on osteoclast differentiation at both cell biological and genetic levels, and glycosaminoglycans (GAGs) in IEC fractions were identified by enzyme-linked immunosorbent assay. Furthermore, ovariectomized (OVX) rats were generated and orally administered water, whole CVBB, and CVBB extracts obtained from IEC one week after OVX. At the end of the administration period, tibia, femur, and lumbar vertebrae were harvested and bone density was measured by micro-computed tomography. CVBB was further treated with gas stove, induction heater and microwave, and the amounts of GAGs in degraded CVBB and their effects on RAW264 cells were compared. **Results:** CVBB was isolated into four fractions by IEC, and both hyaluronan and chondroitin sulfate were identified in the third and fourth fractions (CVBB-Ext). CVBB-Ext showed inhibition of osteoclast differentiation of RAW264 cells, and mRNA levels of osteoclast differentiation marker genes were significantly reduced. In OVX rats, an apparent decrease in bone mineral density was observed in the OVX/control group compared with the sham-operated group, and a partial suppression of the decrease in bone mineral density was observed in the OVX/CVBB-Ext group. CVBB was also found to affect the amount of GAG degradation products and the differentiation of RAW264 cells when treated in different ways. **Conclusions:** We propose that both hyaluronan and chondroitin sulfate in CVBB suppress osteoclast differentiation and inhibit the progression of osteoporosis.

Keywords : bone broth, osteoporosis, osteoclast, hyarulonan, chondroitin sulfate

Genaral Poster Presentation

011-1: Pretreatment with alendronate augments lipid A-induced IL-1β release by ASC-deficient RAW264 cells

R. TAMAI, Y. KIYOURA

Department of Oral Medical Science, Ohu University School of Dentistry, Fukushima, Japan

Objectives: Alendronate (ALN) is an anti-bone-resorptive drug with inflammatory side effects. ALNupregulates lipid A-induced interleukin (IL)-1α and IL-1β release by J774.1 cells via apoptosis-associated speck-like protein containing a caspase recruitment domain (ASC) activation. The present study examined whether ALN augmented lipid A-induced proinflammatory cytokine production using ASC-deficient mouse macrophage-like RAW264 cells. Methods: The mouse macrophage-like cells were pretreated with or without ALN, and then incubated with orwithout lipid A. For inhibition assays, the cells were pretreated with the indicated concentrations of inhibitors for 1 h prior to the addition of ALN. Levels of secreted mouse IL-1α, IL-1β, IL-6 and TNF-α in culture supernatants and activation of activator protein 1 (AP-1) or NF-κB were measured by ELISA. Expression of caspase-11, ASC, myeloid differentiation factor 88 (MyD88), NEDD4-binding protein 1 (N4BP1), α-tubulin and actin was analyzed by Western blot analysis. Toll-like receptor (TLR) 4 expression was analyzed by flow cytometry. Cell viability was evaluated by measuring the reduction of MTS to formazan by living cells. The levels of LDH activity in supernatants, which were assessed to evaluate cell membrane damage, were determined using the Cytotoxicity Detection kit. Results: Pretreatment of RAW264 cells with ALN significantly augmented lipid A-induced IL-1β release, although ALN did not upregulate the expression of TLR4, MyD88 and caspase-11. Moreover, pretreatment ofcaspase-11-deficient RAW264.7 cells with ALN significantly augmented lipid A-induced IL-1β release. Notably, ALN upregulated the activation of FosB, c-Jun or JunD, but not c-Fos or NF-κB in RAW264 cells. Even at 100 μM, ALN did not upregulate N4BP1 degradation, although treatment with lipid A led to the complete degradation of N4BP1 in RAW264 cells. Furthermore, pretreatment with the AP-1 inhibitor SR11302, but not the c-Fos inhibitor T-5224, before addition of ALN inhibited ALN-augmented IL-1β release by lipid A-treated RAW264 cells. SR11302 also reduced ALN-augmented lactate dehydrogenase release by the cells. Conclusions: These findings collectively suggested that ALN augmented lipid A-induced IL-1β release and cell membrane damage in ASC-deficient RAW264 cells via activation of AP-1, but not NF-κB.

Keywords : nitrogen-containing bisphosphonate, AP-1, IL-1β, alendronate, apoptosis-associated speck-like protein containing a caspase recruitment domain

012-2: Interaction of Collagen-binding Protein Cnm with Human Immunoglobulins

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Objectives: *Streptococcus mutans*, a major cariogenic bacterium, produces surface proteins, such as glucosyltransferases (GTFs), glucan-binding proteins (Gbps), and collagen-binding protein (Cnm). We previously reported findings showing an association of Cnm-positive *S. mutans* with the pathogenesis of IgA nephropathy (IgAN), though details regarding IgAN development remain to be clarified. The present study was conducted to examine interactions between Cnm and IgA in order to clarify the IgA development mechanism. Methods: Recombinant proteins of Cnm (rCnm), GTFB (rGTFB), and GbpC (rGbpC) were constructed for the experiments, while three human immunoglobulins, IgA1, IgA2, and IgG, were also used. Binding of rCnm, rGTFB, and rGbpC to those human immunoglobulins was examined with an enzyme-linked immunosorbent assay (ELISA). Furthermore, a rat IgAN-like nephritis-induced model was employed to confirm the localization of rCnm. Biotin-labeled rCnm was administered through the jugular vein of Sprague-Dawley rats (four-week-old males). After 45 days, euthanasia was performed and kidneys extracted. Renal tissue pathology in the kidneys was evaluated using fluorescent immunostaining with anti-IgA antibodies. Results: rCnm showed a significantly greater binding ability to IgA1 than the other bacterial surface proteins (P<0.05) and also to IgA1 as compared with the other immunoglobulins (P<0.01). In rats administered rCnm, IgA deposition was observed in the glomerular mesangial region, whereas that was not noted in those that received PBS. Furthermore, biotin-labeled rCnm was observed in the same region as IgA deposition in the rCnm group. Conclusions: These results suggest that Cnm has an ability to bind to IgA. Taken together, it is considered that following invasion into the bloodstream, Cnm binds to and forms a complex with IgA, leading to deposition of IgA1 in renal glomeruli.

Keywords : Streptococcus mutans, Collagen-binding protein, IgA nephropathy, Recombinant Cnm

013-1: Preparation of NMT1 vector for study of protein myristoylation

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Protein myristoylation is a critical post-translational modification involved in immune response and homeostasis. Although N-myristoyltransferase 1 (NMT1) is the primary enzyme responsible for this process, its function in osteoblasts remains poorly understood. In this study, we aimed to purify NMT1 constructs for recombinant proteins and to investigate its molecular behavior in osteoblasts. We cloned the NMT1 gene using custom gene synthesis and inserted it into plasmid vectors with various tags for protein tracking. The constructed plasmids were then used in bacterial expression systems for recombinant protein production and transfected into HEK cells (fibroblasts) and MC3T3-E1 cells (osteoblasts). The protein expression was confirmed by western blot analysis, and NMT1 reduction was verified through siRNA-mediated knockdown. To detect myristoylated proteins, we employed a chemical binding method and analyzed molecular behavior under different reagent stimulations. We successfully generated NMT1 plasmids and purified recombinant proteins. In addition, NMT1 expression was confirmed in both HEK and MC3T3-E1 cells. Interestingly, we observed that NMT1 expression and the localization of myristoylated proteins in MC3T3-E1 cells were altered in response to inflammatory and differentiation stimuli. These findings suggest that NMT1 might play a significant role in inflammation and differentiation in osteoblasts, and it could potentially be a target for clinical treatments aimed at bone-related diseases.

Keywords : NMT1, myristoylation, osteoblast

014-2: HIF-1α increases LPS-induced IL-13 and IL-33 expression in mast cells

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Mast cells are distributed in a whole body, not only in epithelial tissues such as airway mucosa and skin, but also in connective tissues such as bone. These peripheral tissues are generally exposed to low oxygen, physoxia (about 2-5% O_2), in comparison with atmospheric condition, normoxia (about 20% O_2). Mast cells are recently known to express toll like receptors (TLRs) and play an important role in innate immunity against bacterial infection as well as type I allergy. Lipopolysaccharide (LPS) is one of the well-known pathogen-associated molecular patterns (PAMPs) which is recognized by TLR4 and strongly induces immune responses including cytokine production and inflammation. In response to LPS, mast cells produce not only pro-inflammatory cytokines but also several Th2 type cytokines. In this study, we investigated effects of low-oxygen environment on LPS-induced cytokine expression in mast cells. Murine mast cell line, MC/9, was cultured under hypoxia (2% O_2) or normoxia (20% O_2). Hypoxia inducible factor (HIF) -1α and HIF-2α were increased in MC/9 cells in response to hypoxia. Then, we analyzed effects of hypoxia on LPS-induced cytokine expression. MC/9 cells were cultured in either normoxia or hypoxia for 12 hours prior to LPS stimulation. Interestingly, LPS-induced IL-13 and IL-33 expression was potentiated and prolonged while other cytokines including pro-inflammatory cytokines and other "alarmins" were not significantly affected. We next analyzed by using gene knockdown strategy whether HIF-1α mediated enhancement of LPS-induced IL-13 and IL-33 under hypoxia. Specific siRNA reduced HIF-1α mRNA in MC/9, which also reduced hypoxia-potentiated LPS-induced IL-13 and IL-33 expression while pro-inflammatory cytokine TNF expression was not significantly altered. Surprisingly, siRNA against HIF-1α reduced HIF-1α mRNA about 30%; nevertheless hypoxia-potentiated IL-13 and IL-33 were reduced significantly. These data suggested that HIF-1α plays an important role in enhancement of LPS-induced IL-13 and IL-33 expression in mast cells under hypoxia.

Keywords : mast cell, hypoxia

015-1: Effect of hematopoietic stem cell transplantation on antimicrobial resistance of Streptococcus mutans

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Objectives Hematopoietic stem cell transplantation (HSCT) is used as treatment for cancer. The conditioning regimen includes high-dose chemotherapy and radiation therapy, along with continuous antimicrobial agent administration to manage the resulting immunocompromised state. This has led to concerns about an increase in infections caused by multidrug-resistant bacteria following HSCT. The present study examined the antimicrobial resistance of Streptococcus mutans organisms isolated from children undergoing HSCT as well as gene expression profiles of those isolates related to antimicrobial resistance. Materials and Methods The Okayama University Ethics Review Committee approved this study (Lab 1508-016). Saliva samples were collected from pediatric patients before, and one and three months after undergoing HSCT, and plated in Mitis Salivarius agar including bacitracin to isolate S. mutans. Minimum inhibitory concentration (MIC) values were determined using an antibacterial susceptibility test. RNA sequencing analysis was also conducted to confirm the expression status of all antimicrobial resistant S. mutans genes. Furthermore, real-time RT-PCR examinations were performed using complementary DNA samples with either 16S ribosomal RNA (rRNA), or primers specific for the SMU1605 and SMU1913c genes. Results All S. mutans organisms obtained one month after HSCT demonstrated resistance to various antimicrobial agents, while those obtained before and three months after HSCT did not show antibiotic resistance. Furthermore, in RNA sequencing analysis, S. mutans organisms that showed antimicrobial resistance were found to have significantly increased expression of the SMU1605 gene encoding a drug permease and the SMU1913c gene encoding an immunity protein gene as compared to those without antimicrobial resistance. These expressions were also confirmed by real-time reverse transcription-PCR. Conclusion The present results suggest that S. mutans at one month after HSCT may enhance the extracellular efflux of antimicrobials. Further studies are needed to clarify the detailed mechanisms by which S. mutans acquires antimicrobial resistance.

Keywords : Hematopoietic stem cell transplantation, Streptococcus mutans, RT-PCR, antimicrobial resistance

016-2: Comprehensive analysis of oral bacteria related to red complex species

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Objective: The red complex bacteria, *Porphyromonas gingivalis (Pg)*, *Treponema denticola (Td)*, and *Tannerella forsythia (Tf)*, has high periodontal pathogenicity, and other bacteria may be involved in colonizing these bacteria. In the present study, we analyzed the distribution of oral bacteria in Japan, focusing on the red complex bacteria. Methods: We extracted bacterial DNA from dental plaque specimens of 116 subjects (39 men, 77 women; age range 64 to 91 years, median 75 years). PCR was then performed using this DNA to detect major 10 periodontopathic bacterial species. We further conducted microbiome analysis using 16S rRNA gene sequence form the DNA and quantitative insights into microbial ecology 2 (Qiime 2). Results: The major periodontopathic bacterial species, including *Pg, Tf, Campylobacter rectus, Prevotella nigrescens, Capnocytophaga ochracea, Capnocytophaga sputigena, and Eikenella corrodens, were detected in 60-90% of cases, while Td, Prevotella intermedia, and Aggregatibacter actinomycetemcomitans* were detected in 10-30% of cases. The detection rates of some of these 10 major periodontopathic bacteria was significantly higher in the *Pg*- and *Tf*-positive subjects than in the *Pg*- and *Tf*-negative subjects, respectively ($P < 0.05$). There was no significant difference in the distribution of periodontopathic bacteria between *Td*-positive and *Td*-negative subjects. In a comprehensive analysis of oral microbiome, subjects with all three red complex species had significantly higher αdiversity than subjects with only *Pg* ($P < 0.05$) and had significantly lower βdiversity than subjects with only *Tf* ($P < 0.01$). In the taxonomy analysis, the proportion of Porphyromonas was significantly higher in subjects with all red complex species than in subjects with only *Pg* or *Tf* ($P < 0.01$). Conclusion: The present results indicate that the presence of each red complex species leads to the formation of a unique oral microbiome. Notably, individuals positive for all red complex bacteria may harbor oral bacteria that confer a significant advantage in developing periodontal disease.

Keywords : red complex, 16S rRNA, Comprehensive analysis

017-1: Acid Production of *Candida* Species and Its Resistance to Fluoride

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Objective: *Candida albicans* is thought to be involved in supporting the dental caries process. However, little is known about the acid production from sugars by *Candida* species and the effect of fluoride on it. Therefore, we investigated the acid production, the fluoride sensitivity, and identified the glucose metabolic end products of five *Candida* species under both aerobic and anaerobic conditions.
Methods: Five *Candida* species (*C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. maltosa*, and *C. glabrata*) were grown under aerobic conditions and their acid production was assessed by pH-stat system under aerobic and anaerobic conditions, as well as pH 5.5 and pH 7.0. Different concentrations of potassium fluoride (20-80 mM, 380-1519ppmF^-) were tested at pH 7.0, to observe any changes in acid production. Furthermore, metabolic end products were analyzed using high-performance liquid chromatography (HPLC).
Results: All *Candida* species produced acids from glucose both aerobically and anaerobically. The acid production detected by the pH-stat system at pH 5.5 was significantly lower than at pH 7.0. HPLC analysis revealed that organic acids such as malic, formic, and acetic acids were produced from glucose at pH 7.0 and 5.0. However, the amount of protons detected by HPLC was less than that of protons detected by pH-stat system. Moreover, at pH 7.0, aerobic acid production was hardly affected by fluoride (20-80 mM, 380-1519ppmF^-). Under anaerobic conditions, *C. glabrata* was completely inhibited by the higher concentrations of fluoride, while the other species showed partial dose-dependent inhibition.
Conclusion: *Candida* species produced large amounts of acid from glucose, but the amount of organic acids detected by HPLC was less than the protons detected by pH-stat, suggesting that *Candida* species may produce inorganic acids in addition to organic acids. The high resistance to fluoride under aerobic conditions suggests that *Candida* species may be more involved in the caries process.

Keywords : Candida, Fluoride, dental caries

018-2: Evaluation of binding ability of specific Streptococcus mutans strains to fatty acids

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Objectives Individual affected by non-alcoholic fatty liver (NAFL) show fat accumulation alone in the liver, while non-alcoholic steatohepatitis (NASH) is a fatty liver condition accompanied by inflammation without history of alcohol consumption. Findings in our previous studies suggested that collagen-binding protein (Cnm)- and 190-kDa cell surface protein antigen (PA)-positive *Streptococcus mutans* are involved in progression of NAFL to NASH. Using a mouse model, the present study examined involvement of these specific *S. mutans* organisms in NASH development and their ability to bind fatty acids.
Methods C57BL/6J mice (6-week-old males) were fed a high-fat diet for four weeks, then each received an intravenous injection via the jugular vein of Cnm- and PA-positive (Cnm^+/PA^+) *S. mutans* KT3, KT4 (Cnm^-/PA^+), KT2 (Cnm^+/PA^-), and KT44 (Cnm^-/PA^-) organisms isolated from NASH and NAFL patients. Blood was collected after one or three hours, then liver, visceral fat, and subcutaneous fat specimens were excised following euthanasia. The specimens were inoculated into Mitis-salivarius agar plates containing bacitracin and bacterial colonies counted. Furthermore, binding of these strains to fatty acids was evaluated. Following incubation in brain heart infusion broth at 37°C for 16 hours, the strains were adjusted to an OD550 of 0.6. Next, palmitic acid, oleic acid, or linoleic acid was added to the solution, then mixing for one minute and incubation at room temperature for 10 minutes were performed, and OD550 was determined.
Results After one hour, the number of KT3 organisms was significantly higher in liver specimens as compared to the other strains. Additionally, the fatty acid binding ability of KT3 to each of palmitic acid, oleic acid, and linoleic acid was significantly greater than that of the other strains.
Conclusion The present findings suggest that Cnm- and PA-positive *S. mutans* organisms induce NASH aggravation by binding to various fatty acids in the liver.

Keywords : non-alcoholic steatohepatitis, Streptococcus mutans, collagen-binding protein, protein antigen, fatty acids

019-1: Elucidation of functional characteristics of membrane vesicles produced by *Streptococcus mitis*

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[Objective] *Streptococcus mitis* is a commensal bacterium in the human pharynx and oral cavity that can cause various infectious complications, including bacteremia and infective endocarditis. However, details of its pathogenicity and pathogenesis remain unclear. Membrane vesicles (MVs) from Gram-negative bacteria mediate a wide variety of phenomena, including horizontal gene transfer, nutrient acquisition, and induction of inflammation in the host. Recently, it was shown that *Streptococcus pneumoniae*, a member of the mitis group streptococci, secretes MV. However, MV production from *S. mitis* has not been reported. This study aimed to test whether *S. mitis* produces MVs and to reveal the functional characteristics of MVs produced by *S. mitis*.
[Method] First, MVs were isolated from *S. mitis* cultures by density gradient centrifugation. Then, the particle size of MVs was measured and proteins contained in MVs were identified by LC-MS/MS analysis. Finally, effects of MVs on host cell morphology, cytokine production, and phagocytic activity were analyzed using A549, THP-1, and HL-60 cells.
[Result] We confirmed MVs production from *S. mitis* strains NCTC12261, Nm-65, and Nm-76, and identified the proteins contained within them. LC-MS/MS analysis of MVs showed that they are vesicles rich in cytoplasmic components. Interestingly, the inclusion of virulence factors, such as cholesterol-dependent cytolysin and zinc metalloproteinase, was also noted. MVs were found to bind to and invade A549 cells, promote the production of TNF-α, IL-8, IL-6, IL-1β, and IL-10 from PMA-treated THP-1 cells, and inhibit phagocytic activity. Promotion of IL-8 production was also observed in HL-60 cells.
[Conclusion] This study revealed that *S. mitis* produces MVs, which induce inflammatory responses from host cells. Therefore, MVs were suggested to be an important factor in the pathogenicity of *S. mitis*.

Keywords : membrane vesicle, Streptococcus, Streptococcus mitis

020-2: Bacterial-Mediated Formation of Artificial Dental Calculus

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Introduction: Dental calculus, a hard deposit formed by the calcification of dental plaque, is primarily composed of calcium phosphate mineral salts deposited on natural teeth and restorations. It is closely associated with various periodontal diseases, posing significant risks to oral health. Despite its clinical relevance, the precise mechanisms underlying dental calculus formation remain poorly understood. Understanding these mechanisms is essential for developing effective strategies for its removal. This study focuses on the role of bacteria in the formation of dental calculus, aiming to elucidate the microbial contributions to its mineralization. Material and Methods: A single bacterial species Streptococcus mutans MT8148 was inoculated into different culture conditions to investigate its role in mineralization. The presence of mineralization was confirmed using Alizarin Red Staining. Further structural and elemental analysis was conducted using Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS). Results: The findings demonstrated that viable bacteria induce mineralization by the fifth day of culture. Building on this, our study found that dead bacteria also induce mineralization. We compared the rate of mineralization of dead and live bacteria in the same culture medium, we also found that dead bacteria can accelerate the induction of mineralization. In the future, we will further explore the mechanism of dental calculus formation. Conclusion This study demonstrates that dead bacteria surpass live bacteria in inducing and accelerating mineralization, offering insights into bacterial-mediated mechanisms that may lead to novel strategies for preventing and treating dental calculus.Acknowledgment This work was supported by KAKENHI (grant numbers: 23K24532, 24K22187) from Japan Society for the Promotion of Science and by CREST (grant Number: JPMJCR22L5) from Japan Science and Technology Agency.

021-1: Properties of Streptococcus mutans for binding to type III collagen

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Objective: *Streptococcus mutans*, a major pathogen of dental caries, is regarded as a causative agent of infective endocarditis (IE). Prior to performing an invasive dental procedure, antibiotic therapy is predominantly administered for prevention of IE development. *S. mutans* is thought to contribute to the pathogenicity of IE by adhering to exposed collagen in dental pulp and vessel walls via cell surface proteins, such as the 120-kDa collagen-binding protein (CBP). Collagen in dental pulp is composed of type I (51%) and type III (49%), and previous studies have shown that *S. mutans* adheres to type I collagen even after being killed by antibiotic agents. The present study was performed to evaluate the binding properties of *S. mutans* to type III collagen after killing by an antibiotic agent.

Methods: *S. mutans* TW295 (CBP-positive strain), TW295CND (CBP-defective isogenic mutant strain), and TW295comp (CBP-complemented mutant strain) were cultured at 37°C for 18 hours under two different conditions; living or killed by treatment with 1 mg/mL amoxicillin. Next, each was added to wells of a 96-well plate coated with type III collagen and cultured at 37°C for three hours, then staining with crystal violet was performed. The OD595 value of each *S. mutans* strain was determined and compared with that for SA83, a CBP-positive strain, defined as 100%.

Results: For living *S. mutans* strains, the average collagen-binding rate was high for TW295 (98.1%) and also TW295comp (94.4%), whereas that for TW295CND was low (2.9%). Furthermore, following killing by amoxicillin, the average collagen-binding rate for both TW295 (42.3%) and TW295comp (43.3%) remained significantly higher than that for TW295CND (3.2%) ($P<0.001$).

Conclusion: These results indicate that CBP-positive *S. mutans* strains have a collagen-binding property, even after killing by amoxicillin. Additionally, they suggest pathogenicity of killed CBP-positive *S. mutans* strains for IE via dental pulp.

Keywords : Streptococcus mutans, collagen-binding protein, type III collagen, dental pulp

022-2: Analysis of biological functions of Streptococcus mutans ABC transporter-related genes associated with biofilm formation

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Objectives: *Streptococcus mutans* forms biofilm by adhering to tooth surfaces and producing an extracellular matrix, resulting in development of dental plaque. Generally, biofilm formation is initiated by interactions between planktonic bacteria and a tooth surface in response to environmental stress factors, a mechanism likely related to ATP-binding cassette (ABC) transporters. However, details related to that mechanism remain unclear. The present study examined gene expressions in biofilm-forming bacteria. Furthermore, *SMU922*, an ABC transporter-related gene, was extracted and the biological functions were investigated using *SMU922*-deficient mutant strains.

Materials and Methods: The DNA fragment encoding *SMU922* was amplified by PCR using specific primer sets and ligated using a pGEM-T Easy Vector system. The resultant plasmid was digested with KpnI and inserted into an erythromycin resistance cassette, linearized with SalI, and used to transform *S. mutans* MT8148, which was termed *SMU922* deletion mutant strain (*Δ922*). MT8148 and *Δ922* cells were grown for 18 hours at 37°C, stained with hexidium iodide and suspended with chemically defined medium (CDM) including 0.5% or 1.0% sucrose, and then allowed to form biofilm. Formed biofilms were observed with a confocal laser scanning microscope (CLSM). In addition, MT8148 and *Δ922* were separately inoculated into Todd Hewitt Broth containing 0.5% or 1.0% sucrose, then dispensed into wells of a 24-well microtiter plate and incubated at 37°C for 24 hours. Formed biofilms were sonicated with an ultrasonic disruptor. Following removal of floating cells, remaining biofilms were stained with crystal violet and measured at OD_{570}.

Results: CLSM images revealed that the structure of biofilm formed by *Δ922* had decreased density and thickness as compared to MT8148 biofilm. Furthermore, following sonication, the amount of *Δ922* biofilm was lower.

Conclusion: These results suggest that *SMU922* has relationship with biofilm formation.

Keywords : Streptococcus mutans, biofilm, ABC transporter

023-1: The Klebsiella mannose phosphotransferase system promotes intestinal colonization and the production of extracellular polymeric substances from mannose

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The *Klebsiella* mannose phosphotransferase system promotes intestinal colonization and the production of extracellular polymeric substances from mannose.
Klebsiella spp. are common opportunistic pathogens of humans and constituents of the commensal microflora in the nasal and oral cavities of humans. Recent research has revealed that oral *Klebsiella* spp. can ectopically colonize the intestinal tract, accumulating intestinal Th1 cells. For oral bacteria to colonize the intestinal tract, they need to compete for nutrients with indigenous intestinal bacteria. This study focused on the influence of mucus-derived sugars on *Klebsiella spp.*, including the effect of their ability to be metabolized mannose on this species' virulence.
We investigated whether *Klebsiella* could be cultured with one of the 13 sugars present in the mucus of the intestinal tract as the sole carbon source. We generated a Klebsiella mannose phosphotransferase system (PTS) (*manXYZ*) deficient strain and investigated whether the utilization of intestinal mucus-derived sugars is associated with the growth. Furthermore, we examined the virulence of this organism in the mouse intestinal tract, especially the ability to colonize the host using competition assay.
We found that N-acetylglucosamine, mannose, and glucosamine were used by*Klebsiella* as carbon sources and *Klebsiella* ManXYZ is a PTS that specifically takes up mannose and glucosamine. Through ManXYZ, mannose was used for bacterial growth and the upregulation of extracellular polymeric substances production. In vivo competition assays showed that mannose metabolism promoted intestinal colonization. However, ManXYZ was not involved in Th1 and Th17 induction in the intestinal tract.
This study shows that *Klebsiella spp.* utilize intestinal mucus-derived sugars, particularly N-acetylglucosamine, mannose, and glucosamine, as carbon sources. The fundamental roles of ManXYZ were to ensure that mannose, which is present in the host, is available for bacterial growth and to promote the production of extracellular polymeric substances, thus facilitating bacterial adaptation to the host environment.

Keywords : Klebsiella, Mannose phosphotransferase system, Extracellular polymeric substances (EPS), Intestinal colonization, Mucus-derived sugar

024-2: The relationship between colonization by opportunistic Candida species and local factors in patients undergoing perioperative oral function management

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Objective: The aim of this study was to clarify local factors in the oral cavity related to colonization with the opportunistic pathogen Candida species in patients undergoing perioperative oral function management. Methods: To determine the presence of Candida species colonization in the oral cavity, we have tried to collect clinical isolates using a swab method from the center of the patient's tongue. The swab samples were inoculated onto CHROMagar Candida (Kanto Chemical Co., Tokyo, Japan), from which Candida species was isolated based on the colony color after undergoing incubation. We then used the polymerase chain reaction (PCR) with species-specific primers to identify the Candida species. We compiled a list of local factors in the oral cavity that may be related to Candida species colonization and statistical analysis was performed to examine the association between Candida species colonization and local factors in the oral cavity. Results: In patients undergoing perioperative oral function management, it was found that three local factors in the oral cavity- the number of remaining teeth, whether or not dentures were worn, and dry mouth- were related to the detection of Candida species. Conclusion: In patients undergoing perioperative oral function management in whom immunocompromise is expected, colonization with Candida species is a risk factor for the development of opportunistic infection and postoperative infections. This study demonstrated that the three local oral factors that found to be related to Candida species colonization, namely the number of remaining teeth, whether or not dentures were worn, and dry mouth, could be useful indicators for easily determining whether or not Candida species colonization is present.

Keywords : Candida, colonization, perioperative

025-1: Analysis of iron-induced biological changes in Streptococcus mutans associated with development of nonalcoholic steatohepatitis

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Objectives

Non-alcoholic steatohepatitis (NASH) is considered to develop via hepatic accumulation of excess iron in the blood, resulting in increased oxidative stress. We previously reported that *Streptococcus mutans* possessing both collagen-binding protein (Cnm) and cell surface protein antigen (PA) may be involved in development of NASH. The present study was conducted to analyze gene expression of *S. mutans* strains isolated from NASH patients in the presence of iron.

Methods

S. mutans KT3 (Cnm^+/PA^+) was isolated from a severe NASH patient, then incubated in Todd Hewitt broth or that supplemented with an iron (III) chloride solution adjusted to 1, 2.5, 5, or 10 μM until the logarithmic growth phase. Next, total RNA was extracted, and complementary DNA synthesized by reverse transcription. Expression levels of the *cnm* gene encoding Cnm and the *pac* gene encoding PA were evaluated using real-time reverse transcription PCR. RNA sequencing analysis was also performed to confirm gene expression.

Results

The expression levels of both *cnm* and *pac* in the KT3 strain were significantly lower ($P < 0.05$) following growth in the presence of 10 μM iron (III) chloride as compared to without iron (III) chloride. Expression of several genes in the *S. mutans* organisms were altered in the presence of iron, including those related to ABC transporters and permease. Furthermore, there was a decrease in expression of bacterial surface proteins with LPXTG sequences as well as Cnm and PA in the presence of iron (III) chloride, while the *gtfB* gene encoding GTFB demonstrated increased expression, which is related to biofilm formation.

Conclusion

These results suggest that following bloodstream invasion and adherence to the liver, *S. mutans* organisms possessing both Cnm and PA form biofilms after a decrease in expression of those protein-related factors in the presence of iron, and an increase in GTFB.

Keywords : non-alcoholic steatohepatitis, Streptococcus mutans, collagen-binding protein, protein antigen, iron

026-2: Effects of chitosan properties on its antimicrobial activity against *Candida albicans*.

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Objectives: *Candida albicans* causes opportunistic infections in the oral cavity and measures against *Candida* infection is required. In this study, we prepared four types of chitosan products from *Chionoecetes opilio* and *Decapodiformes*, and investigated effects of chitosan forms, molecular weight, and degree of deacetylation (DAC) on its antimicrobial activity against *C. albicans*.

Methods: The *C. albicans* strain NRBC1594 was grown until optical density at 660 nm (OD_{660}) reached 1.0. Then, the culture was mixed with an equal volume of 1% chitosan or 1% lactic acid for a negative control (NC), incubated, and OD_{660} was hourly measured for 12 h. In addition, serial dilutions of the mixture were used to determine colony forming units (CFUs). Also, rates of dead cells, reactive oxygen species (ROS) production, and the amount of extracellular adenosine triphosphate (ATP) were examined by fluorescence staining and luciferase luminescence assay.

Results: As compared with the NC group, chitosan-treated groups showed a significant reduction in CFUs. CFUs were significantly reduced by chitosan of a larger molecular weight after 30-min treatment, and the chitosan product from *Decapodiformes* tended to have higher antimicrobial activity. The amount of extracellular ATP in all chitosan-treated groups was significantly increased compared to that in the NC group. All chitosan-treated groups showed significantly higher rates of dead cells and ROS production than the NC group, however, there were no statistically significant differences between chitosan-treated groups.

Conclusions: Tested chitosan products possessed antimicrobial activity against *C. albicans*, and the product from *Decapodiformes* showed higher activity than that from *C. opilio*. In addition, when comparing the activity of products from the same raw materials at 30 min after treatment, viable counts were significantly reduced by chitosan of a larger molecular weight, however, there was no correlation between viable counts and DAC. Furthermore, chitosan treatment increased ROS expression and extracellular ATP levels in *C. albicans*, and induced cell death, indicating that chitosan with antimicrobial activity can be used for novel antimicrobial dental materials.

Keywords : chitosan, antimicrobial material

027-1: Combined Effects of FGF-2 and Carbonate Apatite: A Preclinical Study

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Introduction: Fibroblast growth factor-2 (FGF-2) is a signaling molecule that promotes periodontal healing. CO_3Ap has been used as a bone substitute for periodontal treatment. The information is limited regarding the effect of the combined use of FGF-2 and CO_3Ap on periodontal healing. The purpose of this study is to investigate the effects of FGF-2 in combination with CO_3Ap on periodontal healing.
Methods: Standardized periodontal defects were surgically created in Wistar rats. The defects were given FGF-2, CO_3Ap, FGF-2 + CO_3Ap, or left unfilled. Healing was evaluated by histological, immunochemical and microcomputed tomography analysis. The cell viability/proliferation rates of MC3T3-E1 on the CO_3Ap with/without FGF-2 were measured by WST-8, and differentiation was assessed by qRT-PCR. Furthermore, the mineralization was evaluated by alizarin red staining. The Ca^{2+}concentration in the CO_3Ap culture medium was measured by metallo assay. Cell morphology was observed using scanning electron microscopy and confocal laser scanning microscopy.
Results: At 4 weeks, bone volume fraction in FGF-2 + CO_3Ap group was significantly greater than in CO_3Ap group ($p < 0.05$). In FGF-2 + CO_3Ap group, there was more new bone formation compared with FGF-2 and CO_3Ap group, and greater levels of osteocalcin-positive cells compared with CO_3Ap group ($p < 0.05$). Compared with CO_3Ap group, FGF-2 + CO_3Ap group showed higher viability/proliferation ($p < 0.01$), and the expressions of *Runx2* and *Sp7* were reduced ($p < 0.01$). FGF-2 + CO_3Ap group demonstrated greater alizarin red staining level than CO_3Ap group ($p < 0.001$), and higher Ca^{2+}concentrations were found ($p < 0.01$). FGF-2 + CO_3Ap group exhibited a tendency for greater extent of cell attachment and more elongated cells.
Conclusion: Combined use of FGF-2 and CO_3Ap may improve healing in periodontal defect. FGF-2 enhanced cell attachment and proliferation on CO_3Ap, regulated osteoblastic differentiation, thereby contributed to new bone formation.

Keywords : fibroblast growth factor-2, Carbonate apatite, periodontal regeneration

028-2: miR-1260b Promote Anti-inflammatory M2 Macrophage by Targeting NFAT5

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Objectives:
Our previous study demonstrated that exosome from TNF-α treated GMSCs contained increased amounts of miR-1260b and converted macrophage phenotype from proinflammatory M1 to anti-inflammatory M2 (Nakao Y, et al., Acta Biomater, 2021). However, potential target genes of this miR-1260b still remains unclear. Here, we screened novel target genes by database analysis (miRDIP) and picked up one such candidate gene product as NFAT5. Overexpression of NFAT5 is known to activate NLRP3-inflammasome and to produce higher amounts of IL-1β in macrophage. Therefore, we aimed to investigate the effect of miR1260b on NFAT5 regulation and the role of NFAT5 on macrophage polarization.
Methods:
The experimental periodontitis was induced in mice with silk ligation. Animal experiments were approved by an institutional ethical review board (Kyushu University, #A23-113-1). The expression level of NFAT5 in mice gingiva was measured by qRT-PCR. Human $CD14^+$ peripheral blood monocytes (PBMCs), THP-1 human monocytic cell line, and RAW264.7 murine macrophage cell line were transfected with miR-1260b mimics, followed by the stimulation of the cells with LPS. Quantitative real-time PCR analysis and western blotting analysis were performed to confirm the inhibition of NFAT5 and NLRP3. Furthermore, knock-down experiments were carried out by using NFAT5 siRNA and the expression of NLRP3 was examined by qRT-PCR. The M1/M2 macrophage polarization in si-NFAT5- transfected PBMCs was evaluated by flow cytometric analysis. The M1/M2 macrophage marker expression was examined by qRT-PCR.
Results:
The expression of NFAT5 mRNA was up-regulated in the gingiva of mice periodontitis model. Transfection of miR-1260b mimics inhibited the expression of NFAT5 in macrophages. Knock-down of NFAT5 decreased the expression of NLRP3 and promoted M2 polarization in macrophages.
Conclusion:
These results suggest that miR-1260b promotes M2 macrophage polarization by targeting NFAT5, and, therefore, miR-1260b can be a novel therapeutic tool against inflammatory periodontal disease.

Keywords : NFAT5, M2 macrophage, microRNA

029-1: Fatty-acid-based ionic liquids with high biocompatibility for subgingival biofilm therapy

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Ionic Liquids (ILs) are liquid salts at room temperature and highly tunable biomaterials by adjusting the combination of cations and anions. Choline and Geranate IL (CAGE), which consists of choline as a cation donor and geranate as an anion donor, shows an antibiofilm effect due to its penetration into biofilm, which has not been achieved by current clinical drugs. In contrast, host cell irritation by geranate has been a hurdle for medical use. Therefore, we searched for anion donors to replace geranate.
Five fatty acids (linoleic acid, oleic acid, lauric acid, octanoic acid, and azelaic acid) were utilized as anion donors and mixed with choline to fabricate novel choline-fatty acid ILs. Antimicrobial/biofilm efficacy of new ILs and CAGE in vitro was evaluated by measuring minimum inhibitory concentration (MIC) and live/dead staining. Minimum cytotoxicity (MC) of new ILs and CAGE on a human gingival epithelial cell line (Ca9-22) was evaluated by MTT assay, and the safety margin (the range of antimicrobial and toxic concentrations) was calculated by MC/MIC. Gingiva on the upper jaw of C57BL/6 mice was treated with ILs or PBS (5μL/day, for a week). Body weight change and water/food intake were monitored, and tissue irritation was assessed by histology.
New ILs exhibited superior antimicrobial/biofilm efficacy than CAGE. In particular, Choline and Linoleic acid IL were shown to be highly effective compared to CAGE. For cytotoxicity, the new ILs with lower MIC tended to have lower MC. The safety margin of CAGE was four times, but Choline and Linoleic acid IL and Choline and Oleic acid IL were 125 times, showing a significant safety improvement. No tissue irritation was observed in vivo, and there were no differences in body weight changes or water/food intake.
Fatty-acid-based ILs showed promise as topical biofilm treatment with high biocompatibility and significant antimicrobial/biofilm efficacy.

Keywords : Periodontitis, Ionic liquids, Biocompatibility, Antibiofilm efficacy

030-2: Periodontal ligament modulates osteoclast dynamics in periodontitis

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Objectives:The accumulation of dental biofilm triggers inflammation of the gingiva (gingivitis), and persistent inflammation causes periodontitis, which irreversibly destroys periodontal tissue, including alveolar bone. Although bone resorption is mediated by osteoclasts differentiated from osteoclast progenitor cells via RANKL signaling, the origin of osteoclast progenitor cells and the RANKL-producing cell population in periodontitis are not well understood. Methods:We used CX3CR1-EGFP/TRAP-tdTomato mice to identify osteoclasts and their progenitor cells in a ligature-induced mouse periodontitis model. The bone marrow of the CX3CR1-EGFP/TRAP-tdTomato mice was transplanted to wild-type mice to investigate the origin of osteoclasts in the periodontitis. Flow cytometry and scRNA-seq were performed using isolated cells from the mouse periodontal ligament. Results:Imaging and flow cytometry analysis of bone marrow chimera showed osteoclast progenitor cells in periodontitis were recruited from bone marrow to the periodontal ligament and differentiated locally to osteoclasts. We also identified a fibroblast population expressing RANKL in the periodontal ligament, and this population appeared only when periodontitis was induced. Conclusions:Osteoclast progenitor cells in periodontitis originate in the bone marrow, and a RANKL-expressing cell population in the periodontal ligament promotes their differentiation, thus causing periodontitis. Future studies will clarify the exact mechanism underlying the progression from gingivitis to periodontitis.

Keywords : Periodontal ligament, Osteoclast, Periodontitis

031-1: Single Intrapalatal injection erythromycin-loaded microparticle mitigate alveolar bone loss and enhances bone regeneration in periodontitis

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Objective: Erythromycin (ERM) has demonstrated therapeutic potential in promoting alveolar bone regeneration in periodontitis. ERM-loaded nanoparticles or microparticles offer targeted delivery to affected tissues. This study aims to evaluate the efficacy of different ERM-loaded nanoparticle or microparticle formulations administered via intra-palatal injection in enhancing bone regeneration and maintaining periodontal health. Methods: Ligature-induced periodontitis (LIP) was induced on the second molar of 8-week-old male C57BL/6J mice receiving intra-palatal injections of ERM, ERM-loaded nanoparticle, or ERM-loaded microparticle formulations. RNAseq analysis was performed on gingival samples collected from mice with LIP treated with one of the above formulations to assess cytokine-, osteoblast- and osteoclast-related gene expression during bone regeneration. Alveolar bone was evaluated morphometrically and histologically using alkaline phosphatase (ALP) and tartrate-resistance acid phosphatase (TRAP) staining for the presence of osteoblasts and osteoclasts. DEL1, OCSTAMP, and OSCAR protein expression and localization were examined using immunofluorescence staining to assess their rob vssssle in alveolar bone tissue regeneration. Additionally, MC3T3-E1, human periodontal ligament, and primary mouse bone marrow cells were used to investigate the effect of different concentrations (10, 1, 0.1, and 0.01 ug/mL) of ERM nano- and microparticle formulations on osteoblasts and osteoclasts differentiation. Result: Injection of ERM-loaded microparticles, especially PLA14200, upregulated del1, oscar, ocstamp, cxcl10, il1b, il17f, and il19 RNA expression in the gingival tissue, but the same effect was not seen with nanoparticle formulations. Moreover, PLA14200 helped prevent alveolar bone loss and enhanced bone growth by inducing high DEL1, OCSTAMP, and OSCAR protein expression in periodontal tissue compared to other formulations. Additionally, mice treated with PLA14200 exhibited a higher osteoblasts/osteoclasts ratio, suggesting a pro-osteogenic environment and bone regeneration. At higher concentrations, cells treated with PLA14200 exhibited increased mineralization and ALP activity compared to the control ERM-treated cells. Conclusion: This study suggests that PLA14200 promotes bone regeneration and helps maintain periodontal health by simultaneously enhancing osteoblast activity, inhibiting osteoclast differentiation, and modulating the inflammatory environment in disease-affected bone tissue. These effects contribute to bone remodelling crucial for effective bone and periodontal tissue regeneration.

Keywords : Periodontitis, Macrolide, DEL1, alveolar bone regeneration

032-2: Metformin suppresses inflammation-induced VCAM-1 expression on endothelial cells

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Introduction: People with diabetes are less likely to respond to periodontal treatment than healthy individuals due possibly to exaggerated inflammatory responses and impaired wound healing. Recent studies demonstrated that not only systemic but also local insulin resistance played an important role in the pathogenesis of diabetic complications. Therefore, in this study, we investigated the effects of insulin sensitizing reagents, metformin on diabetes-related periodontitis by local administration. Method : *In vitro*, The effect of metformin on E. coli LPS and TNFA (10ng/ml, respectively)-induced VCAM-1 expression and cellular adhesion with human leukocyte cell line (THP-1) were assessed using murine vascular endothelial cell line (TKD2) under hyperglycemia-induced insulin resistant conditions. *In vivo*, C57BL/6J mice were fed a 60% high-fat diet (60% HFD) for 8 weeks, and the effect of local metformin administration on alveolar bone resorption induced by 7-0 silk ligation was evaluated. Results : *E. coli* LPS and TNFA-induced VCAM-1 expression in TKD2 was significantly suppressed by pretreatment with metformin under hyperglycemic conditions for 48 hours, resulting in decrease of the cell adhesion of TKD2 with THP-1. Bone resorption appeared to be suppressed in HFD-fed mice treated with local, gingival administration of metformin as compared with those with vehicle administration. Conclusion : Metformin could suppress inflammation-induced VCAM-1 expression on endothelial cells and the endothelial cellular adhesion with leukocytes under insulin resistant conditions. Therefore, local application of the insulin sensitizing reagents may exhibit beneficial effects against inflammatory periodontal tissue breakdown.

Keywords : Metformin, Diabetes, VCAM1, Periodontitis, Endothelial Cell

033-1: Senescent cells in severe periodontitis with occlusal trauma

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Objectives:Periodontitis is a disease caused by complex factors such as bacterial infection and occlusal trauma. Various inflammatory diseases are related to cellular senescence and can be ameliorated by senolytics eliminating senescent cells. However, the relationship between severe periodontitis with occlusal trauma and senescent cells remains unclear. The present study aimed to advance understanding of the above relationship for development of new therapy. Methods:To induce periodontitis (Perio), wires were used to ligate the maxillary first molars (M1) of 8-week-old male Sprague-Dawley (SD) rats (approval no.: 23-01014, 24-02016). Occlusal surfaces were covered with a composite resin to induce occlusal trauma (OT). Senolytics (Dasatinib and Quercetin [DQ]) were administered orally every 3 d. The rats were divided into five groups: (1) Control, (2) OT, (3) Perio, (4) Perio + OT, and (5) Perio + OT + DQ. Bone resorption was evaluated using micro-computed tomography (CT), hematoxylin and eosin (H-E) staining, and tartrate-resistant acid phosphatase (TRAP) staining. Senescent cells were assessed using immunofluorescence (IF) staining for p21 and p16. Results:CT and H-E staining revealed significant alveolar bone resorption in the Perio + OT group. Perio + OT increased the number of TRAP-positive osteoclasts. IF analysis revealed a higher number of p21-and p16-positive cells in the Perio + OT group than in the control group. The administration of DQ reduced the number of p21-and p16-positive cells and attenuated bone resorption. Conclusions: The present study showed that senescent cells were increased in severe periodontitis with occlusal trauma and that senolytics were effective in attenuating bone resorption. Futher study may provide the new perspective for severe periodontitis treatment.

Keywords : senescence, senolytics, periodontitis, occlusal trauma, bone resorption

034-2: MAIT Cells Drive Periodontitis Associated With Leukocyte Adhesion Deficiency Type1

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Objectives:
Leukocyte adhesion deficiency type1 (LAD1) is an autosomal recessive disorder caused by mutations in the ITGB2 gene, leading to reduced expression of CD18, a critical protein necessary for leukocyte migration into peripheral tissues. As a result, LAD1 patients exhibit a paucity of neutrophils in periodontal tissues and suffer from severe periodontitis from an early age, often associated with the IL-23/IL-17A axis. However, the precise mechanisms driving periodontal disease in the LAD1 environment remain unclear.Recent evidence indicates that mucosal-associated invariant T (MAIT) cells expand and produce IL-17 in local tissues affected by chronic periodontitis, which can contribute to tissue destruction. Given the heightened inflammatory state in LAD1 patients, we hypothesized that MAIT cells may exhibit enhanced activity in the LAD1 environment. This study aims to analyze MAIT cell behavior and investigate their role in LAD1-associated periodontal disease.

Methods:
The expression of MAIT cell-specific receptors in periodontal tissues from LAD1 patients was investigated by quantitative PCR. CD18-deficient (CD18KO) mice, a model of LAD1, and MR1-deficient mice, which lack MAIT cells, were used to study the role of MAIT cells in the LAD1 environment. Microbial analyses using shotgun sequencing, along with *in vivo* intervention experiments, were conducted to elucidate the underlying mechanisms.

Results:
MAIT cells exhibited significant expansion in both LAD1 patients and CD18KO mice. Notably, mice deficient in both CD18 and MR1 showed reduced bone loss and inflammation compared to CD18KO mice. Microbial analysis revealed the presence of distinct microbiota unique to CD18KO mice, capable of activating MAIT cells. Systemic injection of the anti-IL-23 antibody inhibited MAIT cell expansion in CD18KO mice.

Conclusions:
The microbial and inflammatory conditions in the LAD1 environment drive profound MAIT cell expansion, contributing to severe periodontitis. Targeting pathways that enhance MAIT cell activity may offer novel therapeutic strategies for treating severe periodontitis in LAD1 patients.

Keywords : LAD1, MAIT cells, Periodontitis

035-1: Periodontal disease related gene *SIGLEC5* is involved in barrier function of the gingival epithelial cell layer via a transcription factor HMX3

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Recent genomewide association studies have reported that *sialic acid binding Ig-like lectin 5* (*SIGLEC5*) is as a gene related to periodontal disease. However, the effects of this gene on host cells remain unclear. We previously reported that the transcription factor H6 family homeobox 3 (HMX3) is involved in the expression of junctional adhesion molecule 1 (JAM1), a tight junction-associated protein expressed in human gingival epithelial cells. In this present study, we examined the effect of SIGLEC5 on the barrier function of human gingival epithelial cell layers, focusing on *HMX3* and *JAM1* gene expression. To examine the effect of *SIGLEC5* on the intracellular localization of JAM1, we constructed immortalized human gingival epithelial cells stably expressing shRNA against *SIGLEC5* and analyzed the localization of JAM1 using confocal microscopy. To examine permeability of gingival epithelial cell layers, cells were cultured as a monolayer on cell culture inserts (PET track-etched membrane 12 well format cell culture insert, pore size: 3 μm, Corning), and fluorescent tracers, FITC-labeled lipopolysaccharide (LPS) or FITC-labeled peptidoglycan (PGN), were added to the medium on the upper compartment. After 30 minutes, the fluorescence intensity of tracers in the lower compartment were measured at 480 nm/ 530 nm (excitation/emission) using microplate reader. Knockdown of *SIGLEC5* decreased expression levels of *HMX3* and *JAM1* by 36% and 56% in comparison with control ($n=5$, $p<0.05$), and increased permeability of the gingival epithelial cell layer to LPS or PGN (2.9- and 1.6-fold, respectively, $n=8$, $p<0.05$). These results suggested that SIGLEC5 is involved in *HMX3* and *JAM1* expression, and barrier function of gingival epithelial cell layers.

Keywords : periodontitis, gingival function, barrier function

036-2: Glomerular HPGDS-PGD2 axis may contribute to periodontitis-related exacerbation of diabetic nephropathy

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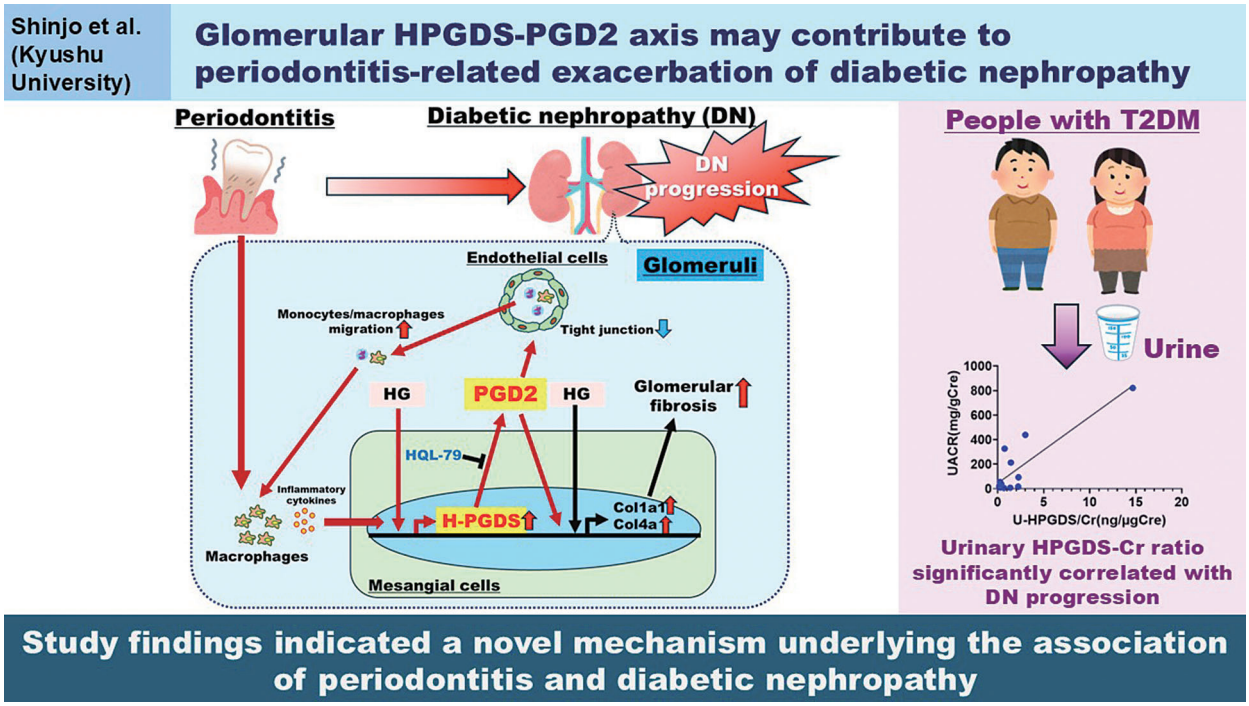
Objectives: Periodontitis (PD) is potentially associated with diabetic nephropathy (DN). However, the causal relationship between PD and DN has not been elucidated. This study aims to unveil the molecular mechanism underlying the PD-related progression of DN. Methods: Ligature-induced periodontitis (LIP) was induced in thirteen-week-old male KK-A^{y} mice, a type 2 diabetes (T2DM)-derived DN model, and C57BL/6 mice (background control) by using 6-0 silk thread. Urine sample and kidneys were isolated for the analysis of DN-related parameters. Glomeruli were isolated from kidneys for RNA and protein extraction. For in vitro studies, murine mesangial cell line (MES-13) and renal microvascular endothelial cell line (TKD2) were used. For the clinical study, people with T2DM visiting Kyushu University Hospital were recruited (N=13, approval number: 2022-41). Results: Urinary albumin-creatine ratio (UACR), glomerular size, fibrotic and mesangial area, and fibrotic and inflammatory gene expressions in KK-A^{y} mice were significantly elevated by LIP. RNA-seq in glomeruli revealed that hematopoietic prostaglandin D synthase (Hpgds) was significantly upregulated by LIP in KK-A^{y} mice. Glomerular HPGDS and PGD2 levels were increased by LIP in KK-A^{y} mice. Oral administration of the HPGDS inhibitor, HQL-79, canceled LIP-mediated exacerbation of DN and decreased glomerular PGD2 level. High glucose (HG) increased mesangial HPGDS expression by 1.5-fold, and IL-1β and LPS/IFNγ stimulation further enhanced it. PGD2 cooperatively enhanced HG-induced fibronectin and collagen1 expression in MES-13 cells. PGD2 downregulated ZO-1 and occludin in TKD2 cells. Among T2DM patients, urinary HPGDS-creatinine ratio was positively and negatively correlated with UACR and estimated glomerular filtration ratio, respectively. Conclusions: These results indicate that PD contribute to the exacerbation of DN via upregulation of glomerular HPGDS, resulting in PGD2-mediated extracellular matrix production by mesangial cells and dysregulation in endothelial tight junctions which might increase immune cell infiltration. Clinical study also supported the link of HPGDS with the progression of DN in humans.

Keywords : Diabetic nephropathy, Periodontal medicine, HPGDS, PGD2, Glomeruli



Poster Presentation

037-1: Gingipain plays crucial roles in preterm birth caused by *P. gingivalis*-odontogenic infection

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Objectives

Maternal periodontitis is a possible risk for preterm birth (PTB). Our research has shown that *P. gingivalis* (*P.g.*) translocated to the placenta following odontogenic infection and contribute to PTB. Recently, gingipain, a type of trypsin-like protease secreted by *P.g.*, has been reported to contribute to pathogenesis of systemic diseases such as Alzheimer and Parkinson disease. However, it was unclear the relationship between gingipain and PTB. In this study, we used a gingipain inhibitor (GI) to clarify that gingipain has crucial roles in PTB caused by *P.g.*-odontogenic infection.

Methods

in vivo experiment: We used 5-week-old wild-type female mice (C57BL/6J) and made 2 of *P.g.*-odontogenic infected groups. Three weeks after infection, one group started daily peritoneal injection of GI (20mg/kg) (*P.g.*+GI group), and the other group (*P.g.*+ group) and noninfected control group were injected PBS. Six weeks after infection, mating was started. Gestational days (Gds) and histological changes in the placenta (15th day of pregnancy) were compared among 3 groups.

in vitro experiment: Using human placenta cells (HTR-8), mRNA expression of PTB-related molecules (Gal-3, TNF-α, COX-2, IL-8) were examined and the effects of 2h-pretreatment of GI (0.1μM) also analyzed.

Results

in vivo experiment: *P.g.*-odontogenic infection induced 1 day of PTB (*P.g.*+: 19.25 days vs Control: 20.25 days). GI-injection recovered Gds (*P.g.*+GI: 20.5days). Additionally, in the placenta, GI injection improved the degenerative and necrotic changes, reduced the expression of COX-2 and Gal-3 proteins.

in vitro experiment: In HTR-8 cells, GI-pretreatment suppressed Gal-3, TNF-α, COX-2 and IL-8 mRNA upregulation caused by *P.g.* infection.

Conclusions

We demonstrated the crucial roles of gingipain in the onset of PTB by increasing the PTB-related molecules aasocoated with *P.g.*-odontogenic infection.

Keywords : gingipain, pretrm birth

038-2: Immunohistochemical study on the abnormal expression of tubular SGLT2 in diabetes model mice with malocclusion-induced hyperglycemia

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Objectives: The present study investigated whether malocclusion contributes to diabetic exacerbation due to an increase in blood glucose levels using an in vivo analysis with a focus on the expression of renal SGLT/GLUT2. Methods: Streptozotocin (STZ)-induced diabetic mice in which enamel was cut on the cusps of the right molars to cause malocclusion as malocclusion were generated. Real-time tissue PCR and immunohistochemical analyses were performed on the kidneys of diabetic mice to examine the effects of malocclusion on the renal expression of SGLT2 and GLUT2. Results: The present results indicate that malocclusion accelerates the tubular expression of the glucose transporters SGLT2 and GLUT2 under hyperglycemic conditions. Conclusions: Malocclusion may be one of the main exacerbating factors in diabetic patients with reduced occlusal support, which is associated with markedly poorer glycemic control due to a shortened occlusion time and swallowing without sufficient mastication.

Keywords : diabetic exacerbation, malocclusion, hyperglycemia

039-1: The Osteocyte Epitranscriptome in Hyperglycemia

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Objectives: Hyperglycemia is a hallmark of diabetes and leads to reduced bone turnover, imbalanced bone remodeling and deterioration of bone quality. Osteocytes are the most abundant cells in bone accounting for 90% of bone cells and they are master manipulators of bone remodeling and the primary mechanosensory cell in bone. We postulate that high glucose levels can impair translation by altering posttranscriptional modifications of RNA (the epitranscriptome), and disrupt cellular functions via dysproteostasis. Therefore, we analysed RNA and tRNA modifications which are integral to the codon optimality and translational efficiency during cellular stress which are tightly linked to the protein synthesis accuracy. Methods: The MLO-Y4 cell line was cultured under euglycemic (5.5 mM) and hyperglycemic (25 mM) conditions. Small RNAs (<200 nt, primarily tRNA >90%) were extracted and analyzed via liquid chromatography-tandem mass spectrometry (LC-MS/MS) following hyperglycemic exposures of 24 hours, 3 days, and 7 days. The findings were then further explored through computational analyses. Results: Out of the 35 tRNA modifications analyzed, 15 exhibited significant changes ($p<0.05$, fold change>2), with alterations identified at 4 structural and 6 anticodon sites. Noteworthy modifications were especially pronounced in the 3-day culture, predominantly at anticodon sites. These findings underscore critical epitranscriptomic alterations in hyperglycemic osteocytes, suggesting potential RNA-based therapeutic targets for diabetes and associated bone disorders. Conclusions: Hyperglycemia impacts osteocyte RNA modifications in vitro potentially leading to dysproteostasis.

Keywords : Osteocytes, Epitranscriptome

040-2: Mediating Effect of Dental Prosthetics on Chewing Ability Recovery

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Objectives:Dental treatment is crucial for restoring chewing ability among older adults with fewer teeth, however the impact of dental visits on chewing ability is unclear. In Japan, where national health insurance covers a wide range of prosthetic treatments, dental interventions may significantly enhance chewing ability in older adults. This study examined the mediating effect of dental prosthesis use on the association between dental visits and chewing ability among older Japanese adults. Methods:This cross-sectional study used data from the 2022 Japan Gerontological Evaluation Study (JAGES). Self-reported questionnaires were distributed to residents aged 65 years and older, with a response rate of 66.6%. The analysis included 4,826 respondents with 19 or fewer remaining teeth. Dental visits within the past year were the explanatory variable, dental prosthesis use and chewing ability were the mediator and outcome, respectively. A causal mediation analysis was conducted, adjusting for confounders such as gender, age, income, education, comorbidities, activities of daily living, smoking, and alcohol consumption. Results:Among 4,826 respondents, 65.0% who visited dentists in the past year reported better chewing ability, compared to 59.3% who did not visit. Mediation analysis indicated that dental prosthesis use accounted for 68.6% of the association between dental visits and better chewing ability (natural indirect effect, odds ratio=1.32, 95% confidence interval: 1.21, 1.43). Sensitivity analysis yielded consistent results. Conclusions:Even after considering for sociodemographic and health factors, dental visits was associated with better chewing ability among older adults with fewer teeth, primarily through the use of dental prostheses. These findings suggest the importance of including prosthetic treatments in universal health coverage for aging societies.

Keywords : chewing ability, dental prothetic, oral health, Universal Health Coverage, causal mediation analysis

041-1: Chewing Difficulty and Inequalities in Dementia

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Objectives: Health inequalities in dementia and oral health have been reported worldwide due to a lack of materials or unhealthy behaviors. This study examined the mediating effects of chewing difficulty on the association between income and dementia among older Japanese people.
Methods: This prospective cohort study was based on the Japan Gerontological Evaluation Study (JAGES), a nationwide survey targeting people aged ≥65 years. We used equivalent income (<2 million JPY or ≥2 million JPY) in 2010 as the explanatory variable and dementia incidence from 2010 to 2022 (follow-up rate: 98.7%) as the outcome. Causal mediation analyses with Cox proportional hazard models were used to assess the mediating effects of chewing difficulty in 2010 (presence/absence). We made two models: model 1, adjusted for confounders, and model 2, adjusted for confounders and the number of natural teeth.
Results: A total of 21,306 participants were included (mean age: 73.4, female 53.5%). Compared to people with higher income (incidence rate of dementia: 19.7%, chewing difficulties: 21.3%), people with lower income had a higher incidence rate of dementia (24.1%) and had chewing difficulties (28.1%). Causal mediation analysis in model 1 showed that low income was significantly associated with dementia incidence (Excess relative risk, ERR [95% confidence interval, CI]: 0.172 [0.093; 0.252]). In addition, chewing difficulty significantly mediated the association between income and dementia incidence (ERR [95% CI]: 0.006 [0.001; 0.011]), and the proportion was 3.7%. However, in model 2, the mediating effects of chewing difficulty were decreased to 1.9% (ERR [95% CI]: 0.003 [-0.0002; 0.006]).
Conclusions: Chewing difficulty partially mediated the association between income and dementia. The mediating effects were affected by the number of teeth. Our results suggest the importance of sustaining chewing ability and maintaining natural teeth.

Keywords : Epidemiology, Gerontology

042-2: Oral Condition of Older Adults Experiencing Cognitive Decline

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Objectives: This cross-sectional study investigated the association between oral health status and cognitive impairment among elderly individuals in Khon Kaen, Thailand. Methods: The study comprised 129 participants aged 60 years and older. Data were collected through questionnaires and comprehensive oral health examinations, assessing periodontal probing depth, plaque accumulation, clinical attachment loss (CAL), tooth decay, and tooth loss patterns using Eichner's index. Cognitive impairment was evaluated using Thai versions of the MMSE-2002 and MoCA questionnaires. The relationship between CAL severity and cognitive impairment was analyzed using chi-square analysis. Results: The mean age of participants was 66.7 ± 3.7 years, with 66.7% being female. Tooth loss predominantly followed Eichner's B pattern (54.3%). The mean periodontal probing depth was 2.1 ± 0.7 mm, with 43.4% of participants showing a mean CAL of 3-4 mm. The overall mean CAL was 4.3 ± 1.6 mm. Participants had an average of 17.8 ± 7.9 teeth, with a mean DMFT of 13.1 ± 8.5. Only 26.4% maintained at least 4 pairs of posterior occlusion support. Chi-square analysis revealed a statistically significant relationship (p = 0.07) between periodontal disease, defined as the percentage of sites with CAL ≥ 5 mm, and cognitive impairment. Conclusions: This study demonstrates a significant association between periodontal disease and cognitive impairment in the elderly population. The findings underscore the necessity for targeted oral health prevention and promotion programs for older adults experiencing cognitive decline.

Keywords : Elderly, Cognitive impairment, Oral health status, Periodontal disease, Clinical attachment loss

043-1: Factors associated with nutritional status in patients with removable dentures: a cross-sectional study

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Objectives: This study aimed to identify factors influencing objective nutritional status as assessed through blood tests in patients with removable dentures. Methods:The study involved 192 patients with removable dentures (73 males and 119 females, mean age 72.8 ± 8.4 years) who visited the Department of Prosthodontics, Showa University Dental Hospital from August 2023 to July 2024. Nutritional status was assessed using the Controlling Nutritional Status (CONUT) score which was calculated based on albumin levels, peripheral blood lymphocyte count, and total cholesterol levels. Nutrient intake was evaluated through a brief-type self-administered diet history questionnaire, focusing on protein, carbohydrate, vitamin A, and vitamin C. Oral health-related quality of life was assessed using four dimension scores of the Oral Health Impact Profile. Masticatory function was measured by glucose extraction from chewing gummy jelly. Denture quality was rated by both patients and dentists in terms of stability and esthetics using a 100 mm visual analog scale. A self-administered questionnaire was used to collect data on the Body Mass Index (BMI) and dietary concerns. The Charlson Comorbidity Index was utilized to account for both the number and the seriousness of comorbid diseases. A binomial logistic regression analysis was performed with CONUT values (0 for CONUT 0 and 1 for CONUT 1-4) as the dependent variable and the aforementioned factors as explanatory variables ($\alpha = 0.05$). Results:Binomial logistic regression analysis showed significant associations between poor nutritional status and factors such as male gender ($p = 0.003$), lower BMI ($p < 0.003$), lower glucose extraction ($p = 0.010$), and fewer remaining teeth ($p = 0.008$). Conclusion:These findings suggest that oral health, particularly masticatory function and the number of remaining teeth, may be associated with the nutritional status of patients with removable dentures.

Keywords : Removable dentures, Nutrition, Masticatory function

044-2: A case report of suspected Erdheim-Chester disease in the mandible

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Erdheim-Chester disease (ECD) is a rare non-Langerhans histiocytosis that was first reported by Jakob Erdheim and William Chester in 1930. ECD is most commonly apparent as symmetric osteosclerosis in bones such as the femur or tibia, on the other hand the wide variety of symptoms and sites of onset complicate the diagnosis. ECD lesions in the jaws are rare. There were no guidelines for the diagnosis and treatment of ECD until the consensus guidelines were proposed in 2015. A neoplastic form of ECD caused by BRAFV600E or NRASQ61R mutations has recently been identified, however, some cases without these gene mutations have also been reported. This time, we experienced a case of suspected ECD in the mandible, so we will focus on the imaging findings. The patient is a 53-year-old female with no significant clinical symptoms in whom ECD was found incidentally on a panoramic dental radiograph. Histologically the lesion mainly composed of foamy macrophages that was CD68 positive and CD1a negative, with no genetic mutations. There were no obvious lesions other than the mandibular involvement. Therefore, the mandibular lesion was highly suspected ECD without *BRAF* or *NRAS* mutation.

Keywords : Erdheim-Chester disease, ECD, mandible, CT, MRI

045-1: Factors associated with masticatory performance in patients with removable dentures after oral tumor surgery

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Objectives: In the treatment of oral tumors, extensive jaw defects due to surgical resection can reduce masticatory performance (MP). We aimed to clarify the factors associated with MP in patients with jaw defects after oral tumor surgery. Methods: In total, 106 patients (61 men and 45 women, mean age: 70.2 years) underwent prosthetic treatment with a removable denture for a jaw defect following oral tumor surgery. Data on history of radiation therapy, number of remaining teeth, and site of the jaw defect were collected. MP was evaluated using test gummy jelly. The patients were classified into two groups: the "Lower MP group" (MP score ≤2, n=51) and the "Higher MP group" (MP score ≥3, n=56). In addition, maximum bite force, tongue pressure, tongue-lip motor function (oral diadochokinesis /ta/), and oral dryness were evaluated. Basic information and oral function were compared between the two groups using the Mann-Whitney U test and the chi-squared test. A logistic regression analysis was performed with the items that showed a significant association between the two groups as explanatory variables, and lower MP as the dependent variable. The significance level was set at 5%. Results: The proportion of patients with a history of radiation therapy was significantly higher in the Lower MP group than the Higher MP group. The median value of number of remaining teeth, maximum bite force, tongue pressure, and oral diadochokinesis /ta/ were significantly lower in the Lower MP group than the Higher MP group. In the logistic regression analysis, number of remaining teeth, maximum bite force, and oral diadochokinesis /ta/ were significant explanatory variables. Conclusions: Number of remaining teeth, maximum bite force, and tongue motor function of the prognosis are associated with decreased MP in patients with jaw defects after oral tumor surgery.

Keywords : mastication, oral function, maxillectomy, mandibulectomy, oral tumor

046-2: Rhyolite Particles as Lipid Digestion Emulsifier, Suppressing Weight Gain

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Objectives: Here, we propose strategies to prevent obesity by using rhyolite particles as a particulate emulsifier on lipid digestion and applying them as a food diet to prevent obesity in high-fat diet (HFD) mice.
Methods: Corn oil under the gastrointestinal (GI) tract and rhyolite with different particle sizes are used for lipid digestion. We also investigated the protein adsorption and release behavior of the rhyolite particles. Then, we applied the smaller particle size of rhyolite as a food diet by oral administration to HFD-mice-induced obesity for 12 weeks compared to activated bamboo charcoal (ABC).
Results: Rhyolite's smaller particle size more effectively releases free fatty acids (FFA), and it has great properties to increase protein adsorption and smaller protein release. For the in vivo results, the rhyolite showed effectiveness in removing lipids in plasma and liver, which has a potent effect on preventing obesity risk. The H&E staining for the liver showed that the rhyolite diet effectively protects the liver compared to ABC.
Conclusions: Rhyolite particles administered orally could be a new strategy to prevent obesity by regulating lipid digestion in the GI tract.

Keywords : Rhyolite particle, Emulsifier, Lipid digestion, Obesity, High-fat diet

047-1: Impact of complete denture treatment and dietary counseling on nutritional status: a randomized controlled trial

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Objectives: The purpose of this study was to evaluate the efficacy of a combination of complete denture treatment and dietary advice for edentulous maxillary or mandibular patients using blood test results. Methods: Thirty-four patients, 16 males and 18 females, with a mean age of 72.4 ± 10.7 years, with at least an edentulous maxilla or mandible who were using a complete denture and seeking new complete dentures were included in this study. All patients were randomly assigned to two groups with age and gender as allocation factors: Group A, denture treatment only (n=17) and Group B, dietary advice followed by denture treatment (n=17). Patients were evaluated before treatment (baseline) and 2 to 3 months after the delivery of new dentures (post-treatment) for the following parameters: serum albumin and plasma amino acid concentration from blood tests, nutrient intake of lipids and saturated fatty acids from the Brief Dietary History Questionnaire (BDHQ), and summary and dimension scores of the Oral Health Impact Profile (OHIP) to assess oral health-related quality of life. Dietary advice was provided on the basis of baseline findings. Differences from baseline to post-treatment for the two groups were calculated and compared using a t-test. The significance level was set at 5%, however, a Bonferroni correction was applied for blood test items (α=0.005). Results: No significant differences were found between the groups in the change in BDHQ nutrient intake and OHIP scores. The change in methionine in Group B was significantly greater than that in Group A (p=0.0016). The changes in total amino acids, essential amino acids, isoleucine, lysine, and phenylalanine tended to be greater in Group B, however, there were no significant differences in albumin and these amino acids. Conclusion: The combination of denture treatment and dietary advice may contribute to the improvement of nutritional status of edentulous patients.

Keywords : Dietary counseling, Complete denture

048-2: Disgust ratings of visual dental stimuli in dental patients

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Objective: Anxious dental patients often cite various dental instruments or procedures as triggers for their dental anxiety, as visual dental stimuli can elicit fear and disgust. The aim of this study was to assess the level of aversive responses to visual dental stimuli in dental patients. Methods: A total of 43 dental patients (25 women, 18 men; mean age 29.4 ± 13.7 years) were included in the study. All participants had previously undergone dental treatment. The level of dental fear was measured using the self-reported Dental Fear Survey (DFS). Thirty-two images related to dental treatment were prepared and classified into three categories: dental instruments, dental procedures, and dental environment. Participants rated their level of aversion to each image on a visual analog scale ranging from 0 to 100. Results: The mean DFS score was 42.9 ± 17.6. Disgust ratings for tooth extraction, tooth drilling, and local anesthesia were all above 60. Disgust ratings for dental impressions, dental lights, and dental chairs showed significant correlations with DFS scores ($r = 0.61$, $p < 0.001$; $r = 0.41$, $p = 0.006$; $r = 0.40$, $p = 0.008$, respectively). Extraction forceps, saliva ejectors, and syringes used in dental procedures were significantly more disliked than the instruments themselves ($p < 0.001$, $p = 0.035$, and $p = 0.013$, respectively). However, the dental turbine was strongly disliked even when presented alone, and its disgust rating was not significantly different from that during the treatment situation ($p = 0.39$). Conclusions: This study demonstrates that patients are most disgusted by invasive dental instruments and procedures. Additionally, aversive reactions to some non-pain-inducing dental items were found to correlate with levels of dental anxiety. These findings may assist dentists in providing more patient-centered care by understanding and addressing sources of patient discomfort.

Keywords : dental anxiety, visual stimuli, dental fear

049-1: The Effect of Voluntary Training with Real-Time Monitoring on the Quality of Cardiopulmonary Resuscitation

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Objectives:
Basic life support (BLS) is widely used by the general population. However, cardiac arrest prognosis remains poor, and it is desirable to train personnel capable of high-quality BLS by expanding training opportunities. The purpose of this study was to investigate how visual feedback using a CPR simulator and monitoring equipment without instructor intervention and auditory feedback with instructor intervention affects basic life support education for dental students and to establish a more effective self-study training method.
Materials and methods:
This study was approved by the Ethics Committee of Kagoshima University Hospital (approval number: 220337). Forty students enrolled in the Kagoshima University School of Dentistry, Kagoshima, Japan, were included in this study. All participants (n=40) were given a pre-test to assess their technical skill of cardiopulmonary resuscitation before training. The students were randomly divided into the following two groups: visual feedback and auditory groups. After training, a post-test was administered using the same method as the pre-test. We statistically analyzed the changes in chest compression (CC) depth, CC velocity, CC fraction, and tidal volume before and after training in the two groups.
Results:
Excluding dropouts, 34 participants (17 per group) were included. Participants showed no significant group differences with regard to age, sex, height, or weight. In the visual feedback group, compared with the pre-test, the post-test revealed significantly improved CC depth. Meanwhile, the CC velocity showed significant improvement in the auditory feedback group. In the other measures, no significant changes were observed in either group.
Conclusions:
Visual feedback of the CC depth was superior to auditory feedback for achieving the required compression depth. Conversely, auditory feedback of the CC velocity was superior to visual feedback. To establish more effective self-study training methods, training programs should provide visual feedback for CC depth and auditory feedback for CC velocity.

Keywords : BLS, QCPR

050-2: A new adhesive tape designed for secure nasotracheal tube in dental treatment under general anesthesia : a randomization trial of efficacy

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Objectives: The aim of this study is to reduce upward displacement of nasotracheal tube in patients undergoing dental treatment or surgery under general anesthesia. Methods: Patients undergoing dental treatment or surgery under general anesthesia. divided to 2 groups: the study group and control group. Collect comparative data between the old tapegroup and the new tape group. Primary outcome variable was the displacement ofnasotracheal tube. Data analysis using statistics: percentage, mean, standard deviation, Chi-square test. Processing period 1 November 2020 - 22 February 2021. Results: 40 patients undergoing dental treatment were divided to 2 groups (20 each) by computer generated random number and all completed the protocol. There was no different in subject and dental treatment characteristics. The upward displacement was decreased statistical significant in new tape group compare with old tape group. (0.21 centimeters and 1.23 centimeters, respectively ; $p<0.05$) No complication was found in both groups. Conclusions: The new tape design significantly decreased upward displacement of nasotracheal tube in patient undergoing dental treatment under general anesthesia.

Keywords : Nasotracheal tube, Dental treatment, General anesthesia, Adhesive tape

051-1: Autonomic nervous system evaluation of a patient prior to extraction of the impacted mandibular third molar

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Objectives: Anxiety and nervousness concerning dental treatment can cause fluctuations in autonomic nervous system (ANS) activity, which can lead to medical emergencies such as increased blood pressure (BP) and vasovagal reflex.In this study, we aimed to determine whether autonomic fluctuations during mandibular third molar extraction differ between dysautonomic and non-autonomic patients, as classified using the Toho Medical Index (TMI).
Methods: In this prospective study, systemic nerve activity index (Low-/high-frequency ratio; LF/HF) and parasympathetic activity index (High frequency ; HF) autonomic nervous system (ANS) activity, heart rate (HR), and systolic blood pressure (SBP) values of 17 patients in the dysautonomic group and 17 patients in the control group, classified according to the TMI questionnaire, were compared before impacted mandibular third molar extraction. In the TMI questionnaire, I (normal) was considered the control group, and type II (dysautonomia), type III (psychosis), and type IV (psychogenic dysautonomia) were considered the dysautonomia group based on the TMI questionnaire.
Results: There were no significant group differences in mean age, height, or weight of study participants. LF/HF and SBP were significantly higher in the autonomic imbalance group than in the control group. Further, the autonomic imbalance group had significantly lower preoperative HF values than the control group. No significant between-group differences in HR were observed.
Conclusions: In conclusion, some patients do not have symptoms of dysautonomia but have a potentially unbalanced autonomic nervous system before tooth extraction. This study suggests that TMI may be able to screen such patients.

Keywords : Autonomic nervous system, Dysautonomia, Toho Medical Index

052-2: Storage Stability Of Neutral Electrolyzed Water By Two-stage Electrolysis

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Objectives: Electrolyzed waters mainly containing hypochlorous acid (HOCl) show high microbicidal effects, biosafety, and eco-friendliness. We aim to expand the use of neutral electrolyzed water (NW) in intraoral care, considering that NW is optimal as acidic types may have a demineralizing effect on human enamel. In this study, the storage stability of NWs by two-stage electrolysis was investigated. Methods: Eight types of NWs (free available chlorine concentration [ACC]: 25, 35, 50 100, 200, 300, 500, and 1000 mg/L) were prepared by an NW generator partially modified by the manufacturer. Changes in their pH and ACC during the 126-d storage were examined. The bactericidal efficacies of NWs after storage were also examined using *Streptococcus mutans*. The bacteria were dispersed in phosphate-buffered saline (PBS) to prepare a bacterial solution (1.6×10^7 colony forming units (CFU)/mL). The bacterial solution (1.0 mL) was added to 9.0 mL of each NW while repetitive pipetting for 3 min. After treatment, a total of 0.1 or 1.0 mL of each NW reacted with the bacteria suspension was appropriately diluted with fresh sterile PBS, the diluted solution was added to each BHI agar culture medium and incubated at 37°C for 48 hours. After incubation, the total number of surviving bacteria in NW was calculated from the CFU in the agar media. Results: The storage under non-shaded at room temperature (LRT) and the higher ACC of NWs tended to have greater changes in the properties. NWs (≤300 mg/L) showed a pH of 5.9-7.4 even after the 126-d storage under LRT; however, higher NWs (500, and 1000 mg/l) fell below the critical enamel pH (5.5) during storage, even under the shaded and refrigerated condition (SLW). Only NW (25 mg/L) stored under LRT resulted in the lowest ACC (5 mg/L), showing a decrease in the bactericidal effect. Conclusion: When storing for use in intraoral care, NWs should be prepared with an ACC of 25-300 mg/L and stored under SLW. If diluted, the ACC should be checked to appropriately dilute every use to take advantage of the bactericidal effect.

Keywords : neutral electrolyzed water, storage stability, free available chlorine concentration, hypochlorous acid, bactericidal effect

053-1: A novel porcine-derived 3D collagen scaffold enhancing osteoblastic like cells behavior

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Objectives: Periodontal regenerative treatments use different graft materials to obtain the better prognosis. Most of the membranes or bone grafts are widely produced from porcine source. Resorbable porcine membranes showed the greater barrier properties to allow osteogenic cell migration and proliferation as well as to prevent the infiltration of gingival tissue. The purpose of this study was to develop the porcine based 3D collagen scaffold to promote bone development and prevent gingival tissue infiltration. Methods: Porcine skin was cleaned thoroughly with deionized water and hair and fat tissues were removed. The remaining dermis layer was divided into 5 cm × 3 cm in dimension. Each intact scaffold was packed and frozen at -20°C for 24 hours. Then, freeze-drying process was followed in four different conditions: (1) -80°C for 24 hours, -196°C for 48 hours, 25°C for 24 hours (scaffold A); (2) -196°C for 96 hours (scaffold B); (3) -20°C for 24 hours, -80°C for 72 hours (scaffold C); (4) -80°C for 24 hours, -196°C for 72 hours (scaffold D). All samples were tested for their physical properties and biological reaction by using osteoblast-like cells (MG63). Results: Microfilament structures were present on all scaffolds in scanning electron microscopy examinations. No nuclei were found in H&E stain histology examination after decellularization. Collagen was observed in all samples by Masson's trichrome staining. Biodegradation rate was similar across four scaffolds, but scaffold A exhibited the greatest tensile strength. MG63 cell proliferation rate was highest of scaffold D on Day 1 and Day 7, while scaffold A showed highest on Day 14. Cell differentiation rate of all scaffolds is increased by Day 14 although scaffold A showed the greatest. Conclusions: All scaffold showed similar characteristics in physical properties. Among all the scaffolds, scaffold A showed the greatest biological responses.

Keywords : porcine scaffold, 3D collagen scaffold, bone regeneration, resorbable scaffold

054-2: Impact of Silver Diamine Fluoride on Resin Composite Bond Strength: An In Vitro Study with Various Adhesive Systems.

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Aim: This in vitro study investigates the effects of Silver Diamine Fluoride (SDF) application on the shear bond strength (SBS) of resin composite to sound and demineralized human teeth using different adhesive systems.

Methods: Eighty sound human third molars were sectioned, mounted in acrylic blocks, and prepared to expose a 2 mm thick dentin layer. The teeth were randomly divided into eight groups, each representing a combination of sound or demineralized dentin, SDF application, and adhesive system used. Demineralization was achieved using a pH cycling process. SDF was applied to the designated groups, followed by the use of either an etch-and-rinse or self-etch adhesive system. Resin composite was then applied, and the SBS was measured using a universal testing machine. Data were analyzed using three-way ANOVA and post-hoc tests to identify significant differences.

Results: The application of SDF generally led to a significant decrease in bond strength ($p<0.05$). In sound dentin, the SBS was higher compared to demineralized dentin ($p<0.05$). OptiBond FL showed higher bond strength than Clearfil SE Bond across all groups, although the difference was not statistically significant ($p>0.05$). The bond strength in the demineralized group using Clearfil SE Bond showed no significant difference between SDF application and non-application ($p>0.05$).

Conclusion: SDF application can significantly reduce the bond strength of resin composite to dentin, with the effect being dependent on the type of adhesive system and the state of the dentin. Further in vivo studies are needed to validate these findings.

Keywords : Silver Diamine Fluoride, Dental Bonding, Shear Strength, Composite Resins

055-1: Li/Sr-releasing bioactive glasses exerting anti-inflammatory effects and promoting odontoblastic differentiation

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Purpose/Aim
Bioactive glasses (BGs) are biodegradable materials which release various ions. We previously reported that biodegradability of strontium-releasing and lithium-releasing bioactive glasses (Sr-BG, Li-BG) could be controlled by using aluminum. In addition, mixtures of Sr-BG and Li-BG promoted osteogenic differentiation of bone marrow-derived mesenchymal stem cells and suppressed the activity of inflammatory macrophages. Here, it was hypothesized that the composites of Li-BG and Sr-BG would have the beneficial effects on odontoblastic differentiation and inflammatory response in dental pulp stem cells (DPSCs). The purpose of this study was to investigate the effects of BG composites on promoting odontoblastic differentiation and reducing inflammation in DPSCs.
Materials and Methods
Li-BG was mixed with Sr-BGs containing 0, 2, 4, or 6 mol% aluminum oxide at 1:1 weight ratio (Li/Sr-Al0, Li/Sr-Al2, Li/Sr-Al4, Li/Sr-Al6). DPSCs were incubated with lipopolysaccharide to induce inflammatory DPSCs (IF-DPSCs). Li/Sr-BG composites were applied to the cells using cell culture inserts. The impacts of Li/Sr-BG composites on odontoblastic differentiation of DPSCs were investigated by real-time PCR, alkaline phosphatase (ALP) assay, von Kossa staining, and western blotting. The expression of inflammation-related genes and proteins in IF-DPSCs was evaluated by real-time PCR and western blotting. The cells cultured without Li/Sr-BG composites were used as controls.
Results
DPSCs cultured with Li/Sr-Al0 and Li/Sr-Al2 significantly increased ALP activity and the expressions of odontoblastic differentiation markers. All Li/Sr-BG composites suppressed the expression levels of inflammation-related genes and proteins in IF-DPSCs. The results of von Kossa staining revealed that DPSCs cultured with Li/Sr-Al0 and Li/Sr-Al2 demonstrated a significantly greater amounts of mineral depositions compared with the control group ($p < 0.05$, Tukey's HSD test).
Conclusion
It was demonstrated that Li/Sr-BG composites suppressed the inflammatory responses and enhanced the odontoblastic differentiation in DPSCs. Li/Sr-BG composites could be useful for achieving the novel pulp capping materials that exhibit anti-inflammatory effects and promotion of reparative dentin formation.

Keywords : bioactive glass, dental pulp stem cells, anti-inflammation, odontoblastic differentiation

056-2: Impact of Crown and Core Materials Combination on Thermal Behavior

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Objective The purpose was to investigate the thermal stress in several combinations of monolithic crown and core materials and elucidate their thermal behavior under thermal loads.
Methods Finite element models of simplified tooth consisting of monolithic crown (0.5mm thick), cement layer and core were created. Mechanical and thermal properties of zirconia (Zr), gold alloy (Au), and resin composite (RC) were assigned to the crown material, and those of Au, RC, and dentin were assigned to the core material. The cement material was standardized as resin cement. Each model was subjected to cooling or heating loads (from 37 to 5 degrees C, or from 37 to 60 degrees C, respectively), and first principal stress was calculated from the thermal distribution at 5 seconds, and then the thermal behaviors (tensile or compressive) were assessed.
Results During the cooling loads, the combination of Zr-crown and dentin-core revealed the highest first principal stress (29.6 MPa) in the lower side of the crown (near crown margin area), the stresses were reduced to less than half for the combination of Zr-crown and RC- or Au-core. Regardless of the crown materials, tensile stresses were generated mainly near the crown margin area during the cooling change. Meanwhile, compressive stresses occurred in the upper side of the crown in the combination of Zr- or Au-crown and RC-core and in the combination of Zr-crown and Au-core. Moreover, most combinations reversed the tensile and compressive stresses in the crown between cooling and heating loads.
Conclusion Regardless of the core material, the thermal behavior near the crown margin area is mainly tensile and compressive stresses during cooling and heating, respectively. However, depending on the combination of crown and core materials, the upper side of the crown stresses can be reversed between tensile and compressive, relieving the first principal stresses in the crown margin area.

Keywords : Thermal stress, FEM, Monolithic crown

057-1: Shaping Ability of Heat-treated Nickel Titanium Rotary Instrumentsin Simulated S-Shaped Canal

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Objectives: The objective of this study to evaluate shaping ability of heat-treated nickel titanium rotary files in simulated S shaped resin canals. Methods: 48 S shaped resin canals were randomly assigned into four groups (n = 12): K3, K3XF, ProTaper NEXT and EdgeTaper Platinum. Each system was prepared up to the size 30. Pre- and postoperative images from Cone beam computed tomography (CBCT) were superimposed to determine any canal deviation and calculated canal transportation and centering ability 0 – 10 mm from apical in mesio-distal and bucco-lingual direction. Data were statistically analyzed. Results: Mesio-distal direction, EdgeTaper Platinum was statistically significant less mean canal transportation than K3 at 0 mm from apical ($P<0.05$). ProTaper NEXT and EdgeTaper Platinum was statistically significant less mean canal transportation than K3 at 1-3 mm from apical ($P<0.05$).There was no statistically significant between all four groups in mean of canal transportation at 4-10 mm from apical. Bucco-lingual direction, there was no statistically significant between all four groups in mean of canal transportation at 0-10 mm from apical. Mesio-distal direction, K3 was statistically significant less mean centering ratio than EdgeTaper Platinum at 1-2 mm from apical ($P<0.05$). There was no statistically significant between all four groups in mean of centering ratio at 0 mm and 3-10 mm from apical ($p>0.05$). Bucco-lingual direction, K3 was statistically significant less mean centering ratio than EdgeTaper Platinum at 0 mm from apical ($P<0.05$). Conclusions: All four rotary systems generated deviations at every canal level. Heat-treated nickel titanium rotary files had less canal transportation and increase centering ratio in simulated S shaped resin canals

Keywords : nickel titanium rotary files, simulated S shaped resin canals, centering ratio, canal transportation

058-2: Effect of SDF on Bond Strength of Glass Ionomer to Demineralized Dentin

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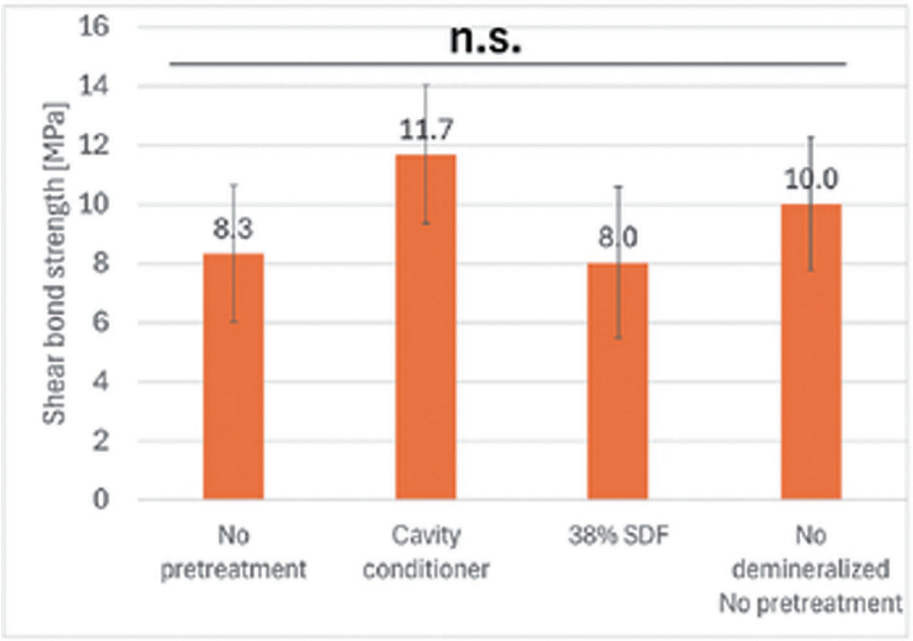
Objective Glass ionomer is commonly used in Atraumatic Restorative Treatment (ART), involving minimal caries removal. SMART, combining ART with silver diamine fluoride (SDF), offers a minimally invasive option for high-risk patients. This study examined SDF's effect on bond strength of Fuji IX GP EXTRA CAPSULE (GC) to demineralized dentin. Method Bovine teeth were embedded in acrylic resin and polished with 600-grit silicon carbide paper to expose the dentin. After immersion in a demineralizing solution (pH 5.0, acetate buffer with calcium dihydrogen bisphosphate 1.1mmol/L) for 66 hours, the specimens were rinsed with water.Four groups were prepared:1) Without pretreatment; 2) Pretreatment using 38% SDF (Tedequim); 3) Pretreatment using cavity conditioner (GC); 4) Control group without demineralization or pretreatment A mold with a diameter of 2.4 mm was fixed, and FUJI IX GP EXTRA CAPSULE was mixed and filled into the mold. Samples were stored at 37ºC with 90% relative humidity for 1 hour, followed by immersion in a remineralizing solution (pH 7.0, HEPES 20mmol/L, calcium chloride 3.0mmol/L, potassium dihydrogen phosphate 1.8mmol/L) at 37°C for 167 hours (approximately 7 days). After which, shear bond strength tests were conducted using a universal testing machine (crosshead speed of 1 mm/min). Each group consisted of 7 samples (n=7). Statistical analysis was performed using Tukey's HSD test to determine $p<0.05$ significant differences (R Statistical Software v4.4.1; 2024-06-14 ucrt). Result No significant differences were observed among all four groups ($p<0.05$). The use of SDF did not decrease the bond strength of FujiIX GP EXTRA CAPSULE to demineralized dentin. Conclusion FujiIX GP EXTRA CAPSULE can be used in combination with SDF for caries treatment and can be considered a suitable material for cases with high caries risk.

Keywords : Cement, SDF, Glass Ionomer, Filling



Poster Presentation

059-1: An effective recycling approach for residual dental zirconia

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Objectives: This study aimed to efficiently recycle residual dental zirconia generated from computer-aided design/manufacturing (CAD/CAM) processes and assess its viability as an alternative dental material, contributing to sustainable development within the field of dentistry. Methods: In this study, ball milling was used to manipulate the recycled zirconia powder (RZP). The initial RZP (RZP-40 μm) and ball-milled RZP (RZP-BM) were pressed respectively, then pre-sintered at different temperatures (1000-1150°C), and finally sintered at 1500°C. The densification, microstructure, mechanical and optical properties of the recycled zirconia were evaluated and compared with those of commercial zirconia. Results: Characterization revealed that RZP-40 μm presented irregular shapes and varying particle sizes. While RZP-BM showed finer, more uniform morphology and higher packing density, with better de-agglomeration achieved after 6 h of ball milling (RZP-BM 6 h) compared with 1 h (RZP-BM 1 h). Analysis of the pre-sintered bodies indicated superior sintering behavior for RZP-BM samples, with a pre-sintering temperature of 1100°C was effective in achieving performance comparable with that of commercial zirconia pre-sintered bodies, whereas RZP-40 μm samples required 1150°C. For final sintered bodies, the RZP-40 μm samples exhibited lower Vickers microhardness, density, flexural strength, and transmittance, and many microstructural defects were detected. Conversely, RZP-BM samples, especially RZP-BM 6 h samples, showed substantial improvement, with performance comparable with commercial zirconia, showcasing great potential as a dental material. Conclusions: This study has established an effective approach for enhancing the properties of dental recycled zirconia, providing a theoretical basis for reusing residuals generated from CAD/CAM process.

Keywords : Pre-sintering, Dental zirconia, Recycling, Microstructure, Transmittance

060-2: Dental resins incorporating NucB-releasing particles for controlling oral biofilm

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Objectives: Previously, we fabricated polymer particles loaded with an eDNA-degrading enzyme (NucB) and reported that these particles demonstrated sustained release of NucB, indicating potential in controlling the extracellular matrix during oral biofilm formation. The purpose of this study was to incorporate NucB-loaded particles into polymethyl methacrylate (PMMA) resin and to evaluate its NucB-release properties and anti-biofilm effects.

Methods: PolyHEMA/TMPT particles loaded with NucB were added to the powder of commercial self-curing PMMA resin, and mixed with the liquid (MMA) to prepare the experimental resin disc. The disc was immersed in HEPES buffer for up to 28 days to evaluate the NucB-release properties. The DNA-digesting properties of eluate from the experimental disc after immersion in HEPES for 1 or 28 days were examined by a calf-thymus DNA assay. The experimental disc was incubated in a *Streptococcus mutans* suspension with 0.2 (wt)% sucrose for 48 hours and the biofilm formed on the surface was observed using CLSM with Rhodamine B and LIVE/DEAD staining. The number of bacteria in the biofilm was counted and the quantity of extracellular polysaccharides was examined by a phenol-sulfuric acid method. PMMA resin discs containing NucB-unloaded particles served as controls.

Results: The release of NucB from the experimental disc continued for 28 days, maintaining the DNA-digesting properties of NucB. CLSM analysis demonstrated that the biofilm on the experimental disc was less dense and significantly thinner than that on the control disc ($p < 0.05$, Student's t-test). The number of bacteria and extracellular polysaccharides in the biofilm on the experimental disc was significantly reduced compared with the control disc ($p < 0.05$).

Conclusion: It was demonstrated that the sustained release of NucB from dental resins was possible by incorporation of NucB-loaded particles and that the experimental resin promoted degradation of eDNA, effectively inhibiting *S. mutans* biofilm formation on its surface.

Keywords : eDNA, NucB, anti-biofilm, PMMA, polymer

061-1: Structural Transformations in Strontium-Doped Hydroxyapatite Synthesized via Mechanochemistry

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Objectives: In the present work, strontium apatite is synthesized by mechanochemical synthesis and sintering. Strontium ions are known to bone formation and suppress bone resorption, by being of therapeutic importance for the treatment of osteoporosis. Methods: The characterization of the as-synthesized materials and following sintering at 1000 'C was carried out by a complimentary set of Scanning Electron Microscopy - Energy Dispersive X-ray Spectroscopy, X-ray Diffraction(XRD), Fourier Transform Infrared (FTIR \)Spectroscopy, Raman spectroscopy, and solid-state Nuclear Magnetic Resonance (NMR) Spectroscopy techniques. Results: The XRD results showed that the samples synthesized by the mechanochemical method had a nanocrystalline apatite crystal structure of less than 100 nm according to the Scherrer equation. In addition, the apatite sintered at high temperatures was found to have high crystallinity. The crystal lattice size of all samples was calculated by Rietveld refinement. It was found that the crystal lattice size increased depending on the strontium concentration. FTIR spectroscopy suggested the presence of hydroxyl groups at 700 cm-1. No OH groups were detected in the unsintered samples of calcium phosphate without strontium. Conclusions: The spectroscopy results suggested that the as-synthesized ones are nano- and low- crystalline with the inclusion of carbonate and protonated phosphate species along with the strontium into the structure. The presenters demonstrate quantification of OH- in doped Hydroxy apatite systems, which may not be reliably achieved by Fourier Transform Infrared or Raman spectroscopy methods due to significant peak broadening induced by structural distortion. It is a relatively simple analysis and quantification by NMR spectroscopy is feasible. The NMR spectroscopy results revealed the presence of OH in both the unsintered and sintered samples. It is suggested that the standardization of solid-state NMR as a method for evaluating synthesized apatite will lead to bioceramics with improved biomimetic properties.

Keywords : Calcium Phosphate, NMR spectroscopy

062-2: Flexural Strength Of Layered Resin Composite Restoration

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Objectives: To study the effects of layering tecnique and thickness on biaxial flexural strength of resin composite restoration. Methods: The disc shape os specimens were made from dentine shade (A2D) and enamel shade (A1E) resin composite (Filtek Z350XT, 3M ESPE, USA). The 0.6-1 mm. thickness specimens were divided into 4 groups; dentine groups, enamel groups, fixed-dentine groups, and fixed enamel groups. The biaxial flexural strength of resin composite was evaluated using Ball-on-ring method. Results: The result of this study revealed that the restoration tecniques and total rstoration thickness significantly influence the biaxial flexural strength of resin composite (P value ≤ 0.05). The 1 mm. thickness of dentin group exhibited higher biaxial flexural strength than other 1 mm. groups (P value ≤ 0.05). Additionally, the 0.6 mm. groups showed lower biaxial flexural strength than 1 mm. groups in each restoration tecniques (P value ≤ 0.05). the Weibull moulus value was high, indicated reliable data due to low data distribution. Conclusions: The layering tecniques and the material thickness were influenced to the flexural strength of resin composite restoration.

Keywords : Biaxial flexural strength, resin composite

063-1: Development of a new denture material cleaning method using agar particle blasting

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Objectives: In recent years, despite the increasing use of removal dentures, an effective cleaning method for denture plaque has yet to be established. Therefore, we developed a new method for cleaning plaque on the removal of dentures by blasting agar particles. In this study, we investigated the ability of agar particle blasting to remove plaque and the surface properties of denture materials.
Methods: The artificial plaque was applied to the denture base, soft relining material, and an artificial tooth that assembled the denture. The surfaces were cleaned by blasting agar particles (S-6, projected area diameter 25μm, Ina Food Industry Co., Ltd. Nagano, Japan). The same blasting was performed with glycine and calcium carbonate particles for comparison. Surface roughness was measured, and the surface was observed using a microscope.
Results: The arithmetic mean surface roughness Ra of the denture base, soft relining material, and an artificial tooth did not change significantly after the blasting of agar particles. The profile curves showed that surface damage was slight. An arithmetic mean surface roughness Ra of less than 0.2μm is ideal for the surfaces of crown restoration. However, when glycine and calcium carbonate particles were used, the surface roughness increased after blasting, with Ra exceeding 0.2μm.
Conclusions: Since agar particles have sufficient cleaning ability against artificial plaque, we consider them effective for cleaning dentures.

Keywords : denture, agar particle, cleaning, surface roughness

064-2: Magnesium Oxide-Coated Porcine Bone Graft Enhances Osteoblast Differentiation: In vitro study

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Objectives: Guided bone regeneration (GBR) has utilized bone grafts and barrier membranes to promote new bone formation. Porcine bone graft shows promise as a xenograft for GBR. This objective is to demonstrate that hydrothermal magnesium oxide (MgO) coating on porcine bone graft enhances its properties for improved osteoblast differentiation in vitro. Methods: We used the hydrothermal method to coat the porcine bone graft with 2 mM and 5 mM MgO. Material physiochemistry and biocompatibility were analyzed at 1, 3, and 5 days. Results: SEM and EDX analyses showed increased surface roughness and higher Mg and O element percentages after MgO coating, with 5% and 9% increases, respectively. The porcine graft coated with 5 mM MgO demonstrated the highest cell proliferation ($p<0.001$) and good cell attachment in immunofluorescence. This Mg coating had the highest alkaline phosphatase activity ($p<0.001$) compared to uncoated porcine graft and 2mM MgO coating. Relative quantitative polymerase chain reaction (qPCR) at days 1 and 5 revealed statistically significant upregulation of osteoblast gene expression in the 5mM MgO-coated samples. Conclusions: Porcine bone graft hydrothermally coated with 5mM MgO showed enhanced biocompatibility and osteoblast differentiation, indicating great potential as a novel graft for GBR.

Keywords : Porcine Graft, Magnesium Oxide, Hydrothermal method, Osteogenesis, Biocompatibility

065-1: Strontium-releasing bioactive glass particles for dentin remineralization

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Objectives:
Previously, we reported that a novel calcium (Ca)-releasing phosphate-based bioactive glass showed dentin remineralization effects. To enhance remineralization ability, strontium (Sr) was introduced due to its similar physicochemical properties to Ca and ability to be incorporated into Ca site of hydroxyapatite in the teeth. The aim of this study was to fabricate Sr-containing phosphate-based glass particles and to evaluate their ion-release properties at neutral pH and dentin remineralization effects *in vitro*.
Methods:
Sr-containing phosphate-based glasses were fabricated using the melt-quenching method. The Ca component in the Ca-releasing phosphate-based glass was replaced with Sr at 0, 50, or 100 mol%, which were abbreviated as Sr0, Sr1, and Sr2, respectively. To evaluate ion-releasing properties, glass particles were immersed in PIPES solutions and ion concentrations in the eluate were determined by inductively coupled plasma-optical emission spectroscopy (ICP-OES). Bovine dentin specimens were used to assess dentin remineralization effects. The specimens were first demineralized, and the glass particles were applied to the dentin window and immersed in synthetic saliva solution (pH 6.70) for 12 days for remineralization. Specimen without glass particles treatment severed as a control. Remineralization effects were examined by X-ray micro-computed tomography (μ-CT).
Results:
The fabricated glass particles exhibited a typical amorphous phase and glass structural network, with a particle size of approximately 11 μm. The concentration of Sr released from the Sr-containing glass particles increased as the pH of the PIPES solution transitioned from acid to neutral. The amount of mineral loss in dentin was significantly lower for the glass groups than the control, and Sr-containing glass particles (Sr1 and Sr2) significantly reduced mineral loss compared with the Sr0 group ($p < 0.05$, ANOVA, Tukey's HSD test, n=5).
Conclusion:
Sr-releasing phosphate-based bioactive glass particles were successfully fabricated, demonstrating remarkable dentin remineralization effects.

Keywords : Strontium, Bioactive glass, Ion-release, Remineralization

066-2: Effect of Touch-Cured Resin Cement and Bioceramic Sealer on Pull-Out Bond Strength.

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Objectives: To evaluate the influence of touch-cured resin cement and bioceramic sealer on the pull-out bond strength of fiber posts. Methods: Sixty-four human mandibular premolars were obtained and horizontally sectioned at 12 mm from the apical root. The specimens were allocated randomly to 8 groups based on the endodontic sealer type (Resin-based or Bioceramic sealer) and four different touch-cured resin cement. The root canals were prepared using Mtwo NiTi files (30/05), then FRC with gutta-percha and AH Plus sealer using warm vertical compaction (group A) or by mean of Ceraseal sealer with single cone techniques (group C). After 24 hours, the post space was prepared to a working length of 7.5 mm and cemented with four different touch-cured resin cement (ESTECEM II; E, G-CEM ONE; G, Panavia V5; P, RelyX Universal; R). Subsequently, the specimens were stored for seven days before undergoing a pull-out bond strength test. Data analysis was performed using Two-way ANOVA and Tukey post hoc test ($\alpha = 0.05$). Results: No interaction was observed between the type of resin cement and the root canal sealer regarding the bond strength data($p=.010$). However, the type of resin cement significantly impacted bond strength. G-CEM ONE resin cement demonstrated higher bond strength than the ESTECEM II group($p=.007$). No significant difference was found between the bond strength of Panavia V5 and RelyX Universal resin cement ($p = .289$ and .071, respectively). Additionally, G-CEM ONE cement showed the highest mean bond strength in both AH-plus and Ceraseal sealer groups (208.42 ± 51.1 N, 205.24 ± 62.9 N, respectively). Conclusions: The bioceramic sealer did not negatively affect the bond strength of fiber posts when used with Touch-cured resin cement, but this conclusion depends on the material used.

Keywords : Bioceramic sealer, Touch-cured resin cement, Dual-cured resin cement, Pull-out bond strength, Resin-base sealer

067-1: Sodium alginate bonded mounted wheels with gelatine to increase bond strength for dry precision polishing of pure titanium

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Pure titanium has excellent biocompatibility and is attracting attention as a crown restoration material for treating metal allergies. However, it is a difficult-to-machine material. In this study, we developed a mounted wheel that enables dry, high-efficiency precision polishing of pure titanium. A new mounted wheel using sodium alginate as the bond was developed. Furthermore, gelatin was added to the bond to improve the strength of the mounted wheel for dry polishing of pure titanium. GC (Green silicon carbide) abrasive grains with a grain size of #1200 (Mean grain size 9.5 microns) were used. The test specimen was JIS Class 2 pure titanium.The shape of the polished surface is 5.0 mm by 30.0 mm. The test specimen was dry polished in a controlled force machining experimental apparatus while the rotating mounted wheel was pressed against it with a constant polishing force F (F=1.47 N). The peripheral speed of the mounted wheel was 3 m/s. When pure titanium was polished using mounted wheels with the percentage of the bond of 10, 11, and 12Vol%, the arithmetic mean surface roughness Ra of the polished surface approached 0.2 microns. When polishing with gelatin, the arithmetic mean surface roughness Ra of the polished surface decreased and approached 0.2 microns for each condition. The standard deviation also became smaller.The arithmetic mean surface roughness Ra in the final polishing of crown restoration should be less than Ra=0.2 microns, which is the threshold for plaque adhesion.A new mounted wheel was modified by adding gelatin to sodium alginate used as a bond. When pure titanium was dry polished with this mounted wheel, high-quality polished surfaces were obtained.

Keywords : Pure titanium, Polishing, Sodium alginate bonded mounted wheels, Gelatine, Surface roughness

068-2: Quantitative Analysis of the Effect of Er;Cr;YSGG Laser on the Microhardness of Human Root Dentin

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Objectives: The objective of the present study aims at evaluating the effect of current non-surgical endodontic protocols, with and without laser treatment, on the microhardness of human dentin. Methods: Ten matched pairs of extracted human teeth were collected and preserved in saline. Two groups were created comparing teeth to their matched-paired counterparts. WL was obtained, and endodontic apical gauging and chemo-mechanical debridement were completed in all specimens using Vortex Blue Nickel-Titanium rotary files, according to the manufacturer's instructions. Canals were irrigated with 2.5% NaOCl and 17% buffered EDTA. In group 2, canals were cleaned and disinfected using the Biolase Waterlase iPlus, according to the manufacturer's settings. RFT2 tips were placed at 1mm short of WL, and laser treatment was applied at 1.25 watts, 50Hz, 20 air, and 20 water, in a withdrawing motion. This was repeated 3 times. Dentin discs of 2mm in thickness were prepared from transversal sectioning of each root at an exact location, at the apical and middle thirds of the canal, respectively. Specimens were embedded in resin and polished to a 0.3-micron smoothness level. Specimens were subjected to Scanning Electron Microscopy for observation purposes, and Vickers hardness testing. Results: A paired t-test was used to analyze the data generated by each matched pair of specimens. No statistical significance could be observed between the 2 groups. Conclusions: In conclusion, Er, Cr:YSGG laser intracanal treatment had no positive or negative effects on the microhardness of root canal walls, when compared to matched-paired specimens, untreated with laser. Future studies should be focused on finding a potential strengthening effect of laser treatment on the microhardness of root canal dentin.

Keywords : Er, Cr:YSGG, microhardness, laser, dentin, matched-paired

069-1: Cementocytes under mechanical environments promote osteo/cementogenesis via Piezo1 signaling pathway

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Objectives: Cementocytes exist in the cementum lacunae and cementum canalicular in cellular cementum, and although they have morphological similarities to osteocytes, their functions remain unclear. This study analyzed the role of Piezo1, which is reported to be expressed on the membrane surface of cementocytes. Methods: The murine cementocyte cell line IDG-CM6 was cultured in a collagen-coated silicon chamber for 2 weeks to induce differentiation. The differentiated IDG-CM6 was stimulated with STB-140 STREX (STREX Co.) at a stretch rate of 20% at 10/60 Hz for 6 hours, and the culture supernatant and total RNA were collected. Gene expression was analyzed by real-time RT-PCR and protein expression by ELISA. Results: Cyclic stretch stimulation of cementocytes induced gene expression of Wnt1, a canonical Wnt ligand, and osteoprotegerin (OPG), a soluble decoy receptor for RANKL, and suppressed gene expression of Sclerostin (Sost), an inhibitor of Wnt signals. The expression of OPG in the culture supernatant also increased significantly. Addition of GsMTx4, a Piezo1 antagonisit, to this culture significantly suppressed these responses. Stimulation of cementocytes with Yoda1, a Piezo1 agonisit, induced gene expression of Wnt1 and OPG, as well as decreased gene expression of Sost, similar to those by cyclic stretch stimulation. Furthermore, the response to Yoda1 stimulation was suppressed in the presence of Akt Inhibitor IV. These results indicate that cyclic stretch stimulation of cementocytes increases the expression of Wnt1 and OPG and suppresses the expression of Sost via Piezo1-AKT signal pathway. Conclusions: Cementocytes under mechanical environments promote osteo/cementogenesis through upregulating Wnt1 and Opg expression and downregulating Sost expression via Piezo1-AKT signal pathway.

Keywords : cementogenesis, IDG-CM6, Piezo1, Yoda1

070-2: Identification of Key Genes Involved in Root Resorption

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In apical periodontitis, external root resorption is frequently observed and is primarily driven by an inflammatory response triggered by bacterial infection. While bone resorption is typically associated with this condition, dentin and cementum may also become targets for resorption under certain conditions. Despite differences in the structures of bone matrix, dentin, and cementum, their similar components suggest that these tissues could be susceptible to osteoclastic resorption. However, even when conditions seem favorable, root resorption does not always occur, indicating the involvement of additional regulatory mechanisms or signaling pathways. To investigate the mechanisms underlying root resorption, we analyzed publicly available single-cell RNA sequencing data from human apical periodontitis, including cases with root resorption, to identify potential gene markers. Our analysis highlighted SFRP1 and SFRP3 as key candidates, as these genes are known to inhibit the Wnt signaling pathway. To validate these findings, we created a mouse model of apical periodontitis with root resorption and collected RNA from apical periodontal tissues at various stages leading up to root resorption. Bulk RNA sequencing revealed a negative correlation between the expression of SFRP1 and SFRP3 during the onset of apical periodontitis and tooth root resorption. The expression of SFRP1 showed an increasing trend until root resorption occurred, whereas the expression of SFRP3 exhibited a decreasing trend. These opposing expression patterns suggest a critical role in the development of root resorption associated with apical periodontitis. Identifying SFRP1 and SFRP3 as significant genes in root resorption provides insights into potential new treatment strategies for challenging cases of apical periodontitis and traumatic dental injuries.

Keywords : Root Resorption, Periodontits

071-1: Innate Lymphoid Cells Promote Alveolar Bone Formation

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Objectives: Following tooth extraction, various immune cells contribute to socket bone formation. Innate lymphoid cells (ILCs), which exhibit properties similar to helper T cells, have recently been reported to regulate bone metabolism in the tarsal joint. However, the role of ILCs in alveolar bone metabolism remains unclear. In this study, we investigated the role of ILCs in alveolar bone formation using a mouse tooth extraction model. **Methods**: The maxillary first molars of wild-type mice were extracted to establish a model for observing post-extraction socket healing. Maxillae were harvested 0, 2, 4, 8, 16, and 32 days post-surgery. Bone formation within the socket was evaluated using micro-computed tomography. Single cells from the tissue surrounding the socket were collected for single-cell RNA sequencing and flow cytometry to analyze changes in the ILC population. The harvested maxillae were prepared for histological sectioning, and ILCs were histologically identified by immunohistochemistry. The same molars were extracted from *Rag2*$^{-/-}$ mice (lacking T cells) and *Il2rg*$^{-/-}$*Rag2*$^{-/-}$ mice (lacking both T cells and ILCs), with bone formation evaluated in these mice 10 days post-surgery. **Results**: Bone volume and bone mineral density within the sockets gradually increased from 0 to 32 days following tooth extraction. Single-cell RNA sequencing confirmed the presence of ILCs in the sockets. Flow cytometry revealed that the proportion of group 2 ILCs (ILC2s) significantly increased compared to that of ILC1s and ILC3s ($p < 0.05$). Histological examination revealed an increase in IL17RB (ILC2 marker)-positive and CD4 (helper T cell marker)-negative cells over time pos-extraction. T cell/ILC-deficient mice exhibited significantly lower bone volume and bone mineral density in their sockets compared to T cell-deficient mice ($p < 0.05$). **Conclusions**: These results suggest that ILC2s promote socket bone formation following tooth extraction. Our findings open the field to new possibilities in the development of a novel socket preservation technique targeting ILC2s.

Keywords : Innate lymphoid cells, Alveolar bone formation, Tooth extraction socket, Osteoimmunology, Socket preservation

072-2: Femur bone Marrow Formation: Enzyme and Macrophage Roles

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Objectives: Bone marrow formation within newly developing bone is crucial for proper bone growth. Despite its significance, the detailed processes of its effects within the femoral epiphysis are not fully understood. This study aims to map the distribution of matrix metalloproteinases (MMPs) and macrophages in the bone development regions of the femur epiphysis. Materials and Methods: Femur samples from postnatal ICR mice (P7-P12) were fixed in paraformaldehyde and decalcified with 10% EDTA. Immunofluorescence staining was employed to detect MMP2, assessing its distribution and localization. Additionally, immunofluorescence staining for CD206 and CD169 was performed to evaluate macrophage involvement. CD206 staining identifies M2 macrophages, typically associated with tissue repair and anti-inflammatory responses, while CD169 staining marks osteomacs, a subset of macrophages involved in immune surveillance and tissue homeostasis. Results: MMP2 expression was observed both inside and outside the bone formation area. As bone growth progressed, there was a decrease in MMP2 levels within the bone formation area, suggesting that MMP2 may have a limited role in early matrix remodeling. Immunofluorescence staining for CD206 and CD169 confirmed the presence of macrophages within the bone formation area. CD206 staining identified M2 macrophages, while CD169 marked distinct macrophage subsets. Conclusion: The findings suggest that macrophages, particularly M2 macrophages and subsets marked by CD169, may play a role in bone remodeling independent of MMP2 activity. These macrophages appear to be involved in bone formation and remodeling processes, highlighting their significance in the overall process of bone development within the femur epiphysis. Acknowledgement This work was supported by KAKENHI (grant numbers: 23K24532, 24K22187) from Japan Society for the Promotion of Science and by CREST (grant Number: JPMJCR22L5) from Japan Science and Technology Agency.

Keywords : Bone growth, Macrophages

073-1: Chemo-dynamic perspective on bone formation in ligature mouse model

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Objectives:We aim to elucidate the critical role of blood supply in the early stages of bone mineralization and provide insights into the temporal relationship between vascular invasion and bone formation from the initial onset for comprehensive understanding of the underlying mechanisms and eventually apply these mechanisms for enhanced bone regeneration.
Methods:In this study we initiated a protocol to induce localized ischemia in ICR mice femur at p5 (time point before the initiation of osteogenesis), preventing angiogenesis before the onset of mineralization. Following the surgery, we conducted daily mineralization assessments using micro-computed tomography (CT) as well as monitoring tissue perfusion by immuno-histochemistry using anti-CD31 antibody capturing real-time data on blood flow dynamics, Followed by histological analysis to evaluate the progression of mineralization and the potential compensatory mechanisms activated due to the vascular blockage. Finally, we simulated these findings and applied them ex-vivo using femur epiphysis.
Results:We revealed that due to blood flow restriction, the transition into hypertrophic chondrocytes was completely blocked at P7 which is a crucial step for endochondral ossification. we also found drop in pH that also contributes to the impaired mineralization. Finally, we simulated the biochemical milieu established by vascular invasion by adjusting the osmotic pressure and pH and applied these finding for ex-vivo femur bone ossification.
Conclusions:The sophisticated interplay between osteogenesis and angiogenesis isn't limited to the nutritional and hormonal factors, angiogenesis is also crucial for stabilizing the chemical parameters of the bone microenvironment and it's impairment leads to chemical equilibrium disturbance in the form of pH and osmotic pressure as observed in preventing chondrocytes hypertrophy. Recreating these conditions ex-vivo exhibited marked ossification which provides an innovative approach built upon mimicking natural and physiological conditions and thus paves the way for the future creation of biomaterials with dual function.
Acknowledgement:This work was supported by KAKENHI (grant numbers: 23K24532, 24K22187) from Japan Society for the Promotion of Science and by CREST (grant Number: JPMJCR22L5) from Japan Science and Technology Agency.

Keywords : Osteogenesis, Vasculogenesis

074-2: Spatiotemporal expression patterns of Msx2 and CEBPA during mouse amelogenesis

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Objectives: It is critical to understand how normal tooth development occurs to realize tooth regeneration in the future. However, the whole blueprint of tooth development has not been elucidated to date. During amelogenesis, ameloblasts differentiate from the undifferentiated inner enamel epithelium in the differentiation stage. Next, differentiated ameloblasts are elongated and polarized to secrete enamel proteins such as Amelogenin, Ameloblastin, and Enamelin as well as some proteases including MMP20 and KLK4 during the secretion stage. After the short transition stage, the ameloblasts become shortened and called ruffle-ended ameloblasts and smooth-ended ameloblasts during the maturation stage. Upon completion of enamel formation, the ameloblasts become flattened in the reduction stage. Among a number of genes/proteins involved in amelogenesis, Msx2 is a homeobox type transcription factor and expressed in the inner enamel epithelium and ameloblasts. CCAAT/enhancer-binding protein alpha (CEBPA) is another transcription factor and known to regulate Amelogenin expression during enamel formation. An in vitro study has revealed that Msx2 protein binds CEBPA protein to suppress Amelogenin expression. However, their spatiotemporal expression patterns in vivo have not been clarified. Methods: Section in situ hybridization and immunohistochemistry methods using developing mouse teeth were performed to detect Msx2, CEBPA, and Amelogenin to reveal their spatiotemporal expression patterns in vivo. Results: Msx2 mRNA was expressed in the undifferentiated and transition stages. CEBPA and Amelogenin were co-expressed in differentiated ameloblasts especially in the secretion stage but not overlapped with Msx2. Conclusions: Our results indicate that Msx2 suppresses CEBPA expression in the undifferentiation and transition stages in order to suppress Amelogenin expression, but reduced expression of Msx2 in the secretion stage leads to the expression of CEBPA and Amelogenin.

Keywords : tooth development, enamel formation

075-1: 3D-engineered osteogenic cellular constructs for bone regenerative therapy by Direct Conversion

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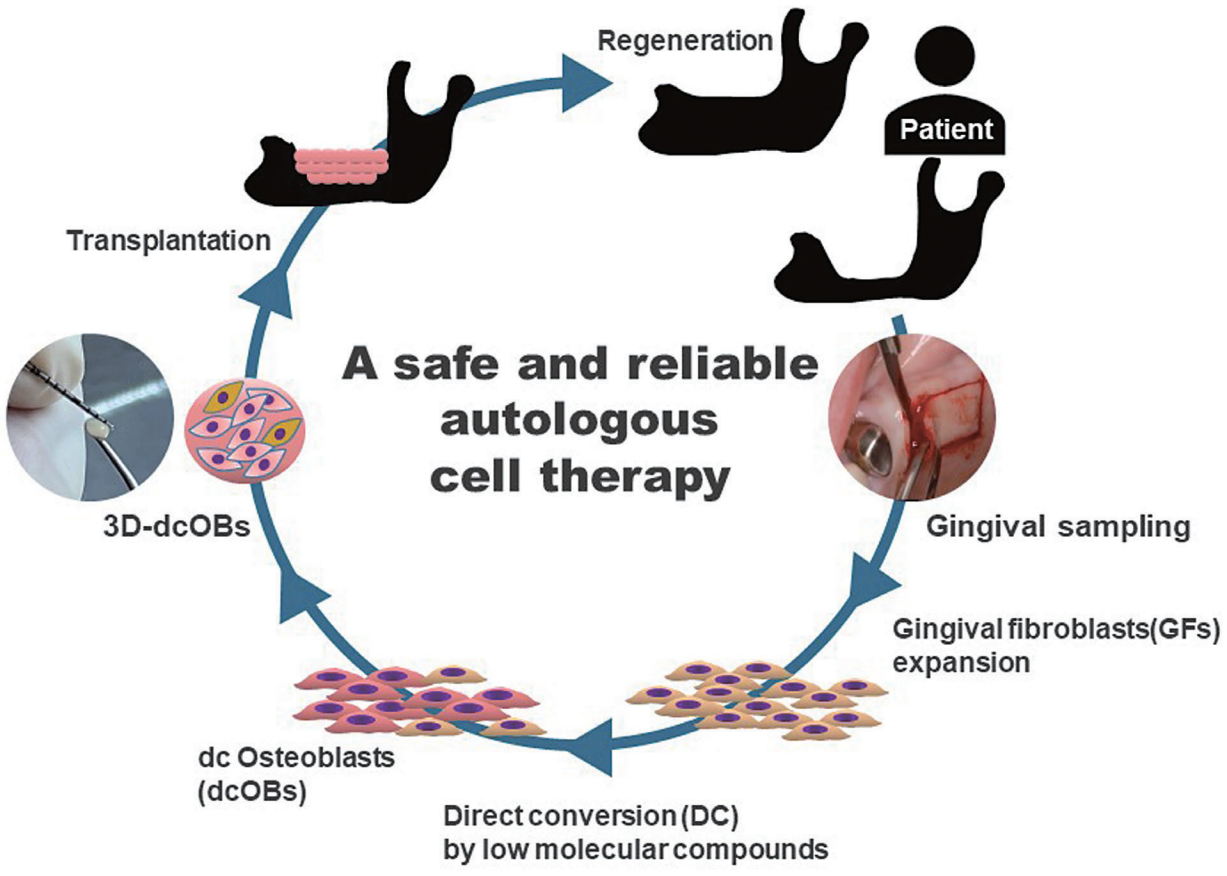
Objectives: Direct conversion (DC) of somatic cells into another differentiated lineage has attracted scientific attention for tissue regenerative cell therapy. Previous studies reported a DC method by inhibiting activin-like kinase 5 (ALK5) that can directly transform fibroblasts into osteoblast-like cells (dcOBs) in a conventional 2D culture system. To develop a promising bone regenerative graft, this study aimed to generate 3D-dcOBs from human gingival fibroblasts (GFs), consisting of functional osteoblasts and bone-related ECM proteins without the use of artificial materials.
Methods: Human GFs isolated from healthy donors were maintained in osteogenic medium with or without DC compounds, including an ALK5 inhibitor and vitamin D3. Confluent cells in 48-well culture plates formed cellular sheets, which were detached using a micropipette tip. The floating cellular sheets then contracted into round clumps and were cultured for 15 days. The biological and bone-regenerative properties were assessed in vitro and in vivo.
Results: Cell clumps approximately 1.5 mm in diameter, established with osteogenic medium and DC compounds (termed 3D-dcOBs), exhibited numerous OCN-expressing cells, indicating mature osteoblasts, and abundant ECM protein type I collagen (COL1). In contrast, cellular constructs generated with osteogenic medium alone (3D-GFs) lacked OCN expression. 3D-dcOBs showed higher levels of osteoblast-related gene expression, ALP activity, and OCN production. Transplantation of human 3D-dcOBs with no artificial scaffold into a nude rat calvarial critical defect model induced complete bone reconstruction after eight weeks. Interestingly, human OCN-expressing cells were detected under the reconstructed bone, likely descended from the grafted 3D-dcOBs.
Conclusions: These findings suggest that 3D-dcOBs derived from human GFs, which provide mature osteoblasts and bone-related ECM to bone lesion areas, will be a safe and reliable autologous cell therapy for bone regeneration.

Keywords : Regeneration, Bioengineering, Bone, Cell



076-2: Enhanced dentin remineralisation by fluoride-containing varnish and SDF

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Objective We aimed to evaluate and compare the interactions of ions with organic components during dentin remineralisation facilitated by fluoride-containing agents. Method The Osaka University Graduate Schools of Dentistry Research Ethics Committee approved this study (H30-E36). Six human-sound third molars were sectioned to expose the root dentin, and subjected to a demineralizing solution (pH=5) for five days. Specimens were then treated with three distinct fluoride-containing agents- SDF, MI Varnish, and Enamelast and incubated in saline for a week. Comprehensive analyses of lesion surfaces were conducted using Micro-CT, SEM-EDS, and CLSM. Quantitative assessments by micro-CT were undertaken to ascertain the mineral density at the lesion surface up to 10 micrometre depth and the overall mineral density of exposed dentin. SEM-EDS was used to investigate elemental intensity profiles and determine the total demineralisation depth extending up to 60 micrometres. Finally, CLSM analysis was performed to examine the presence of collagen fibres and fibromodulin which are associated with dentin remineralization on the lesion surfaces. Statistical analysis was conducted using ANOVA followed by a post-hoc Tukey test. Result A substantial increase in overall mineral density was found in the SDF-treated group compared to the control and other treatment groups. From the surface up to 10 micrometres, significant differences in mineral density were observed between the control and treatment groups (p less than 0.05). Elemental analysis also indicated a linear pattern of mineral loss extending to 40 micrometres with significant differences in demineralisation area among all the groups (p less than 0.05). The presence of fibromodulin was matched with the sulfur, fluoride, and fluorescence expression at the remineralised surface. Conclusion These findings indicated that SDF enhances a broader scope of dentin remineralization whereas fluoride varnishes showed a more localised area of remineralisation. This study was supported by JSPS KAKENHI 24K02620, 23K16022 and Nakao Foundation Grants.

Keywords : Fluoride varnish, SDF, organic and inorganic components, CLSM and SEM-EDS, Dentin remineralisation

077-1: Comparative Evaluation of the Remineralizing Effect of Fluoride Varnish, Clinpro™ 5000, and Remin Pro cream, on the Remineralization of Primary Teeth Enamel: An In Vitro Study

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Objectives: To compare the effectiveness of fluoride varnish and two calcium-based fluoride products on remineralizing primary teeth enamel.

Materials and Methods: Thirty-six anterior deciduous teeth were divided into three groups (N=12). The Vickers (50gr/5 seconds) surface microhardness (SMH) was conducted at baseline, demineralization, and remineralization. All teeth were immersed in demineralizing solution for 96 hours to create caries-like lesions and SMH was determined for the artificially-induced caries. The teeth were randomly assigned to three groups consisting of 5% fluoride varnish once daily/10 seconds, Clinpro™ 5000 toothpaste once daily/2 minutes, and Remin Pro cream once daily/3 minutes for 28 days. All specimens were kept in artificial saliva with pH cycling during the study period. After remineralization, SMH was evaluated for the last time. Data were analyzed by one-way ANOVA, with Bonferroni correction for inter-and- intra-group comparisons.

Results: Final SMH was highest in the Clinpro group (296.4±73.1kgf/mm^2), followed by Remin Pro (283.8±119.3kgf/mm^2), and varnish (270.9±78.3 kgf/mm^2). There was no significant difference among the groups after treatment (P>0.05). We also did not observe a significant difference among the three different study stages (P>0.05).

Conclusion: Within the limitations of this in-vitro study, daily application of low fluoride-calcium compound seems to be as effective as the professional use of fluoride varnish or high-content fluoride toothpaste in remineralizing initial caries of primary teeth.

Keywords : Dental Caries; Tooth Remineralization; Tooth, Deciduous.

078-2: Cariogenic potential of hyperglycemia-induced migration of circulating metabolites into the oral cavity

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Objectives: Saliva, secreted by the salivary glands, plays a crucial role in shaping oral microbiota and influencing oral disease susceptibility. Previous studies indicated that hyperglycemia causes covariation of metabolites between plasma and saliva, suggesting metabolite migration from plasma to saliva. However, it remains unclear if hyperglycemia drives specific metabolites to migrate, altering oral microbiota and increasing oral disease risk. This study aimed to demonstrate hyperglycemia-induced metabolite migration from plasma to the oral cavity via saliva and assess its impact on oral health.
Methods: We developed a novel method for untargeted metabolomics profiling of saliva from sublingual and submandibular glands and integrated this data with plasma and whole-saliva profiles from participants, including those with type 2 diabetes. Using multi-block orthogonal component analysis (OnPLS), we explored joint and unique variations between plasma, gland-saliva, and whole-saliva.
Results: Gland-saliva metabolomics profiles were more reflective of cardiometabolic traits than whole-saliva. OnPLS revealed a shared component across plasma, gland-saliva, and whole-saliva, which correlated with glycemic parameters. Plasma contributed 40.7% of the shared variation, gland-saliva 9.74%, and whole-saliva 5.17%. Several saccharides, including glucose, showed correlation with the shared variation in both plasma and gland-saliva, while not in whole saliva. Glucose and fructose, in particular, showed decreasing positive correlation with glycemic parameters in the order of plasma, gland-saliva, and whole-saliva, indicating their migration from systemic circulation to the oral cavity and subsequent consumption by oral microbiota. Their migration from plasma to saliva was significantly higher in participants with dental caries and plaque accumulation.
Conclusions: Collectively, the current study identified joint variation between plasma, gland-saliva, and whole-saliva and highlighted the potential cariogenic effects of hyperglycemia-driven saccharide migration into the oral cavity, suggesting a link between diabetes and dental caries.

Keywords : Saliva, Diabetes, Caries

079-1: Calculating the levels of dental plaque in multiple zones of the teeth based on a 3D intraoral scanner

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Objectives: Rapid confirmation of the location of dental plaque is a crucial step in oral hygiene. Existing methods for detecting dental plaque often require the application of plaque disclosing agents followed by patient education conducted by dentists. This reliance on professional experience can lead to variability in results, and the use of plaque disclosing agents may cause allergic reactions in patients. With the intraoral scanner now a standard part of current treatment and diagnostic procedures, the principle of Quantitative Light-Induced Fluorescence (QLF) is used to enhance the imaging of oral bacteria. By stimulating bacteria with UV light to produce autofluorescence, this method allows for the precise identification of dental plaque locations. However, this technique requires quantification into indicators to serve as a basis for long-term assessment of dental health. Methods: In this work, we propose a customized interface that utilizes intraoral scan data and deep learning methods to quickly segment teeth and their positions. Each tooth is divided into multiple-zone areas, calculating the proportion of dental plaque in each area. This not only allows patients to quickly understand areas of insufficient cleaning but also serves as a basis for long-term hygiene assessment. Results: This study uses standard dental models obtained from 3D Intraoral Scanners, simulating the placement of plaque disclosing agents, and provides six-zone areas for dentists to efficiently explain the distribution of dental plaque in the mouth. The process can be completed within one minute. Conclusions: Experimental results show that our system can adapt to the specific zoning needs of each dentist, accurately display the proportion of dental plaque, and is suitable for long-term monitoring of dental plaque.

Keywords : dental plaque, deep learning, multiple-zone areas

080-2: Adhesion of *Streptococcus mutans* to additive-manufactured occlusal splint materials

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Objectives: The aim was to investigate the initial adhesion of *Streptococcus mutans* (*S. mutans*) on additive-manufactured occlusal splint (OS) materials with various fabrication procedures. Methods: Two materials for additive-manufactured OS, hard (KeySplint™ Hard) and soft materials (KeySplint™ Soft), were tested. Using two 3D printers with different printing systems, liquid crystal display (LCD) (Creo™ C5) and digital light processing (DLP) (Asiga MAX™), 48 disk-shaped specimens (12 for each pair of the material and printer) were fabricated. Each 12 specimens were classified into 3 groups based on the post-curing atmosphere (nitrogen gas (N_2)/air) and polishing conditions (as-printed/polished with 4000-grit abrasive paper): 1) as-printed group post-cured at an N_2 atmosphere; 2) as-printed group post-cured in the air; and 3) polished group post-cured at in the air (n=4/group). As controls, two conventional OS materials, autopolymerizing (Palapress™) and heat-polymerized resins (Paladon 65™), were also tested. All specimens were incubated in artificial saliva and subsequently exposed to a suspension of *S. mutans* to facilitate initial adhesion. *S. mutans* adhesion was assessed using a colony forming unit (CFU) assay, followed by statistical analyses using 1- and 2-way ANOVA (α=0.05). Results: 2-way ANOVA revealed that material type (hard/soft) would significantly affect *S. mutans* adhesion on OS materials (p=0.017), while polishing condition would not. There was the interaction of material type and printing system (p=0.004), revealing material type would affect CFU only when using LCD system (p<0.001). The as-printed hard material additive-manufactured with LCD system and post-curing in the air showed significantly higher CFU than the as-printed soft material additive-manufactured with the same procedures (p=0.042) and autopolymerizing resin (p=0.004) as well. Conclusions: Material type and printing system can affect *S. mutans* adhesion on additive-manufactured OS materials. Meanwhile, additive-manufactured OS materials exhibit a comparable level of *S. mutans* adhesion to heat-polymerized conventional material.

Keywords : Digital dentistry, Bacteria adhesion, Additive-manufacturing, Occlusal splint, Streptococcus mutans

081-1: Integrating Transformers with Probabilistic Diffusion for Enhanced Digital Inlay Restoration

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Objectives:Accurate reconstruction of the inlay shape is a crucial component of digital inlay restoration.Traditional methods frequently rely on labor-intensive manual operations, with the quality heavily dependent onthe operator's experience. Additionally, these processes are time-intensive, leading to inefficiencies andvariability in quality. Previous research on image restoration has focused on the known regions surrounding thedamaged areas, neglecting the overall image structure. Although Transformer-based approaches delve into allknown regions rather than confirming only limited known regions for damaged areas, they are far from thetexture semantic level. Methods:In this study, we propose an innovative approach that integrates Transformer-based techniques withprobabilistic diffusion. The approach begins by utilizing an encoder to generate a global crown texturereference set. A coarse filling attention module is then employed to capture global structural information. Finally, a decoder, equipped with a structural texture-matching attention module, facilitates rapid andautomated digital inlay restoration. The workflow is divided into key steps: converting the tooth into a 3Dmodel, generating a 2D depth map from the model, repairing damaged areas within the depth map, reconstructing the 3D model from the repaired depth map, and performing mesh post-processing for 3Dprinting to produce an inlay suitable for the patient. Results:The entire process, from depth map generation and repair to 3D model reconstruction andsmoothing, is completed within an average of 19.5 seconds. We validated the similarity between the standarddental model and those repaired regions generated by the proposed AI system using the Structural SimilarityIndex (SSIM). Our findings demonstrate an average depth map similarity exceeding 80%, with key areasreaching a similarity of 88.7%. Conclusions:These results indicate that our method holds significant promise for enhancing digital inlayrestoration.

Keywords : Digital Inlay Restoration, Transformer, Probabilistic Diffusion, 3D Model Reconstruction, Structural Similarity Index (SSIM)

082-2: Transformer-Based Deep Learning for Automatic Tooth Arrangement in Clear Aligner Therapy: A Predictable Constraint Approach

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Objectives: Tooth arrangement in 3D dental model digitization is a critical task in clear aligner therapy. This is a challenging task, as the tooth arrangement must meet aesthetic requirements while also being tailored to the specific conditions of each patient, a process that often relies on the expertise and skill of dentists. Recently, several deep learning-based methods for automatic tooth arrangement have been proposed, involving segmentation, encoding, training, and prediction. Although these methods are suitable for this task, the data augmentation in current methods does not take into account the limitations of aligner therapy in general. Methods: In this study, we address this shortcoming by proposing a Transformer-based deep learning method that incorporates predictable constraint conditions. The method involves conditional rotation and translation data augmentation on the original teeth, which serve as input to the model. The model is then trained using positional encoding and multi-head attention mechanisms, and the training process includes the use of local reconstruction loss, global reconstruction loss, rotation loss, translation loss, angular loss, symmetry loss, and spatial relationship loss to perform the automatic tooth arrangement task. Results: This study utilized real pre-treatment data from patients to achieve simulated automatic tooth arrangement results, with the process completing a prediction within an average of 3 seconds. The experimental results demonstrate that this method is capable of achieving automatic tooth arrangement under predictable constraint conditions. Conclusions: We evaluated this method using data from real patients, and the results demonstrate that data augmentation under predictable constraint conditions leads to outcomes that more closely resemble real clinical practice.

Keywords : tooth arrangement, deep learning, transformer, data augmentation

083-1: Development of database for dental implant surgery using MR devices

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In recent years, dental implant surgery has advanced with guided systems that utilize dynamic navigation for *real-time* implant positioning. However, these systems require large equipment and impose limitations on the operator´s and assistant´s positions. To address these issues, we developed a system using a *goggle-shaped* MR devices (HoloLens 2, Microsoft) that enables mixed reality (MR) for remote guidance during implant surgery. Unlike dynamic navigation systems, this system does not require large equipment or monitors, allowing the operator to perform surgery while focusing on the surgical field, simply by wearing the MR device. Since the surgery is conducted following the usual procedures, we believe there is no added risk. Our purpose is to introduce this system into implant surgeries to achieve more appropriate and safer procedures, independent of the operator´s experience, and to establish methods for quantifying surgical techniques, creating algorithms, and building a database.

As the first step in this study, we tracked the movements of the operator´s fingers and handpiece during simulated implant surgeries on jaw models (implant training models, NISSIN). The MR device recorded and saved in both as video and csv format (x, y, z coordinates for each indicator every 0.2 seconds). The csv data was reconstructed using software (Unity, Unity Technologies). A total of 15 simulated surgeries (9 cases on maxillary models and 6 on mandibular models) were conducted by an implant specialist, and tracking video was compared with the reconstructed one to assess precision.

In this study, we successfully tracked the movements of the operator´s fingers and handpiece during implant surgery using the MR device, reconstructed them, and compared the results, confirming clinical applicability. In future studies, improving the method of data overlay and enhancing the accuracy of data recording will be the next challenges.

Keywords : guided implant surgery, mixed reality, dynamic navigation, hologram, education

084-2: Computer-assisted accurate tumor resection and functional reconstruction of mandibular defects

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The most important factors of the treatment of maxillofacial benign and malignant tumors are adequate resection and reconstruction of function and morphology. A segmental mandibulectomy for a malignant tumor requires the reconstruction of hard tissue with an autogenous bone graft, such as a free fibular flap and reconstruction plate. However, the reconstruction of large segmental mandibular defects presents a challenge for maxillofacial surgeons. Virtual surgical-planning technology in head and neck surgery is witnessing strong growth. In recent years, the use of a custom-made cutting guide for mandibular segmental resection and custom-made plates such as the Trumatch have improved surgical accuracy. The double-barrel fibula flap technique has been used for reconstruction, with precise adjustments made to the shape and position of the flaps to ensure proper implant placement. This technique allows for stably longer implant placement and solves the problem of requiring dental implants with abnormally long crown lengths, which occurs with single-barrel free fibula reconstruction. However, since most of these custom-made devices are manufactured in Europe, the delivery time to Japan is more than 4 weeks, which limits their use in cases of malignant tumor resection. To solve this problem, a custom-made mandibular reconstruction plate made in Japan was developed in 2022. This new custom-made mandibular plate, Cosmofix, is made of laminated titanium molding that replicates the curvature of the mandible bone and allows for morphologically aesthetic reconstruction. This custom-made reconstruction plate can be delivered within 2 weeks of a web discussion with an engineer, making it very useful in the treatment of malignant tumors. We describe cases in which a custom-made cutting guide, custom-made reconstruction plate, and dental implants were used for segmental mandibular defects.

Keywords : reconstruction, custom-made plate, Virtual surgical-planning technology, head and neck cancer

085-1: Esthetically restorative design and treatment via digital dentistry for spaced and conical-shaped dentition

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Objectives: The application of digital dentistry in treatment planning and procedure can enhance the accuracy and predictability of aesthetic outcomes, thereby increasing the success of dental treatments ans patient satisfaction : Case report Methods: A 26-year-old Thai female patient presented with small gaps in her upper anterior teeth and undersized lateral incisors, seeking improved aesthetics and whiter teeth. The treatment involved digital smile design, gingival contouring, and the placement of six ceramic veneers (IPS Emax Pess). Digital tools such as intraoral scanners and computer-aided design and manufacturing (CAD/CAM) systems were utilized throughout the process. Results: The treatment resulted in whiter teeth with improved shapes of upper anterior teeth, achieving a harmonious and aesthetically pleasing smile in line with aesthetic theories. The patient expressed high satisfaction with the outcome of ceramic veneers for full smile. Conclusions: The use of digital processes in aesthetic dental treatment planning and procedure allows for accurate prediction of outcomes, ensuring that treatments proceed as planned. Patients can visualize and anticipate results both during and after treatment, aligning closely with the initial design.

Keywords : Digital dentistry, Smile design, Ceramics, CAD/CAM

086-2: Evaluation of automatically generated crown designs based on occlusion types

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Objectives: This study aimed to evaluate the influence of occlusion types on the outcomes of auto-generated crown designs. Methods: Five resin typodonts with different occlusion types (normal occlusion, class I diastema, class II division 1, class II division 2, and class III reversed occlusion) were digitized using an intraoral scanner (IOS) (n=10). A desktop scanner was used to obtain the reference scans. Crown preparations were performed on the maxillary right central incisors and maxillary right first molars. The original typodont IOS scans were duplicated, and the prepared tooth regions were removed. The typodonts of crown prepared teeth were then rescanned using IOS. Two automated computer-aided design (CAD) software programs were used to design crowns. Surface deviation between original tooth form and crown design was assessed using 3-dimensional (3D) metrology software. The quality of crown design was evaluated according to the World Dental Federation's criteria (FDI). Statistical analyses were conducted using the Kruskal-Wallis H test, one-way ANOVA, Welch's ANOVA, and Mann-Whitney U test (α=0.05). Results: Surface deviation and quality of crown designs were significantly different among the five occlusion types for each software and tooth number ($P<0.05$). Regardless of software and tooth number, crown designs in class I diastema showed the highest surface deviation and was significantly different from the other occlusion types ($P<0.05$). However, there were no significant differences in the quality assessment of crown designs ($P>0.05$). Conclusions: Occlusion types significantly influence the accuracy and quality of auto-generated crown designs. Overall, the performance of automated CAD software differed based on each occlusion type.

Keywords : Artificial intelligence, Automated generation, Computer-aided design, Digital dentistry, Occlusion

087-1: Enhancing Full Arch Implant Restorations Using Digital Technology: A Case Study on the Application of the PIC Camera®

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Objectives: To improve the quality of full arch implant restorations by utilizing digital technology, specifically the Precise Implant Capture (PIC camera®), to make the treatment process easier and reduce treatment time. Methods: An 85-year-old Thai female patient presented with a chief complaint of seeking fixed prosthesis for the lower jaw. Oral examination revealed fully edentulous ridge in the lower jaw and partially edentulous ridge in the upper jaw, along with worn teeth. The treatment plan involved placing six implants in the lower jaw to support a fixed detachable prosthesis and restoring the upper jaw with six crowns and bridges, combined with a removable partial denture. The PIC camera® was used during the implant impression process to ensure precise implant positioning, and the prostheses were fabricated by milling metal bars and ceramic. Results: After delivery of the prostheses, the patient expressed high satisfaction with the treatment outcomes. Conclusions: The use of the PIC camera®, a precise digital oral scanner for capturing digital impressions of multiple dental implants, significantly enhances the accuracy and ease of full arch implant restorations, improving the quality of the restorations while reducing treatment time.

Keywords : Implant, PIC Camera

088-2: Melting curve analyses in the quantitative real-time polymerase chain reaction of methylated/non-methylated DNA, toward the detection of oral cancer using gargle fluid

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Introduction
Early detection and early treatment of oral cancer are of paramount importance for improving patient prognosis. We previously reported a non-invasive testing method for oral cancer with commercially available Methylation-Specific Multiple Ligation-dependent Probe Amplification (MS-MLPA) method, focusing on DNA methylation of cells in gargle fluid. However, conventional MS-MLPA methods are complicated and costly, making it difficult to use for screening and other health examinations. Based on previous reports that methylated DNA affects the amount of PCR products, this study aimed to develop a simpler method for the diagnosis of oral cancer using quantitative real-time PCR (qPCR) melting curve analysis.
Materials and methods
Gargle fluid was collected from 30 patients with oral cancer and 30 healthy subjects. After DNA extraction from the gargle fluid, qPCR (SYBR-Green method) was performed. The area of the melting curve was calculated to assess the amount of PCR product and compared between samples for statistical analysis. The DNA was BRCA2 and CDH13, which showed methylation in oral cancer from previous studies. A diagnostic formula was established by regression analysis from the results of the training set (20 oral cancer cases and 20 healthy subjects) and validated on the test set (10 oral cancer cases and 10 healthy subjects).
Results
Using the diagnostic formula established in the training set, the AUC of the ROC curve with the detection of oral cancer as endpoint was 0.780. The aforementioned diagnostic formula was validated in the test set and the AUC was 0.830, indicating reproducibility of diagnostic performance.
Conclusion
Assessment of cancer-suppressor genes in gargle fluid by qPCR can be a non-invasive and convenient tool for oral cancer diagnosis.

Keywords : quantitative real-time PCR, melting curve analysis, gargle fluid, prediction, oral cancer

089-1: Association of vitamin D and related biomarkers with temporomandibular disorders

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Objectives
Vitamin D plays variety roles in body and many studies have been reported association of low vitamin D levels with pain-related conditions. The impacts of vitamin D deficiency on pathogenesis or symptoms of temporomandibular disorders (TMD) are not clearly investigated. The aim of this study was to evaluate the association of vitamin D and related blood biomarkers with clinical and psychological symptoms in patients with TMD.
Methods
Twenty-four patients with TMD of arthrogenous origin and 31 healthy control subjects were evaluated. Venous blood samples were collected from each subject, and serum 25-hydroxyvitamin D_3 (25-OHD), and other related blood biomarkers including parathyroid hormone (PTH), calcium, phosphorous, C-reactive protein (CRP), and complete blood cell count were measured. Each group was classified into vitamin D deficiency (under 20ng/mL) and normal subgroups. The clinical severity and psychological outcomes were assessed by Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) Axis I and II, and Symptom Checklist-90-Revision (SCL-90-R) questionnaires.
Results
There are no significant differences in serum 25-OHD, calcium, phosphorous, CRP, and complete blood cell count between patient and control groups. However, serum PTH level was significant lower in patient than control group. There are no significant differences in 9 dimension scores of SCL-90-R between vitamin D deficiency and normal subgroups in control subjects, but significant higher scores in interpersonal sensitivity (I-S), anxiety (ANX), and phobic anxiety (PHOB) dimensions in vitamin D deficiency than normal subgroup in TMD patients. Serum 25-OHD level was significant correlated with ANX scores, serum PTH, and calcium levels.
Conclusions
There were no significant evidences about the impact of serum vitamin D level on the prevalence and severity of TMD, but low vitamin D level was significantly associated with psychological symptoms in TMD patients. The evaluation of vitamin D deficiency should be considered as a potential biomarker for diagnosis and treatment of TMD.

Keywords : Temporomandibular disorder, Vitamin D, Parathyroid hormone, Blood marker, Psychological outcomes

090-2: What causes joint effusion, disc displacement or degenerative bone changes?

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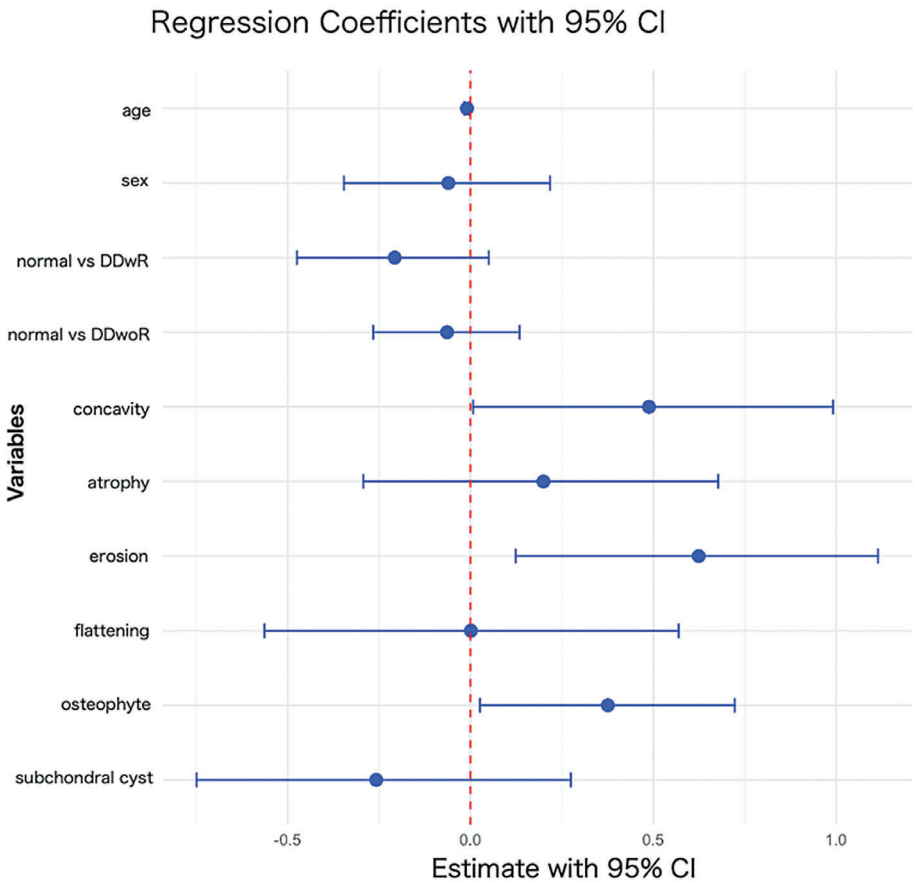
Objectives The aim of this study was to investigate which factors-age, gender, disc displacement, and degenerative condylar changes in the temporomandibular joints (TMJ) are associated with joint effusion (JE) using multivariate analysis of large MRI data and to determine the clinical significance of observing JE. Methods The study sample consisted of 761 consecutive outpatients (1522 TMJs; average age: 45.8 years; 582 females, 179 males) with symptoms of temporomandibular disorders who underwent MR examination. Degenerative bone changes in the condyle were assessed basis on MRI. Also, JE images were classified into five groups: none, trivial, mild, moderate, and severe. Ordinal logistic regression analysis assuming mixed effects by individual, was performed to identify significant associations between the outcome (ordinal variable regarding JE) and the predictors (covariates: age, sex, disc displacement, and degenerative bone changes [concavity, atrophy, erosion, flattening, osteophyte, subchondral cyst]). Two examiners independently evaluated MR images, and any differences were resolved by forced consensus. Results Disagreements requiring forced consensus occurred in 8.5% (129/1522) of joint effusion cases. The classifications of JE were as follows: none, trivial, mild, moderate, and severe were 691 TMJs (45%), 180 TMJs (11.8%), 319 TMJs (21%), 215 TMJs (14.1%), 117 TMJs (7.7%). Ordinal logistic regression analysis showed that age and the presence of erosion, osteophyte, and concavity were significantly associated with JE. Additionally, age and JE showed a negative correlation, indicating that the occurrence of JE tended to decrease with age. Among the bone changes, the strongest association was found for erosion, which represents progressive bone changes. On the other hand, disc displacement was not significantly associated with JE. Conclusions Joint effusion was statistically significantly associated with degenerative bone changes in the condyle rather than disc abnormality. Therefore, JE could be an important imaging finding indicating the progression of bony changes.

Keywords : Temporomandibular disorders, joint effusion, MRI, degenerative bone change, disc displacement



091-1: Consideration of the optimal solution when analyzing the trade-off between the contribution rate of image observations and the number of imaging types in orthodontic diagnosis

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Objective 1) To analyze the trade-off between the contribution rate of image observations and the number of imaging types used in orthodontic diagnosis; 2) to examine the minimum combination of imaging types to make an orthodontic diagnosis in an efficient manner. Materials and methods In Experiment 1, 967 consecutive patients who visited our department and for whom digital records of orthodontic evaluation charts were available for collection were included. The contribution rate of image observations was calculated for each combination of five image types: frontal cephalogram (FC), lateral cephalogram (LC), panoramic radiograph (PR), intraoral photograph (IP), and facial photograph (FP). We defined the contribution rate of image observations as the number of observations obtained from a combination of images for a given patient divided by the total number of observations for the patient.In Experiment 2, trade-off curve analysis was conducted to determine the trade-off value in the relationship between the combination of images and the contribution rate of image observations. The optimal trade-off value was determined using the Youden index from those with a contribution rate of image observation of 50% or more. Results In Experiment 1, the combination of FP, IP, LC, and PR showed the highest contribution rate of image observations (93%), except when all five image types were selected. IP was included in the top 16 with the highest contribution rates of the image observations.In Experiment 2, the optimal trade-off value was obtained when the combination of IP and LC was selected (contribution rate = 80%). Conclusion By analyzing the trade-off between the contribution rate of image observations and the number of imaging types used in orthodontic diagnosis, the intraoral photograph and lateral cephalogram were selected as the minimum combination of imaging types to make an orthodontic diagnosis in an efficient manner.

Keywords : Orthodontics, Diagnosis

092-2: Alveolar bone density evaluations in child odonto-hypophosphatasia patients using orthopantomography

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Background: Hypophosphatasia (HPP) is a skeletal disease characterized by impaired bone mineralization and premature loss of primary teeth. The mildest form is odonto-type HPP, which features dental complications without bone symptoms and is found in all ages. Odonto-type HPP occasionally shifts to childhood- or adult-type HPP along with bone symptoms as the patient ages, thus long-term follow-up examinations of those affected are important. The present study evaluated alveolar bone density in child patients with odonto-type and compared the results to those noted in healthy children.
Methods: The study protocol was approved by the Osaka University Graduate School of Dentistry ethics committee (no. H29-E26-7, R1-E42). Healthy (n=160) and odonto-type HPP (n=11) child patients who visited our clinic for oral management were invited to participate in this study when orthopantomography was required as part of their treatment. Ages ranged from 2-13 years and they were classified into four age groups (2-4, 5-7, 8-10, 11-13 years; n=40 each). Examination findings were used for analysis of alveolar bone density, defined according to pixel values and corrected by brightness shown by an indicator applied to the orthopantomographic device. The measurement site was manually placed on the distal side of the second mandibular premolar root or primary second mandibular molar.
Results: Comparisons indicated that bone density for the healthy children was not significantly different from that of the odonto-type patients regardless of age. However, greater than 55% of the odonto-type in each age group showed bone density below the mean value for the healthy children.
Conclusion: The present results indicate that odonto-type HPP patients may not have abnormalities in alveolar bone. However, the majority of those showed alveolar bone density below the reference value for healthy children, thus it is necessary to monitor for appearance of bone symptoms in follow-up examinations.

Keywords : hypophosphatasia, odonto type, orthopantomography, alveolar bone density

093-1: MCTP2 induced epithelial mesenchymal transition and invasion via TGFb1 in oral squamous cell carcinoma

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Objectives Oral squamous cell carcinoma (OSCC) is marked by significant local invasion and a high risk of lymph node metastasis, both linked to poor prognosis. This underscores the need for novel molecular markers to improve treatment and predict outcomes. Multiple C2 transmembrane protein 2 (MCTP2), part of the C2 domain-containing protein family, has been associated with various diseases. However, its role in cancer, particularly OSCC, remains unclear. This study aims to clarify the relationship between OSCC and MCTP2.

Method This study conducted comprehensive analyses, including big data examination, expression profiling of 63 OSCC samples, and in vitro functional assessments, to investigate the roles of MCTP2 in OSCC. Functional studies using multiple OSCC cell lines were performed to evaluate the impact of MCTP2 on migration and invasion capabilities. Additionally, we explored the interaction between MCTP2 and TGFB1, a well-known inducer of epithelial-mesenchymal transition (EMT).

Results Bioinformatic analysis of publicly available datasets suggested a positive correlation between MCTP2 expression and the TGFB pathway in OSCC. Immunohistochemistry and mRNA expression analyses of patient samples revealed significantly higher MCTP2 expression in cases with lymph node metastasis or high-grade invasion patterns compared to those without metastasis or with low-grade invasion patterns. In vitro analysis showed that MCTP2 knockdown in OSCC cell lines suppressed migration and invasion, accompanied by an increase in CDH1 (E-cadherin) expression. Conversely, EMT regulators (e.g., Snail1, Vimentin) and matrix metalloproteinases were downregulated following MCTP2 knockdown. Additionally, MCTP2 expression was found to increase in a dose-dependent manner upon TGFB1 stimulation.

Conclusion These findings strongly support the role of MCTP2 in promoting metastasis and invasion in OSCC and suggest the potential for novel therapies aimed at suppressing MCTP2 overexpression. Further research is warranted to explore the restoration of aberrant MCTP2 function as a possible treatment strategy.

Keywords : Oral squamous cell carcinoma, MCTP2, migration, invasion, TGFb1

094-2: Combined effects of butyrate and calcitriol on oral host cells

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Objectives: Butyrate is one of the major pathogenic factors in periodontitis. We have previously reported that butyrate inhibits the proliferation of oral host cells. Since butyrate can be detected in the oral cavity even in healthy individuals, oral host cells may be continuously influenced by butyrate. On the other hand, calcitriol (activated vitamin D) is known to have several positive effects on host skin cells, such as enhancing barrier function and promoting turnover. Furthermore, calcitriol is reported to reduce tumor progression and metastasis. The aim of this study was therefore to investigate whether calcitriol counteracts the inhibitory effect of butyrate on oral normal and cancer cells.

Methods: HaCaT (normal epithelial cells) and HSC-2 (oral squamous cell carcinoma cells) were used in this study. The effects of butyrate (2.5, 5, 10 mM) and calcitriol (0.1, 0.5, 1.0 μM), alone or in combination, on the proliferation of these cells were evaluated by counting cells after 4 days culture in each medium (DMEM with 10% FBS) with/without butyrate and calcitriol.

Results: In both cells, butyrate alone inhibited the proliferation in a concentration-dependent manner. Calcitriol alone also tended to inhibit proliferation. On the other hand, when calcitriol added to cell culture in the presence of butyrate, the butyrate-induced inhibition of cell proliferation was relieved in a concentration-dependent manner. When a high concentration of calcitriol (1.0 μM) coexisted with a low concentration of butyrate (2.5 mM), the butyrate-induced inhibition on cell proliferation was almost completely relieved.

Conclusions: These results suggest that calcitriol may contribute to the recovery of periodontal tissue damage caused by butyrate and the maintenance of oral health. On the other hand, the inhibitory effect of butyrate on oral cancer may also be reduced, so further investigation is required.

Keywords : Carcitriol, Periodontitis, Oral Cancer, Cell proliferation

095-1: Comparative analysis of zoledronic acid administration routes and periodontitis on the development and severity of bisphosphonate-related osteonecrosis of the jaw in mice

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Obejctive: the aim of this study was to compare the effects of different routes of zoledronic acid administration and the presence or absence of periodontitis on the development and severity of BRONJ.
Materials and Methods: Female C57BL/6J mice (7 weeks old) received zoledronic acid intraperitoneally or intravenously twice weekly for two weeks, followed by ligature-induced periodontitis (LIP) on the second molar. Treatment continued for six weeks. Control mice received NaCl. Four weeks post-LIP, teeth were extracted, and gingival tissue from the socket was analyzed for pro-inflammatory cytokines and bacterial counts. Maxillae were histologically examined, including TRAP, ALP staining for osteoclast activity, and TUNEL staining for apoptosis. Primary bone marrow was also harvested, differentiated into osteoclasts, and analyzed via TRAP staining in vitro.
Results: Intravenous zoledronic acid administration resulted in incomplete healing, increased bacterial counts, and elevated levels of Il6 and Il17 mRNA expression compared to controls and the intraperitoneal zoledronic acid group. TRAP and ALP staining revealed increased osteoclast activity and bone formation in the alveolar bone of the intraperitoneal and intravenous group. TUNEL staining indicated higher apoptosis in these groups. In vitro, osteoclasts from intravenously and intraperitoneally treated mice with zoledronic acid showed decreased TRAP-positive areas compared to controls.
Conclusion: The route of zoledronic acid administration significantly impacts LIP-related BRONJ, with intravenous administration linked to more severe cases than intraperitoneal, highlighting the critical role of administration route and LIP presence in BRONJ risk and severity.

Keywords : Bisphosphonate, Zoledronic acid, Osteonecrosis, Apoptosis

096-2: Primary Human Oral Cancer Organoid-Derived Air-Liquid Interface Cultures: A Novel Model for Studying Oral Squamous Cell Carcinoma Invasion

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Invasion of oral squamous cell carcinoma (OSCC) significantly impacts patient prognosis, with invasive tumours associated with poor survival rates and increased risk of metastasis. Despite its critical role in disease progression, our understanding of OSCC invasion has been limited by the lack of physiologically relevant models that accurately recapitulate this process. Current in vitro models often fail to capture the complexity of the tumour microenvironment, while animal models may not fully reflect human disease characteristics. Here, we developed primary human oral cancer organoid-derived air-liquid interface (ALI) cultures, which serve as a physiologically relevant model to successfully recapitulate invasion in human tissue. This innovative approach allows us to study the complex interactions between cancer cells and their microenvironment in a controlled, three-dimensional setting. Our ALI culture system maintains the cellular heterogeneity and structural organization of the original tumour, providing a more accurate representation of OSCC behaviour in vivo.Using this model, we observed distinct invasion patterns and identified key molecular drivers of OSCC progression. Time-lapse imaging revealed dynamic cell-cell and cell-matrix interactions during the invasion process. Furthermore, we found that the tumour microenvironment significantly influenced invasion rates and directionality, highlighting the importance of stromal components in OSCC progression.In conclusion, our primary human oral cancer organoid-derived ALI culture provides a robust and physiologically relevant model for investigating OSCC invasion. This approach bridges the gap between traditional in vitro methods and in vivo studies, paving the way for more accurate preclinical testing and improved understanding of OSCC pathogenesis.

Keywords : OSCC, tumor organoid, air-liquid interface culture, invasion, metastasis

097-1: Single-nucleotide polymorphisms in *FTO*, *GNL3*, and *DOT1L* could be associated with the development of temporomandibular joint osteoarthritis: Clinical and *in silico* study

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Purpose:
This study investigates the potential associations between temporomandibular joint osteoarthritis (TMJOA) and single-nucleotide polymorphisms (SNPs) previously demonstrated to contribute to limb osteoarthritis (OA) and OA-related diseases.
Methods:
Clinical examinations using DC/TMD, MRI tests, and genome collection were performed on 354 patients who visited the Osaka University Dental Hospital with symptoms of temporomandibular disorders. Patients were classified into TMJOA and non-TMJOA groups based on MRI tests. In addition, microarray genotyping was carried out for 16 candidate SNPs in the limb OA-related genes. Multivariate analysis utilizing a generalized linear mixed model constructed with Bayesian modeling was conducted to examine the relationships between the presence of TMJOA with the following explanatory variables: age, sex, positional disc abnormalities, dynamic disc abnormalities, and each genomic allele of the 16 SNPs. The SNPs in linkage disequilibrium with the detected TMJOA-related SNPs were explored using the jMorp database. We also performed *in silico* prediction with the programs SpliceAI and ESEfinder to investigate their potential pathogenicity.
Results:
Four SNPs in the *FTO*, *GNL3*, and *DOT1L* genes and an intergenic region were detected as risk alleles for TMJOA by the multivariate analysis. Among the identified SNPs, an intronic SNP (rs8044769) in the *FTO* gene showed a significant association with the disease between homozygous alleles. Using the jMorp database, we identified nine mutations showing strong linkage disequilibrium with rs8044769. *In silico* analyses employing ESEfinder and SpliceAI suggested that, rather than the rs8044769 mutation itself, a co-occurring mutation rs8047395 may strongly affect mRNA splicing in the *FTO* gene.
Conclusion:
We newly identified SNPs involved in the development of TMJOA and found that these mutations may affect mRNA splicing, potentially contributing to the pathogenesis. This study provides significant insight into novel pathogenic mechanisms involving genetic factors.

Keywords : temporomandibular joint osteoarthritis, SNP, genetic factor, in silico analysis, multivariate analysis

098-2: YAP/TAZ hyperactivation enhances PD-L2 transcription to promote immune evasion of oral squamous cell carcinoma

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The Hippo pathway and its downstream YAP/TAZ are aberrantly regulated in cancers. We have clarified that genetic alterations induce dysregulation of the Hippo pathway and YAP/TAZ hyperactivation, thereby promoting proliferation of oral squamous cell carcinoma (OSCC). Immune checkpoint inhibitor (ICI) has emerged as a novel therapeutic option. PD-L1 or tumor mutational burden (TMB) are clinically used as predictive markers for the ICI therapy. However, the effect of ICI is still limited due to unknown mechanisms. In that point, the relation between the dysregulated Hippo pathway and cancer immune evasion remains unclear. We aim to clarify the novel mechanism by which dysregulation of the Hippo pathway induces immune evasion of OSCC.Database of cancer cells and tissues was analyzed. RNA-seq, exome-seq, in vivo xenograft, T cell killing assay using human OSCC cells were performed. Database analysis revealed that the patients harboring genetic alterations related to the Hippo pathway showed better response to ICI therapy. In vivo, YAP/TAZ-hyperactivation inhibited differentiation, suggesting genome instability. Transcriptional and genomic analysis revealed that YAP/TAZ-hyperactivation reduced differentiation-related genes and increased in TMB. Next, database of cancer cells and tissues showed that PD-L2 expression enriched YAP/TAZ-targeted gene sets. We focused on PD-L2 showing a higher affinity to PD-1 than that of PD-L1. Mechanistically, YAP/TAZ gathered TEAD, BRD4, and RNA polymerase II onto the super-enhancer and promoter regions of PD-L2, enhancing PD-L2 expression in OSCC. Additionally, PD-L2 activates Stat3, thereby enhancing PD-L1 transcription. T cell killing assay showed that YAP/TAZ-hyperactivated cells recruited cytotoxic T cells closer but also evaded them through PD-L2. We demonstrated that YAP/TAZ recruit cytotoxic T cells via TMB but evade them through enhancing PD-L2. YAP/TAZ hyperactivation could serve as a better predictor for stratifying patients undergoing ICI therapy. Targeting YAP/TAZ/TEAD could offer a promising treatment avenue for cancers harboring YAP/TAZ hyperactivation.

Keywords : Hippo, YAP/TAZ, Oral squamous cell carcinoma, PD-L2, immune evasion

099-1: Roles of TEAD1 during orthodontic tooth movement in rats

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Objectives: The function of the Hippo signaling pathway in orthodontic tooth movement (OTM) has not been fully elucidated, despite its critical function in mediating mechanotransduction. This study aimed to investigate the expression pattern of TEA domain family member 1 (TEAD1), a transcription factor of the Hippo pathway, in rat periodontal tissue during OTM of maxillary first molars (M1), and to analyze its role in osteoblast differentiation of periodontal ligament (PDL) cells. Methods: Eighteen 8-week-old male Sprague-Dawley rats were subjected to OTM for 1, 7, and 14 days (n = 6 per group). Immunohistochemical (IHC) staining was performed to detect the expression of TEAD1, yes-associated protein (YAP), transcriptional coactivator with PDZ-binding motif (TAZ), and runt-related transcription factor (RUNX2) on the compression side and the tension side in periodontal tissues of M1. PDL cells were isolated from extracted rat maxillary M1, and Tead1 gene expression was suppressed using the small interfering RNA (siRNA). Reverse transcription-quantitative polymerase chain reaction (RT-qPCR), alkaline phosphatase (ALP) staining, and 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assays were performed to evaluate the role of TEAD1 in osteoblast differentiation and proliferation. Results: The highest TEAD1 expression was observed on the compression side in PDL of M1 on day 7, which was consistent with the expression patterns of YAP and TAZ. The highest RUNX2 expression was observed on the tension side of M1 on day 7. A significant increase in the mRNA expression of Tead1, Yap, and Taz was observed after 3 days of culture in the osteogenic differentiation medium, which started to diminish after 7 days. Suppression of Tead1 gene expression in PDL cells resulted in a significant increase in Runx2 mRNA expression and ALP activity, however cell proliferation decreased significantly. Conclusions: YAP/TAZ-TEAD1 axis may be involved in the regulation of osteoblast differentiation during the early stages of OTM.

Keywords : TEAD1, orthodontics tooth movement

100-2: bFGF affects human periodontal ligament fibroblasts during orthodontic tooth movement

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Orthodontic treatment enables tooth movement through bone remodeling. However, the mechanisms of root resorption in orthodontic treatment remain largely unexplained. Therefore, we investigated the effects of basic fibroblast growth factor 2 (bFGF, FGF2) and mechanical stress simulating orthodontic treatment on human periodontal ligament fibroblasts (HPdLFs), focusing on cementoblast and osteoblast differentiation markers, to examine the potential of bFGF in the prevention of root resorption. The effect of bFGF and mechanical stress (applied for 24 hours using a centrifuge to simulate orthodontic compressive force) was evaluated on HPdLFs (Lonza). Changes in each marker were assessed using real-time PCR (n = 4) and western blotting (n = 3). Furthermore, the effect of bFGF on the mineralization of HPdLFs was assessed at 3 and 5 weeks using Alizarin Red S staining (n = 4). Statistical analysis was performed using Student´s t-test and one-way ANOVA followed by Tukey´s test.bFGF did not alter the expression of *FGF-2* or its receptors (*FGFR1* and *FGFR2*), but it increased the expression of *RUNX2* and *CEMP1*. HPdLFs exposed to mechanical stress had significantly reduced *FGF-2* expression and increased *FGFR1* expression. *CEMP1, CAP, GLUT1, RUNX2*, and *ALP* expression were significantly reduced. When bFGF was added to HPdLFs under mechanical stress, *FGF-2* expression remained unchanged, but *FGFR1* expression significantly increased. No changes were observed in osteoblast differentiation markers, while *CEMP1, CAP*, and *GLUT1* expression significantly increased. FGFR1 was significantly upregulated at the protein level, while cementoblast differentiation markers showed an upward trend. Mineralization showed no noticeable changes at 3 weeks. However, at 5 weeks, considerable mineralization was observed in the group where bFGF was continuously added under mechanical stress. These findings indicate that bFGF may prevent or suppress root resorption in orthodontic treatment.

Keywords : bFGF, FGF-2, orthodontic

101-1: Exacerbating Orthodontic Tooth Movement in Mice with Salt-Sensitive Hypertension

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[Objective] Orthodontic tooth movement (OTM) involves the resorption of alveolar bone on the compression side and the formation of new bone on the tension side. With evolving lifestyles, hypertension has become a significant systemic condition that must be considered during orthodontic treatment. Our previous research has highlighted the negative impacts of salt-sensitive hypertension (SSHTN) on bone health. This study aims to delve into how SSHTN affects OTM processes. **[Materials and Methods]** We generated SSHTN mice model by post-N^{ω}-nitro-L-arginine methyl ester hydrochloride (L-NAME) high-salt challenge. A Ni-Ti closed coil spring was fixed between maxillary left first molar and incisors as OTM mice model to move the first molar in the mesial direction. Maxillae were subjected to micro-computed tomography to evaluate the level of OTM. The number of osteoclasts on the compression side was evaluated by TRAP staining. **[Results and Discussion]** Following a 2-week regimen of L-NAME treatment, followed by a 2-week washout period and a subsequent 3-week high-salt diet, the mice developed hypertension. This regimen led to a significant increase in systolic blood pressure compared to untreated controls. The distance of tooth movement was notably greater in SSHTN mice compared to those on a normal diet. The increase in tooth movement was accompanied by enhanced osteoclast formation on the compression side. The observed acceleration in tooth movement in SSHTN mice, with statistical significance (n=4/group, $P<0.05$), is likely due to elevated systemic inflammatory mediators, which promote increased osteoclast activity during OTM. These findings suggest that SSHTN exacerbates tooth movement by influencing bone resorption processes, potentially requiring specialized orthodontic management for patients with this condition. **[Conclusion]** Our research revealed that mice with SSTHN accelerated orthodontic tooth movement compared to normal mice, underscoring the need for customized orthodontic strategies for hypertensive patients.

Keywords : Orthodontic tooth movement, Hypertension, Osteoclast

102-2: Neural tissue engineering using dental pulp stem cell constructs

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Objectives: Peripheral nerve injury is often difficult to spontaneously heal, and the injury site could be treated with autologous nerve and neuroprosthesis. However, these approaches fail to regenerate functional nerve fibers. Recently, we revealed that three-dimensional (3D) cell constructs composed only of dental pulp stem cells (DPSCs) could be fabricated by using thermo-responsive hydrogel. Taking into account that DPSCs are capable of differentiation into neural cells, we hypothesized that novel cell-based biomaterials for nerve regeneration could be fabricated by neural induction of DPSCs constructs. In this study, we attempted to induce neural differentiation of DPSCs constituting the 3D cell constructs. Methods: The 3D DPSC constructs were prepared using thermo-responsive poly-N-isopropylacrylamide gels. DPSC constructs were cultured with neurogenic differentiation medium for up to 20 days. The size alterations of construct were quantified via stereoscopic images. After 5, 10, and 20 days of neural differentiation, DPSC constructs were processed for the live/dead staining, hematoxylin-eosin (HE) staining, Nissl staining, and immunofluorescence staining. Expression of neural differentiation markers in DPSCs constituting the constructs was evaluated by using real-time PCR. For electrophysiological analysis, action potential was recorded by whole-cell patch clamp in DPSCs after 20 days of differentiation. Results: The long axis of DPSC constructs decreased to approximately 50% at day 20, however the rod-shaped morphology was maintained after neural differentiation. Histological analyses revealed that DPSC constructs showed loose structure at day 5 and gradually increased density by day 20. In addition, DPSCs within the construct maintained viability and expressed neural markers. Electrophysiological analysis demonstrated that DPSCs constituting the construct formed voltage-dependent potassium and sodium channels after neural differentiation. Conclusions: These results demonstrated that neural differentiated cell constructs could be fabricated by using DPSCs. This 3D DPSC construct could be useful as a cell-based biomaterial for nerve regeneration.

Keywords : dental pulp stem cells, cell construct, cell differentiation, nerve regeneration

103-1: A New 3D Culture Model for Bone Regeneration with Controlled Morphology

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Background: Being derived from bone marrow mesenchymal stem cells (BMSCs), "highly purified osteoprogenitors" (HipOPs) have shown to be a promising candidate for studying bone organ regeneration in murine models. However, the morphology of bone formed by HipOPs needs to be further controlled for proper integration within well-organized host bone. In this study, inspired by the interactions between osteoblasts (OBs) and BMSCs, a 3D model was developed to direct the bone formation morphology. Materials and methods: HipOPs were first differentiated into a monolayer of OBs on collagen gel. Subsequently, the OB layer was co-cultured with a HipOP-seeded gelatin sponge in a perforated Poly Lactidecoglycolide (PLGA) tubular scaffold to allow cell communication. The models were then transplanted subcutaneously into immunodeficient mice to investigate the ability of in vivo bone formation. All experiments were repeated independently three times, and the data were reported as the means and standard deviations. Results: In vitro studies showed that the OBs produced signaling molecules that significantly upregulated osteogenesis-related genes in the HipOP population (Student's t-test, P-values less than 0.05). Furthermore, the osteogenic differentiation of HipOPs in the sponge depended on signal concentration, with a higher response in the area near the OB layer. Eight weeks after the in vivo transplantation, HipOP-seeded sponges formed bone organs with only a layer of cortical bone where they contacted the OB layer, and from there, bone density gradually decreased in the form of spongy bone filled with bone marrow tissue. Conclusion: The 3D culture models have successfully generated hierarchically structured bone organs, which would offer an advantage in reconstructing well-integrated bone in defective regions without the remodeling process. All experiments were performed according to the guidelines related to animal care of Osaka University Graduate School of Dentistry (AD-R-01-011-0). This study was supported by JSPS KAKENHI Grant Numbers: 23K16021 and 24K026200.

Keywords : bone organ regeneration, paracine signaling, 3D culture, bone morphology, mesenchymal stem cells

104-1: Bioactivity of PDGF-BB on bone marrow-derived mesenchymal stem cells

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Growth-factor enhanced matrix containing platelet-derived growth factor (PDGF-BB) has been clinically applied to treat periodontally related defects. Previous studies have shown that PDGF-BB treated rat femoral bone marrow-derived mesenchymal stem cells (MSCs) exhibit high osteogenic differentiation and PDGF-BB treated human iliac bone marrow-derived and rabbit femoral bone marrow-derived MSCs exhibit high migration. The characteristics of mandibular bone marrow-derived MSCs (MBMSCs) are clearly different from other tissue-derived MSCs. Therefore, the effects of PDGF-BB on MBMSCs may differ from those of other MSCs, but there are no studies that have evaluated the bioactivity of PDGF-BB on MBMSCs. The purpose of this study is to clarify how PDGF-BB affects the function of MBMSCs. With the approval of the Ethical Review Committee of Kagoshima University (Ethical Review Committee Approval Number: 170263), bone marrow fluid was collected from the implantation fossa formed during the primary surgery for implant placement in the mandible from three patients consented to this study, and MBMSC was cultured. The proliferative, osteogenic differentiation, and migratory response of human MBMSCs to PDGF-BB were investigated. The effect of PDGF-BB on intracellular signaling in MBMSCs was evaluated. The results showed that PDGF-BB did not affect proliferative and osteogenic abilities of MBMSCs. However, PDGF-BB strongly promoted cell migration. Akt inhibitor, LY294002, markedly inhibited the migratory response of MBMSCs to PDGF-BB. Girdin phosphorylation was observed in PDGF-BB stimulated MBMSCs. We found that PDGF-BB-induced promotion of MBMSC migration may be mediated through the Akt-Girdin pathway. Until now, PDGF-BB was considered advantageous for angiogenesis and osteoblast differentiation in the treatment of periodontally related defects. This study suggests that MBMSC migration may also be involved in the treatment of periodontally related defects by PDGF-BB.

Keywords : mesenchymal stem cells, cell migration, platelet-derived growth factor, Akt, Girdin

105-1: Exosomes from iPS-Derived PDL Cells Promote Osteogenic and Anti-Inflammatory Properties

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Objectives Periodontal ligament (PDL) cells and their exosome are a promising source for periodontal tissue regenerative therapy. However, the high invasiveness of harvesting PDL cells is a major challenge for their practical application. To tackle this issue, we considered the use of induced pluripotent stem (iPS) cells. We have already established iPS-derived PDL (iPS-PDL) cells by culturing with supernatant of PDL cells. Objective of this study was to investigate the biological functions of exosomes from iPS-PDL cells. Methods Exosomes were isolated from conditioned medium of iPS-PDL cells by size-exclusion chromatography and characterized by nanoparticle tracking analysis, transmission electron microscopy and nano flow-cytometory. Exosomes were fluorescently labeled using the lipid bilayer fluorescent dye and PDL cells were cultured with the labeled exosomes for 4 h.Osteogenic and anti-inflammatory potentials of iPS-PDL exosomes were evaluated by adding different concentrations (0, 0.25, 0.5 and 1 μg protein/mL) of iPS-PDL exosomes to PDL cells and RAW264 cells, respectively. Results Characterization of iPS-PDL exosomes revealed typical exosome morphology and size distribution and concentration besides positive markers (CD9 and CD63). Treatment with iPS-PDL exosomes enhanced the proliferation and migration of PDL cells compared to the control ($p<0.05$). Exosomes with red fluorescence were observed within the cytoplasm, suggesting successful exosome internalization into the PDL cells. Osteogenic markers evaluated by RT-qPCR were upregulated with exosome treatment in a dose-dependent manner in PDL cells ($p < 0.05$). Alizarin red staining at 14 days revealed robust mineralization of PDL cells by the treatment of exosomes (0.5 and 1 μg/ml). The exosome treatment reduced nitric oxide production and pro-inflammatory gene expression of RAW 264 cells treated with LPS and IFN-γ in a dose-dependent manner ($p < 0.05$). Conclusions These findings demonstrate that iPS-PDL exosomes exhibits potent effects on osteogenesis and anti-inflammatory for periodontal regeneration.

Keywords : Exosome, Regeneration, Osteogenesis, Anti-inflammatory, Cell

106-2: Pathological JAG1-NOTCH-TGFB3 pathway is crucial for abnormal skeletal development in Alagille syndrome

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Objectives: Alagille syndrome (AGS) is an autosomal dominant genetic disorder caused by a single gene mutation in *jagged canonical Notch ligand 1 (JAG1)* predominantly or in its receptor gene, *NOTCH receptor homolog 2 (NOTCH2)* rarely, resulting in multiple organ disorders, such as liver. The skeleton abnormality is clinically manifested as characteristic facies. Transforming growth factor (TGFB) signals are indispensable for regulating craniofacial bone development and skeletal patterning. However, the pathogenic mechanisms of abnormal skeletal development in AGS remains unknown. In this study, we investigate how abnormal JAG1-NOTCH-TGFB signaling modulates the skeletal disorder in AGS. **Methods:** We isolated stem cells from human exfoliated deciduous teeth of JAG1 mutated AGS and healthy donors, AGS-SHED and CONT-SHED. We then analyzed calcified nodule formation and osteoblast-specific gene expression in AGS-SHED and CONT-SHED by Alizarin red-O staining and quantitative reverse transcription and polymerase chain reaction under *in vitro* osteogenic condition. We further analyzed the ligands and receptors of TGFB signaling and the associated signal pathways in AGS-SHED and CONT-SHED by Western blot analysis. We also analyzed the effect of TGFB type 3 (TGFB3) on AGS-SHED under osteogenic condition. **Results:** AGS-SHED exhibited mesenchymal stem cell characteristics. AGS-SHED showed abnormal JAG1-NOTCH signaling. AGS-SHED showed less osteogenic differentiation capacity in vitro than CONT-SHED as indicated by less calcified nodule formation and reduced osteoblast-specific gene expression. AGS-SHED expressed the increased TGFB receptor type 2 (TGFBR2) and reduced TGFB3 but the similar TGFBR1, TGFB1, and TGFB2 compared to CONT-SHED. AGS-SHED suppressed the phosphorylated level of AKT, but not that of SMAD2 and SMAD3. AGS-SHED also showed the increased expression of Forkhead box protein A1 compared to CONT-SHED. Furthermore, TGFB3 treatment restored the suppressed osteogenic potency of AGS-SHED. **Conclusions:** Taken together, these findings suggest that the abnormal JAG1-NOTCH-TGFB3 pathway is a crucial pathological mechanism of skeletal disorder in AGS.

Keywords : Alagille syndrome, Human exfoliated deciduous pulp stem cell, Transforming growth factor 3, Bone formation

107-1: Peripheral clock gene, *Npas2* in BMSC maintenance and bone regeneration

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It has been reported that circadian clock genes optimize cell proliferation and differentiation in stem cell populations during wound healing. We have previously identified that a circadian clock molecule neuronal PAS domain 2 (*Npas2*) played a critical role in skin wound healing (Sasaki et al. 2018). The objective of this study was to characterize the bone marrow stromal cell (BMSC) maintenance by *Npas2 in vitro* and investigate the role of *Npas2* during wound-induced bone regeneration *in vivo*. Stemness marker gene (*Nanog* and *Klf4*) expression and cell proliferation ability of BMSCs with WT and *Npas2* KO were evaluated by real time RT-PCR and WST-1 cell proliferation assay, respectively. *in vitro* osteogenic differentiation of BMSCs with WT and *Npas2* KO were determined by alkaline phosphatase (ALP) staining. Mouse calvarial bone defect were created in C57B6/J (WT), *Npas2* KO mice, and bone regeneration in the defect was assessed by histology (HE staining) and μCT analyses. *Npas2* KO BMSCs showed significantly higher stemness marker gene expression and proliferative activity than WT (ANOVA; $P<0.05$). After culturing in growth medium for 3 weeks, *Nanog* and *Klf4* gene expression of *Npas2* KO BMSCs were significantly higher than WT (ANOVA; $P<0.05$). *Npas2* down regulation enhanced ALP activity of BMSCs after osteogenic differentiation. At the 4th week, the accelerated new bone formation was observed in *Npas2* KO mice, and the bone volume in the defect of *Npas2* KO mice were larger than WT mice. These results suggest that peripheral clock gene *Npas2* KO enhances and maintains the stemness of BMSC in vitro and plays a role in regulating bone regeneration *in vivo*. These findings represent an important step toward the therapeutic application of controlling peripheral circadian rhythm to alveolar bone regenerative medicine.

Keywords : Clock gene, BMSC

108-2: Effect of CD10-positive cells on the osteogenic differentiation of human maxillary/mandibular bone marrow-derived mesenchymal stem cells

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Objective: Maxillary/mandibular bone marrow-derived mesenchymal stem cells (MBMSCs) are a heterogeneous cell population, and their osteogenic potential varies among different cell lines. However, the relationship between the characteristics of these cell populations and their osteogenic potential remains unclear. This study aims to investigate the effect of CD10-positive cells within the MBMSC population on osteogenic differentiation. Design: CD10 expression in iliac bone marrow-derived MSCs (IBMSCs), MBMSCs, and gingival fibroblasts (GFBs) was measured by flow cytometry. Osteogenic potential of 19 MBMSC lines was evaluated, and based on the degree of osteogenic potential, they were classified into two groups: the high osteogenic differentiation group (OS-High) and the low osteogenic differentiation group (OS-Low). The percentage of CD10-positive cells in each group was then compared. Effect of co-culturing GFBs and CD10-positive cells on the osteogenic differentiation ability of MBMSCs was also assessed. Tissue inhibitor of metalloprotease-1 (TIMP-1) expression in OS-High MBMSCs and OS-Low MBMSCs was measured by quantitative real-time polymerase chain reaction (RT-PCR), western blotting, and ELISA. Furthermore, the molecular mechanisms underlying the regulation of osteogenic differentiation in MBMSCs were investigated. Results: CD10 was not expressed in IBMSCs, but was highly expressed in GFBs. In MBMSCs, the CD10 positivity rate varied greatly between cells, and MBMSCs with a high CD10 positivity rate showed low osteogenic differentiation potential. Co-culture with fibroblasts or CD10-positive cells reduced the osteogenic differentiation potential of MBMSCs. TIMP-1 was highly expressed in CD10-positive cells, and OS-Low MBMSCs showed significantly higher TIMP-1 expression compared to OS-High MBMSCs. It was revealed that β-catenin signaling was suppressed in OS-Low MBMSCs. Conclusion:It was found that CD10-positive cells within the MBMSC population could be an important factor in regulating osteogenic differentiation. This finding provides important insights for the development of bone regeneration therapies using MBMSCs.

Keywords : mesenchymal stem cells, CD10, TIMP-1

109-1: Potential of dental pulp cells in periodontal ligament regeneration

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Objectives: Dental pulp stem cells are expected to be utilized in regenerative medicine, including periodontal ligament regeneration. However, dental pulp stem cells constitute only a small fraction of dental pulp (DP) cells. In this study, we aimed to investigate the potential of converting the entire population of DP cells into periodontal ligament (PDL)-like cells. We analyzed the differences in gene expression between DP cells and PDL cells using RNA-seq and evaluated the differentiation potential of DP cells into PDL-like cells when cultured in PDL-cultured supernatant. Methods: DP and PDL cells were harvested from the molars of individuals aged 19-23 years. The cells were divided into three groups for culturing: Group 1 - DP cells only, Group 2 - PDL cells only, and Group 3 - DP cells cultured in PDL-cultured supernatant. Comprehensive analysis was performed using RNA-seq. Results: In the analysis of differentially expressed genes (DEGs), keratin 14 exhibited a significant expression change between PDL and DP cells ($n=4$, $p < 0.05$, Wald test), but no change was observed between PDL cells and DP cells cultured in PDL-cultured supernatant. Conclusions: These findings suggest that DP cells cultured in PDL-conditioned medium, which contains the epithelial cell rests of Malassez expressing keratin 14, may be induced to differentiate into periodontal ligament-like cells.

Keywords : dental pulp cell, periodontal ligament cell

110-2: Efficient Fabrication of Human Induced Pluripotent Stem Cells-derived Osseous-like Constructs

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Objectives: Induced pluripotent stem cells (iPSCs) exhibit unlimited proliferation and multiple differentiation potentials, thus expected to be promising candidates for regenerative therapy. Three-dimensional (3D) scaffold-free osteogenic constructs from iPSCs showed bone regeneration capacity, which represented effective technology for bone regeneration. However, there are no standard protocols for osteogenic induction of 3D iPSCs. Our group succeeded to establish the mesodermal induction protocols to fabricate the feeder-free human iPSCs (hiPSCs)-derived mesodermal spheres previously. The objective of this study is to establish the efficient osteogenic induction method from hiPSCs-derived mesodermal spheres by optimizing the culture conditions. **Methods**: hiPSCs were incorporated in ultra-low attachment micro-space culture plates to produce the mesodermal spheres. Subsequently, these mesodermal spheres were subjected to shaking culture and maintained in osteogenic induction medium for 30 days. The hiPSCs-derived osseus-like constructs was evaluated by gene expressions and histological analysis. **Results**: The hiPSCs-derived spheres transferred to a shaker flask by 110 spheres or more/mL showed significantly higher osteogenic gene expressions of Osteocalcin and SP7/Osterix. The culture condition was further subjected to retinoic acid (RA) and simvastatin (ST) treatment, an essential signaling molecule for bone regeneration, for efficient osteogenic induction. As a result, RA treatment for 20 days followed by ST treatment for 10 days showed mineralization of spheres and enhanced osteogenic gene expressions. **Conclusions**: These results suggested that our osteogenic induction method with optimized sphere numbers and RA/ST treatment efficiently fabricated osseous-like construct from hiPSCs, which may provide a promising strategy for bone regeneration therapy.

Keywords : Induced pluripotent stem cells (iPSCs), Bone regeneration, Culture method

111-1: A Model for Analyzing Pulpal Cellular Dynamics After Cavity Preparation

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Dynamic cellular changes, including cell proliferation and apoptosis, have been observed in dental pulp after dental cavity preparation (DCP). We previously showed that cellular senescence is involved in cellular dynamics following DCP. However, studies on the effects of DCP conditions, such as direction and depth, for pulpal cellular dynamics remain scarce. In this study, we aimed to establish a repeatable experimental model of pulpal cellular dynamics following DCP. The hard tissue thickness of the upper first molars (M1) was measured in rats using micro-computed tomography (μCT) in two directions: (1) occlusal and (2) mesial. Cavities were prepared on the mesial surfaces of M1 (approval numbers: 23-01019, 24-02015) and classified into two groups: (3) shallow (superficial layer of dentin) and (4) middle (middle layer of dentin) using μCT. TUNEL and p14 immunofluorescence staining, which are closely associated with apoptosis and cellular senescence, were performed in the shallow and middle groups. Additionally, the middle group underwent TUNEL and p14 staining at 1 h, 6 h, 1 d, 3 d, and 7 d after DCP. μCT showed that the occlusal treatment exhibited wider variation in hard tissue thickness than the mesial treatment. TUNEL and p14-positive cells were rarely observed in the shallow group, whereas a significant increase was noted in the middle group. Spatiotemporal analysis showed that TUNEL-positive cells were transiently present within odontoblasts (ODB) at 1 h and decreased drastically. p14 was highly expressed in ODBs at 1 h, suppressed by 6h, and reexpressed from day 3 onward after DCP. This study suggests that DCP from the mesial direction to the middle layer of dentin may provide a stable analysis of cellular dynamics within the dental pulp. This model contributes to elucidating the mechanisms of pulpal cellular dynamics, including apoptosis and cellular senescence, after DCP.

Keywords : cavity preparation, cellular dynamics, apoptosis, senescence, odontoblast

112-2: Identification of a dental pulp stem cell population essential for reparative dentin formation.

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Objective: The aim of this study was to identify a dental pulp stem cell population that contribute to the formation of reparative dentin.

Materials and Methods: Single-cell RNA sequencing and pseudotime trajectory analysis were conducted to identify a stem cell population within mouse dental pulp cells. Axin2rtTA; TRE-H2BGFP (Axin2^{GFP}, 4-week-old) mice and Axin2rtTA; TRE-Cre; R26tdTomatoFx (Axin2$^{Cre\text{-}Dox}$; R26tdTomato, 4-week- or 18-month-old) mice were treated with doxycycline (Dox) for 3 days to examine the localization of Axin2-expressing cells in dental pulp and to assess the self-renewal ability of these cells. To investigate the response of Axin2-expressing cells to pulp exposure, Dox was administered for 3 days to 4-week-old Axin2$^{Cre\text{-}Dox}$; R26tdTomato mice, followed by pulp exposure and direct pulp capping.

Results: Single-cell RNA sequencing and pseudotime trajectory analysis identified a dental pulp stem cell population, with Axin2 uniquely expressed in this group. Fluorescent imaging of molars in Axin2^{GFP} mice showed that Axin2 was highly expressed in dental pulp cells at the root apex. After 9 months of tracing, the Axin2-lineage cells expanded into the root canal and pulp chamber, becoming polarized cells on the dentin surface. The ratio of Tomato+ cells continuously increased during the tracing period. Additionally, these Axin2-expressing cells at the root apex were still present in the aged molars of 18-month-old Axin2$^{Cre\text{-}Dox}$; R26tdTomato mice treated with Dox for 3 days. In a pulp exposure model, the number of Axin2-lineage cells at the root apex was increased compared to that in uninjured controls. These lineage cells were also detected on the surface of reparative dentin.

Conclusion: Axin2-expressing cells located in the root canal at the root apex represent a dental pulp stem cell population essential for the formation of reparative dentin.

Keywords : Dental pulp, Dental pulp stem cell, Adult stem cell, Regeneration, Mouse genetics

113-1: Localization of MSCs after Pulp Revascularization Procedures in Mice.

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Objectives: Pulp revascularization has been conducted as a new therapy for immature permanent teeth with necrotic pulp. However, the involvement of mesenchymal stem cells (MSCs) in the healing process remains still unknown. The objective of the study was to investigate localization of Axin2- and Gli1-expressing cells, which are MSCs candidates in the periodontal tissue, after pulp revascularization by cell lineage tracing analysis. Methods: Axin2-Cre^{ERT2}-Tomato and Gli1-Cre^{ERT2}-Tomato mice were generated. Tamoxifen was injected at 4 weeks old, and pulp revascularization was performed on the mesial root canal of the right maxillary first molar at 5 weeks old. The mice were sacrificed at 1 hour, 7 days, and 14 days post-treatment, and frozen sections were prepared. Immunofluorescence was carried out using an anti-osterix antibody as a marker for cementoblasts. The mesial roots of the left maxillary first molars in the same mice were used as untreated control. The number of tdTomato-positive cells and tdTomato/Osterix double-positive cells in the root canal and periapical regions were counted. Results: At 1 hour, the root canals in the experimental group were filled with blood clots, and no Axin2 and Gli1 were seen. Axin2-positive cells were found mainly in the lower part of root canal at 7 days, and infiltrated to the upper part of the canal at 14 days. Ratio of Axin2-positive cells and Axin2/Osterix double-positive cells in the root canal increased (n=5, $P < 0.05$). Gli1-positive cells accumulated in the entire root canal and periapical tissue at 7 and 14 days. Although the ratio of Gli1-positive cells increased at 7 days, it decreased at 14 days. The ratio of Gli1/Osterix double-positive cells increased (n=5, $P < 0.05$). Conclusions:The results suggest that Axin2- and Gli1-expressing cells in the periapical tissues migrate into the root canal through the apical foramen and involved in wound healing after pulp revascularization.

Keywords : Pulp revascularization, MSCs, Axin2, Gli1, osterix

114-2: Efficacy of Colloidal Platinum Nanoparticle with MTA after pulp capping

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Objectives: Colloidal platinum nanoparticle (CPN), composed of metallic nanomaterials synthesized from a colloidal suspension of platinum particles, reduce inflammation and prevent apoptosis. We aim to assess the combined effects of mineral trioxide aggregate (MTA) and CPN when used as a direct pulp capping material compared with MTA and a negative control in rat molar teeth, and comprehensively evaluate its potential as a direct pulp capping material. Methods: A total of 36 cavities were prepared in the maxillary first molar teeth of 18 male Wistar rats. Under aseptic conditions and anesthesia, the pulp chamber was exposed using a 1/2 stainless steel round bur followed by sterile #20 stainless-steel K-files. Subsequently, the teeth were divided into 4 distinct experimental groups: Group 1, the commercially available mineral trioxide aggregate (MTA; GC Corporation, Japan), and Group 2, the combination of CPN (Apt, Japan) and MTA (CM), Group 3, negative control (no direct pulp capping materials [NC]). All cavities were filled with Super-bond (Sun Medical, Japan) after the pulps were covered with each direct pulp capping material. The pulpal reaction was observed at 14 and 28 days, respectively. Results: On day 14, the CM group exhibited a complete mineralized tissue formation, whereas the MTA and NC groups showed incomplete and defective mineralized tissue formation. On day 28, a complete mineralized tissue barrier formation was observed in the CM, MTA and NC groups. Conclusions: The combination of CPN and MTA had comparable mineralized tissue formation inducibility to mineral trioxide aggregate, suggesting its potential as a direct pulp capping material.

Keywords : Colloidal platinum nanoparticles, Mineral Trioxide Aggregate, Pulp capping material

115-1: Effects of Hypoxia on the Murine Embryonic Cranial Base Development

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Objectives: Fetal hypoxia impairs the growth and development of various oral and maxillofacial tissues. However, its effects on prenatal endochondral ossification of the cranial base remain poorly understood. This study investigates the impact of hypoxic exposure during pregnancy on murine fetal endochondral ossification, focusing on the cranial basioccipital and basisphenoid bones.

Methods: Pregnant C57BL/6 female mice at 11.5 days of gestation were randomly assigned to control and hypoxic groups (n=3 per group). The hypoxic group underwent a controlled oxygen regimen, consisting of 3 hours of hypoxia (10% oxygen) followed by 21 hours of normoxia, for 7 days. At embryonic day 18.5 (E18.5), embryos were collected, weighed, and measured for crown-rump length. The heads of the embryos (n=6 per group) were subjected to micro-CT imaging and bone morphometric analysis.

Results: Hypoxic embryos (Hypo-embryos) exhibited significantly reduced height, weight, and craniofacial bone mineral content (BMC), bone volume (BV), and tissue volume (TV) compared to control embryos (Cont-embryos). The basioccipital and basisphenoid bones in Hypo-embryos were markedly smaller, with significantly lower tissue mineral density (TMD), BMC, BV, and TV compared to Cont-embryos.

Conclusions: This study reveals the negative effects of fetal hypoxia on the endochondral ossification of the cranial base. Given the critical role of cranial base development in postnatal craniofacial growth, further research is warranted to elucidate the underlying mechanisms driving these changes.

Keywords : Fetal hypoxia, Cranial base, Development, Endochondral ossification

116-2: Relationship between trabecular structure of the mandibular condyle and tooth placement

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It is said that the trabecular structure of the jawbone responds to stress generated by jaw movement and shows a suitable form. In addition, since mechanical stimuli act directly on the inside of the bone through the teeth, the trabecular structure is constructed to resist stress and shows a characteristic trabecular course. Research on the morphology of the jawbone, especially the internal structure, has revealed that the presence or absence of teeth causes a greater difference in morphology of the jawbone than the morphological changes associated with growth and aging. After tooth loss, the vertical absorption of the mandible reaches the upper edge of the mental foramen. It is said that the width and connectivity of the trabecular structure inside the jawbone change with bone remodeling. With the recent development of dental medicine, including implants, the number of procedures that reach the inside of the jawbone has increased, and detailed analysis of the trabecular structure inside the jawbone is now required. On the other hand, the temporomandibular joint is the only joint in the oral region and the only complex joint in the human body, but the structure of the mandibular condyle, which is its component, has not necessarily been fully elucidated. In this study, a three-dimensional reconstruction of the fine bone trabeculae inside the mandibular condyle were performed using the micro-CT, which can take high-resolution images non-destructively and output image data for quantitative analysis, the trabecular morphology in three dimensions were observed, and measuring the bone morphology was enforced and some interesting findings as a result are reported. The research materials used were mandibular condyles extracted from cadavers used in systematic anatomy training at the Kagoshima University School of Dentistry. Bone samples were photographed using a micro-CT (Skyscan1174 Bruker AXS). The reference plane for photographing the samples was the upper and lower regions of the horizontal section connecting the lateral and medial poles of the mandibular condyle, which was the specimen. After photographing, slice image data was created using the company's reconstruction software (NRecon), and the analysis software (CTAn) was used to measure the volume density (BV/TV) and trabecular surface area (BS) of the trabecular bone in the region of interest as primary measurement items, and the secondary measurement items of the surface area ratio to trabecular volume (BS/BV), trabecular width (Tb.Th), number of trabeculae that can exist in a unit volume (Tb. N), and trabecular space (Tb.Sp) were calculated as structural indices of the trabecular bone, and their relationship with the tooth implantation condition was examined. As a result, it was found that the trabecular bone of the specimens in which occlusion at the molar area was maintained by natural teeth or prostheses had a higher trabecular width and density and a stronger trabecular structure than the trabecular bone of the edentulous jaw. From this, it was inferred that the state of dental occlusion affects not only the trabecular structure of the mandibular body, which is already known, but also the structure of the temporomandibular joint.

Keywords : mandibular condyle, cancellous bone, bone morphology, micro CT

117-1: SLC26A2-mediated sulfate metabolism is essential for the tooth development

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The sulfate transporter gene SLC26A2 is crucial for skeletal formation, as evidenced by its role in diastrophic dysplasia, a type of skeletal dysplasia in humans. While SLC26A2-related chondrodysplasia also affects craniofacial and tooth development, its specific role in these processes remains unclear. In this study, we explore the pivotal roles of SLC26A2-mediated sulfate metabolism during tooth development. We found that Slc26a2 is predominantly expressed in dental tissues, including odontoblasts and ameloblasts. Slc26a2 knockout mice (Slc26a2-KO-exon2) exhibit distinct craniofacial abnormalities, such as a retrognathic upper jaw, small upper incisors, and upper molar hypoplasia. These mice also show flattened odontoblasts and loss of nuclear polarity in upper incisors and molars, with significant reductions in odontoblast differentiation markers Dspp and Dmp1. Ex vivo and in vitro studies further reveal dentin matrix hypoplasia, tooth root shortening, and downregulation of Wnt signaling in Slc26a2-deficient cells. These findings highlight the essential role of SLC26A2-mediated sulfate metabolism in tooth development and offer insights into the mechanisms underlying dental abnormalities in patients with SLC26A2-related chondrodysplasias.

Keywords : Tooth development, Odontoblasts, Extracellular matrix, Sulfate metabolism, SLC26A2

118-2: Oral and craniofacial morphology in Japanese patients with achondroplasia

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Objectives Achondroplasia (ACH) is an autosomal dominant disorder characterized by short-limb dwarfism and an estimated incidence of 1/20000 live births. More than 95% of patients with ACH have the amino acid substitution G380R due to point mutations in fibroblast growth factor receptor 3 (*FGFR3*). This results in constitutive activation of FGFR3, which inhibits chondrocyte proliferation and differentiation. This study aimed to characterize the oral and craniofacial morphologies of Japanese patients with ACH from an orthodontic perspective. **Methods** Five ACH patients (one male, four females; mean age: 19.5 ± 10.4 years) were analyzed using lateral cephalograms, orthopantomograms, dental casts, medical records, and facial and intraoral photographs obtained during initial examinations at the Institute of Science Tokyo Hospital. Z-scores were calculated based on the age- and sex-matched Japanese standard values. **Results** All patients exhibited enlarged calvariae, frontal bossing, low nasal bridge, foramen magnum stenosis, and a basilar impression. Cephalometric analysis revealed a strikingly enlarged anterior cranial base length, shortened posterior cranial base length, and acute cranial base angle. All patients showed skeletal Class III jaw relationships with severe maxillary hypoplasia in anteroposteriorly and vertically. Increased mandibular ramus length and mandibular body lengths were observed, with most patients having average mandibular plane angles. Four patients had Angle Class III molar relationships and anterior crossbites with open bites. **Conclusion** Despite the small sample size, our findings clarified that mid-facial hypoplasia in patients with ACH is more likely to be characterized by an enlarged anterior cranial base, strikingly shortened posterior cranial base, nasal bone hypoplasia, and relative mandibular prognathism with an open bite. Brain enlargement has been reported in patients with ACH and it may influence anterior cranial base growth. The strikingly shortened posterior cranial base length and acute cranial base angle were likely due to early synchondrosis closure in cranial base.

Keywords : Achondroplasia, FGFR3, Orthodontics, Cranial base, Cephalometric analysis

119-1: Analysis of the effect of oxytocin analogues on a mouse model of dental phobia

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Objective Oxytocin, a reproduction-related peptide hormone, has been studied for decades due to its multifaceted action, including to the central nervous system. In the present study, we examined whether oxytocin and its analog (carbetocin and atosiban) could reduce fear-conditioning behavior of mice that is often applied in the studies of dental phobia. **Methods** Male C57BL/6J mice were used at 8 weeks after birth. Fear-conditioning experiment was conducted according to the methods in previous study (Bouchekioua et al., 2022 Bio-protocol). In the 6th day, mice were administered intranasally with 5 µL of 100 µM oxytocin, 10 mM carbetocin, 10 mM atosiban, or saline after electrical shock session. The effect of fear-conditioning was evaluated as lick-suppression ratio in the 7th day. For immunohistologial analysis, mice brains were dissected and formalin-fixed at 30 min. after drug administration. StatPlus software (AnalystSoft Inc., CA, USA) was used to determine statistical difference. **Results** One-way ANOVA and Tukey's *post hoc* test detected that lick-suppression ratio of saline-treated group was significantly higher than that of non-conditioned group ($F_{(4,16)}$=5.56, p=0.005; p<0.05). It was also determined that lick-suppression ratio of carbetocin-treated group was significantly lower than saline-treated group (p<0.05). For immunohistological analysis, we examined the number of of c-Fos-positive and protein kinase Cδ-negative cells in lateral-part central amygdala and one-way ANOVA revealed that there was statistically significant difference between groups ($F_{(4,37)}$=9.19, p=0.00003). Tukey's *post hoc* analysis detected that the number was increased in saline-treated group compared with no-conditioned group (p<0.05) and that the number was lower in oxytocin or carbetocin-treated group compared with saline-treated group (p<0.05). **Conclusions** From the result in the present study, it was indicated that carbetocin effectively reduced fear-conditioning of mice. It is suggested that selective oxytocin receptor response might contribute reduce fear-conditioning effect, since carbetocin selectively activates Gq protein-related response of oxytocin receptor.

Keywords : Dental phobia, Fear-conditioning, Oxytocin, Amygdala, Nasal administration

120-2: Low concentrations of menthol suppress TRPV1-mediated pain related behavior

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Menthol is a typical agonist of TRPM 8 and has been suggested to mediate both analgesia and nociception, but its mechanism of action is unclear. To investigate the role of TRPM8 in pain in the oral region, we examined the effects of topical menthol application on nociceptive behaviors in rats. Wild-type male Wistar rats (300-500 g) were used for experiments. Menthol (10 mM, 100 mM, 1 M), and capsaicin (100 µM) were used as stimulants, and 1% DMSO was used as a control. A drop of the stimulant was applied on the labial fornix region of the lower incisors in each rat. Immediately after the application, mouth rubbing by both forelimbs was observed for 5 min as a pain-related behavior. To examine the analgesic effects of menthol, menthol and capsaicin were applied simultaneously. Since TRPA1 can be activated by menthol, we performed the same experiments using TRPA1 knockout male rats. Additionally, the TRPM8 antagonist AMG-333 was administered orally to determine whether the responses were TRPM8-dependent. Application of high concentrations of menthol (1M) significantly prolonged rubbing time compared to the control groups. This response was inhibited by AMG-333. As the prolonged rubbing time was absent in TRPA1 knockout mice, the increased rubbing behavior was attributed to TRPM8 activation. In contrast, lower concentrations of menthol (10 and 100 mM) did not prolong rubbing time. The concurrent application of low concentrations of menthol with capsaicin, a TRPV1 agonist, significantly reduced capsaicin-induced increase in rubbing time, and this effect was also inhibited by AMG-333. The findings suggest that TRPM8 activation by low concentrations of menthol inhibits TRPV1-mediated pain. In conclusion, our results indicate that TRPM8 activation by high concentrations of menthol induces nociception, while lower concentrations produce analgesic effects.

Keywords : TRPM8, Menthol, Analgesia

121-1: Optogenetic strategies to investigate the role of projections from the insular cortex to the parabrachial nucleus in pain-related behaviors of rats

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The parabrachial nucleus (PBN) receives various sensory inputs such as visceral sensation, gustation, and pain. The PBN directly and indirectly transmits these sensations to the insular cortex (IC). On the other hand, IC neurons send their axons to the PBN, however, little is known about the role of the descending projections from IC to PBN. In this study, we examined the physiological functions of the descending projections from IC to PBN glutamatergic and GABAergic/glycinergic neurons. We recorded synaptic currents from PBN neurons in response to activation of IC axon terminals in the PBN. Monosynaptic excitatory postsynaptic currents were almost comparable between excitatory glutamatergic and inhibitory GABAergic/glycinergic PBN neurons. Next, we recorded the frequency of facial grooming after the injection of capsaicin to the right whisker pad under the condition with or without optical stimulation using rats injected with AAV-CAG-ChR2-mCherry in the IC and implanted optical fiber in the PBN. The behavior test showed that activation of IC axons in the PBN increased the frequency of facial grooming in response to nociceptive stimulation. These results suggest that IC projections to the PBN enhance excitatory outputs from the PBN, which is likely to facilitate nociception.

Keywords : insular cortex, parabrachial nucleus, pain

122-2: Severe periodontitis denervates the mesencephalic trigeminal nucleus and promotes an increase in Aß$_{1–42}$ oligomers.

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An association between Alzheimer's disease (AD) and periodontitis has been suggested, but the detailed mechanism remains unclear. In this study, we focused on the mesencephalic trigeminal nucleus (Vmes), which receives pressure sensation around the periodontal ligament, to determine the effect of severe periodontitis on the Vmes and whether it promotes an increase in Aß$_{1–42}$ oligomers using mice.

Periodontitis was induced by ligating the maxillary right second molar (M2) of 60–, 70–, and 80–day–old AD model mice *APP*$^{NL–G–F}$ with silk threads and administering LPS (1mg/ ml, 10µl once) from the periodontopathogenic bacterium *Porphyromonas gingivalis* around the ligature once every 3 days. At 90 days of age, brain and oral tissues were collected for µCT imaging around M2, and brain sections were immunostained and analyzed using optical and confocal microscopy.

After ligation and LPS administration, the periodontitis-induced side showed significant bone resorption compared to the control side, and was classified into mild, moderate, and severe periodontitis groups according to the degree of bone resorption. Immunostaining of brain sections revealed a decrease in the number of Vmes cells and an increase in extracellular Aß$_{1–42}$ oligomers in the severe periodontitis group compared to controls on the periodontitis-induced side.

The present results show that Vmes neurodegeneration was accelerated in the brains of mice with severe periodontitis. Aß$_{1–42}$ oligomers around Vmes cells were also increased. Since Aß$_{1–42}$ oligomers are causative agents of tissue damage in AD, it was suggested that severe periodontitis causes progression of AD pathology. Although it was previously reported that an increase in the number of missing teeth correlates with the progression of AD, it is conceivable that severe periodontitis also directly causes neurodegeneration of Vmes and is associated with AD aggravation.

Keywords : periodontitis, amyloid-beta, alzheimer's disease

123-1: Rats discriminate the texture of gel foods

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Objectives: Food texture perception is an important factor in palatability and in feeding and swallowing function. We have established a method for evaluating oral viscosity and particulate perception in rats. The aim of this study was to evaluate the discrimination of texture of gels, such as springiness, in rats.
Methods: We performed conditioned texture aversion test using LiCl as an unconditioned stimulus (US) and agar or gelatin gels as a conditioned stimulus (CS).
Results: When 3% agar gel was used as the CS, preference for 3% agar gel was significantly decreased in a two-bottle choice test between 1% and 3% agar gels. In contrast, when the CS made into a paste, no aversion to the 3% agar gel was observed. Furthermore, when 14% gelatin gel was used as the CS, aversion to the 3% agar gel was established in a two-bottle choice test between 1% and 3% agar gels. These results suggest that aversion learning occurs based on the texture of gels. To investigate the threshold for discriminating differences in agar concentration, we conducted a two-bottle choice test between 2% and 3% agar gels, with 3% agar gel as the CS. Rats showed aversion to the 3% gel. However, in a test between 2.4% and 3% agar gels, no aversion to the 3% gel was observed, suggesting that rats can discriminate a 1% difference in agar concentration based on texture.
Conclusions: Our results demonstrate that the method used in this study can accurately evaluate rats' ability to discriminate the physical properties of gels. This method could be useful for future receptor and neural circuit analysis.

Keywords : Oral physiology, Food texture, Oral texture sensation, Oral tactile sensation

124-2: Morphological analysis of dendritic spines of thalamic neurons receiving sensory input from the orofacial region.

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INTRODUCTION: Spines are compartmentalized structures responsible for synapse-specific transmission and plasticity. The function of dendritic spines has been intensively studied in the cortex and hippocampus, where they exhibit morphological plasticity. Spines that receive inputs at high frequency show long-term potentiation, in which their size increases, whereas spines that receive infrequent inputs decrease in size, resulting in long-term depression. Such morphological plasticity of spines is thought to be the structural basis of learning and memory. As for thalamic neurons, they were shown to exhibit dendritic spines more than 100 years ago using the Golgi impregnation method. Since then, however, the dendritic spines of thalamic neurons have not been studied at all.
METHODS: We analyzed the morphology and density of spines of thalamic neurons in the mice, rats, and monkeys, focusing especially on thalamic nuclei that receive sensory input from the oral-facial region. Spines were visualized using rapid Golgi staining and viral labeling methods.
RESULTS: The Golgi staining visualization method showed that mouse and rat thalamic neurons had a higher density of spines than monkey thalamic neurons. In the monkeys, rats, and mice, the spines of thalamic neurons were distributed at similar densities in all thalamic nuclei. Spines were distributed along the dendrites of all neurons in all thalamic nuclei, but were less dense near the cell body. The interspine distances were frequently very small, allowing interactions between axo-spinous synapses.
CONCLUSION: Spines are an important but poorly studied component of thalamic neurons. Spines of thalamic projection neurons are conserved structures in mice, rats, and primates and are distributed in all thalamic nuclei, making it likely that they serve an important function. Whether thalamic neuron spines exhibit plasticity and participate in memory and learning in the same way as cortical and hippocampal spines remains to be determined in future studies.

Keywords : Trigeminal nervous system, Thalamus, Orofacial regions, Dendritic spines, Plasticiry

125-1: Long-term plasticity in GABAergic synapses of the rat cerebral cortex

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Objectives: The insular cortex (IC) plays an important role in processing gustatory, orofacial, and nociceptive sensations. Long-term synaptic plasticity, such as long-term potentiation (LTP) has been well studied in cortical excitatory synapses. However, in inhibitory synapses, the underlying mechanisms inducing plasticity remain unmasked. Here, we examined whether GABAergic connections of fast-spiking neurons (FSN)-pyramidal neurons (PN) showed long-term plasticity. We also addressed how plasticity affects orofacial pain, especially LTP in IC inhibitory synapses. Methods: We performed multiple whole-cell patch-clamp recordings of unitary IPSCs from FSNs and PNs in the slice preparations in the VGAT Venus A transgenic rat. Parvalbumin-Cre transgenic rats and channel rhodopsin2 were also employed to activate selectively the FSNs in the behavioral test. Theta-burst stimulation (TBS) derived from depolarized pulses and LED light pulses to presynaptic and transplanted light fiber into IC was used *in vitro* and *in vivo* to induce synaptic plasticity. The acute pain in response to an irradiated pulsed laser in the orofacial region was measured by escape behaviors. Results: TBS to a presynaptic FSN induced LTP and LTD in two postsynaptic PNs projected from the FSN. The paid-pulse ratio (PPR) before TBS correlated with the degree of LTP and LTD, indicating that short-term plasticity determines long-term plasticity. Changes in PPRs of LTP-and LTD-inducing synapses imply that presynaptic mechanisms were mediated. Bath and presynaptically intracellular application of a $GABA_B$ receptor ($GABA_BR$) antagonist and a GTPase inhibitor, respectively, blocked to induce LTP. A phospholipase C (PLC) inhibitor added presynaptically suppressed LTP induction, raising the possibility that PLC participates in LTP induction. Surprisingly, a low concentration of baclofen (1 μM), a $GABA_BR$ agonist, induced LTP-like potentiation in FSN-PN synapses. In the behavioral experiments, selective activation of FSNs provided by TBS-like light stimulation increased the threshold of orofacial pain against the orofacial laser irradiation. Conclusions: These results suggest that LTP depends on short-term plasticity and is mediated by the presynaptic $GABA_BR$-PLC. The long-lasting activation of FSNs in IC has the potential to relieve acute orofacial pain.

Keywords : LTP

Author Index-演者索引

謝　辞

第 72 回国際歯科研究学会日本部会（JADR）総会・学術大会開催にあたり、
下記の企業・団体様より多大なご支援を賜りました。ここに厚くお礼申し上げます。

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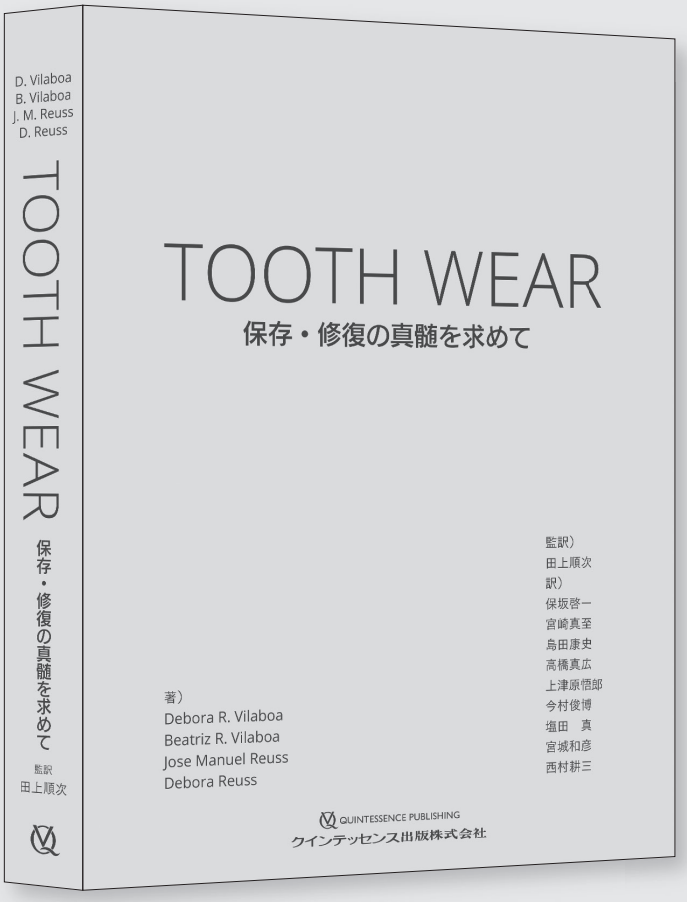
TOOTH WEAR

保存・修復の真髄を求めて

う蝕，歯周病に次ぐ第３の歯科疾患とされる現代病 “Tooth Wear” の診断，治療から予防・メインテナンスまでを網羅した決定版 完成！

Tooth Wear(トゥースウェア) を引き起こす酸蝕症・摩耗症・咬耗症・アブフラクションの病因や評価，削らずに付加的な処置で歯の修復をはかる “additive restoration” の実際，デジタル機器の活用，矯正・インプラントの併用，食事や生活習慣改善・適切な歯磨き・マウスガード装着等による対応など，最新情報に基づく治療法を収載．Tooth Wear 患者に対する具体的で実践的な診療システムの構築に役立つ，全歯科医院必携の１冊！



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QUINTESSENCE PUBLISHING 日本　●サイズ:A4判変型　●変型412ページ（別途付録16ページ）　●定価41,800円（本体38,000円+税10%）

クインテッセンス出版株式会社
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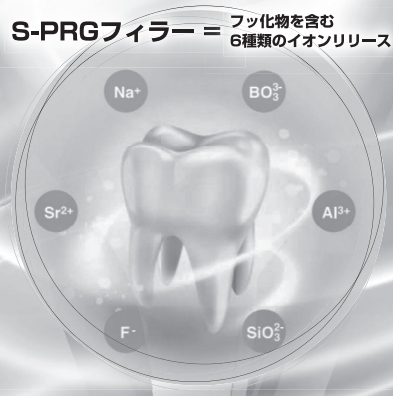

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