



# Research at GSDM

## **Boston University School of Dental Medicine**

***Maria Kukuruzinska, Ph.D.***

*Associate Dean for Research*

*Professor and Interim Chair*

*Department of Translational Dental Medicine*

*Director, Predoctoral Research Program*

*Goldman School of Dental Medicine*

*Director, Head and Neck Cancer Program*

*Boston University*



# Office of the Associate Dean for Research



**Dr. Maria Kukuruzinska**

Associate Dean for Research  
Professor and Chair, Translational Dental  
Medicine



**Barbara Pyke**

Associate Director of Research

**Biostatistics and Epidemiology  
Data Analytics Center (BEDAC)**

Statistical Consultation



**TBA**

Translational Research  
Grant Associate



**Kendrick Smaellie**

Program Manager

## Center for Clinical Research



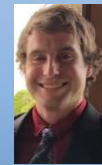
**Marianne Jurasic**

Director  
Clinical Professor, General  
Dentistry / Health Policy & Health  
Services Research



**Kendrick Smaellie**

Program Manager

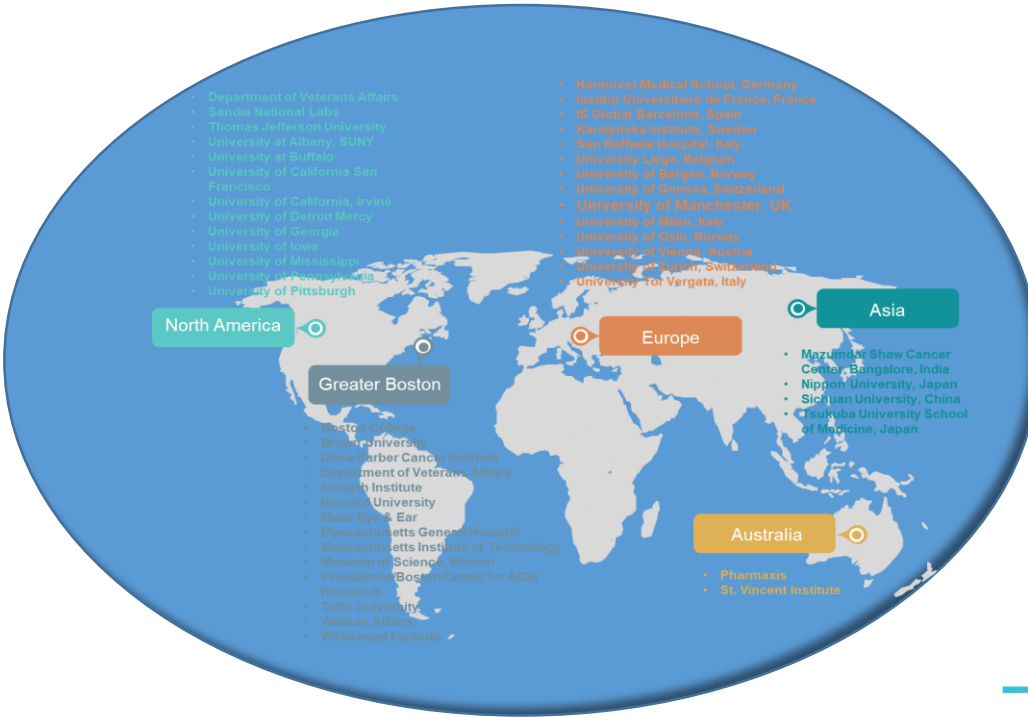


**Bobby McDonough**

Data Analyst

# Research Collaborations

## Research Collaborations Worldwide



## Industry Collaborations



# Boston University Collaborations

## Digital Health Initiative (B. Borrelli)

- Within the Rafik B. Hariri Institute for Computing and Computational Science & Engineering
- Supports research that leverages technologies and methodologies from computing and data sciences to tackle a range of applications related to healthcare

## Head and Neck Cancer Program (M. Kukuruzinska)

- Collaborative, multidisciplinary, cross-institutional basic, translational and clinical research
- Biochemistry, Computational Biology, Biomedical Engineering, Environmental Health, Hematology/Oncology, Oral and Maxillofacial Surgery, Otolaryngology, Pathology & Laboratory Medicine, Radiation Oncology, Surgery, Translational Dental Medicine

## Mobile and Electronic Health ARC (B. Borrelli)

- Transdisciplinary research program in mobile and electronic health focusing on underserved populations
- Over 150 member affiliates across numerous schools

## Simulation Modeling for Population Health Group (B. Heaton)

- Focused Research Program within the Rafik B. Hariri Institute for Computing and Computational Science & Engineering
- Multidisciplinary community of faculty and students applying simulation modeling to public health research



# Center for Behavioral Science Research



## Text Messages to Improve Child Wellness and Oral Health in Vulnerable Populations

Belinda Borrelli (Lead Co-PI)  
Michelle Henshaw (Co-PI)  
Co-Is: Bill Adams, Tim Hereen  
Funded by: NIDCR UH2/UH3

- ❖ Randomized controlled trial n=754 families
- ❖ Target pediatric community clinics
- ❖ Automated, yet interactive
- ❖ Customized
- ❖ Gamified
- ❖ Co-designed with clinicians & target population



## Delivery of a Smoking Cessation Intervention Via Virtual Reality Headset During Dental Cleaning

PI: Belinda Borrelli  
Co-Is: M. Jurasic, L. Quintiliani, R. Endrighi, H. Cabral

Funded by: NIDCR UH3DE028866

## Electronic Framingham Heart Study (eFHS)

Custom mobile app paired with wireless Blood pressure cuff and smartwatch deployed at FHS exam

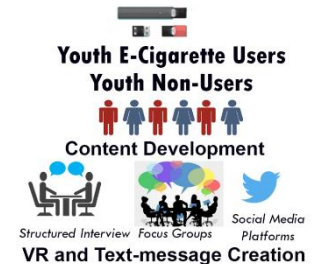
- Compare digital data to in Research Center data



RWJ Award #74624; R01HL141434  
J. Murabito, PI; B. Borrelli Co-I

## Virtual Reality Intervention to Promote Cessation of Nicotine Vaping in Youth

PI: Belinda Borrelli  
Co-Is: Endrighi, Quintiliani, Hart, Walker, Hadland  
Funded by: American Heart Association



Randomize Youth Users  
One Month Intervention  
Completion Evaluation



## Dental Data Repository Projects

### NIDCR-funded Project: Effect of Overweight and Obesity on Periodontal Treatment Intensity and Cost

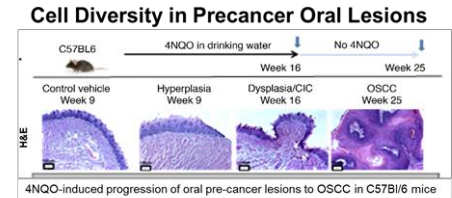
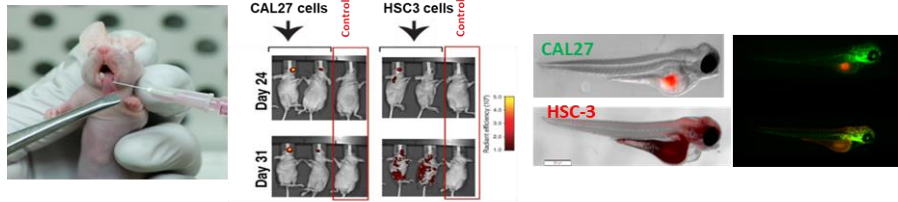
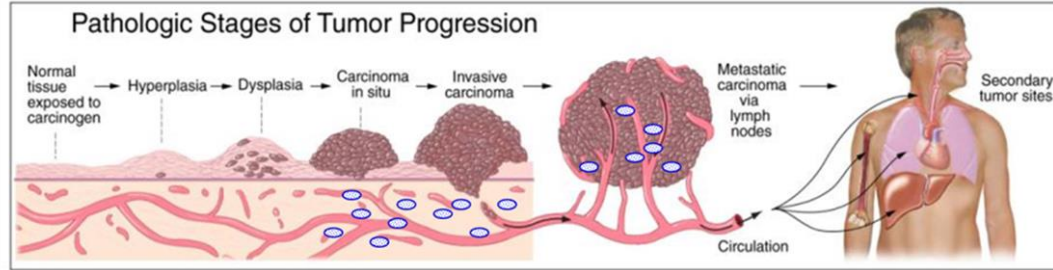
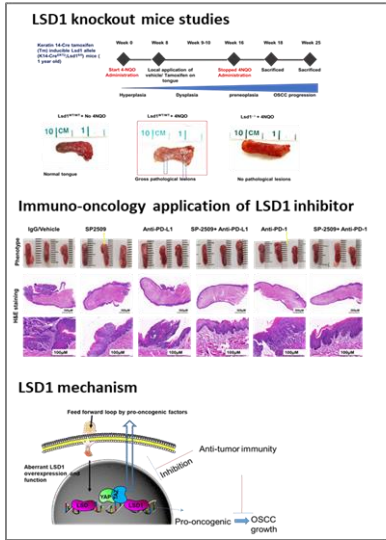
- PI: E. Kaye; Co-I: R. McDonough, A. Singhal, R. Garcia, M. Jurasic
- Main findings: The results indicate obese and overweight individuals require more intensive periodontal treatment compared to normal weight individuals, independent of initial disease severity.

### Current Dental Public Health Resident Projects

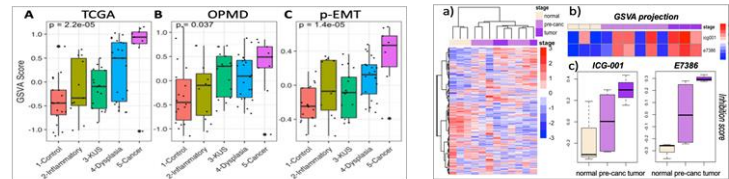
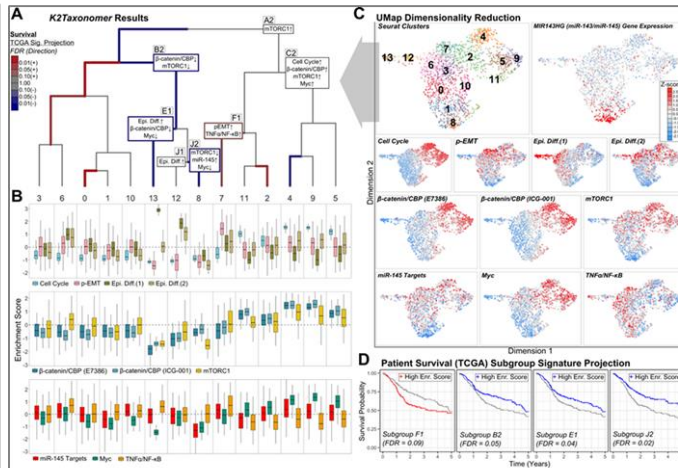
- Clinical Effectiveness Projects
  - Use of antibiotic prophylaxis during implant placement surgery
  - Use of opioid and non-opioid analgesics following surgical tooth extractions



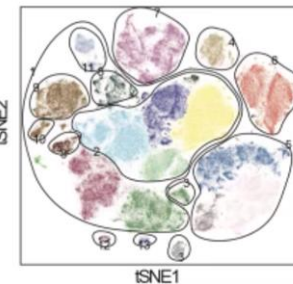
# Head & Neck Cancer Program



## Decoding Cell Identities in HNSCC



## Multi-omics of patient-derived organoids to define cell plasticity and immune landscape for precision therapies



1. CD8+ T cell
2. CD28+, CD8+ T cell
3. B cell
4. CD62L+, CD4+ T cell
5. CD62L-, CD4+ T cell
6. CD40L-, NK cell
7. CD40L-, NK cell
8. NKT cell
9. CD117+, CD103+ TRM, CD8+ T cell
10. CD103+ TRM, CD8+ T cell
11. Va7.2+, CD8+ T cell
12. Va7.2+, CD103+ TRM, CD4+ T cell
13. Va7.2+, CD4-, CD8- T cell





# Endodontics

- The role of LSD1 (Lysine Specific Demethylase 1) in OSCC (oral squamous cell carcinoma) and immunotherapy
- Development of catheter-based Endodontic Endoscope
- LOXL2 (Lysyl Oxidase Like-2) in chondroprogenitor function and osteoarthritis
- Safety and effectiveness of GentleWave<sup>®</sup>
- Novel root canal disinfection system – EndoLogic





# General Dentistry

Research done by General Dentistry faculty is often Educational research used for Quality Improvement or collaborative with other departments



- Rodriguez-Vamvas S, Keohane A, (IRB H-41836): Practicing dentistry in the age of COVID-19: Perception changes due to the coronavirus pandemic and new PPE standards
- Dowlatshahi S, Chen CY, Zigdon-Giladi H, Horwitz J, Ahn C, Kim DM, Machtei EE. Volumetric assessment of changes in the alveolar ridge dimension following GBR using a combination FDBA with collagen membrane or novel resorbable scaffold: A prospective two-center clinical trial. J Periodontol. 2021 Jul 09. PMID: [34245016](#); DOI: [10.1002/JPER.21-0006](#).
- Ahn C, Kaczmarek K, Yeh SY, Li A, Chen E, Ohshima H. Dental Education in the COVID-19 Era and Beyond: A Nationwide Survey Study. In preparation
- Kaczmarek K, Chen E, Ahn C, Ohshima H. Students Perceptions of Remote Testing During the Pandemic. In preparation.
- Henshaw MM, Karpas S. Oral Health Disparities and Inequities in Older Adults. Dent Clin North Am, 65(2): 257-273, 22 Jan 2021
- Alamoudi A, Selvam NP, Kashtwari D, Ruprecht A, Hansen M. Chronic Recurrent Multifocal Osteomyelitis Involving the Mandible - A Rare Case Report. J Clin Pediatr Dent. 2021 Oct 1;45(4):273-277. doi: 10.17796/1053-4625-45.4.10. PMID: 34534306.
- Schnell R, Bajaj N. **IRB Number:** H-41987 "*Design and validation of a cost-effective virtual dental surveyor for cast removable partial dentures*"
- Blidman V, Zea A, Smaellie K, Kong C. :IRB Number: H-39891 Students' perceptions on the use of E-portfolios to assess progress towards competency in self-assessment and critical thinking.
- Reboucas B. IRB number H-40738. Effect of Computer Based Learning compared to Class Based Learning on the performance of Dental Students.
- Maseli V. , Kong C. IRB number : H-39294. CEREC training Effectiveness as surveyed by Faculty members and the evaluation of their completed projects.
- Lakhani A. IRB number H-38418 The Impact of Peer mentoring on the Professional Development of Dental Students
- Jurasic M. Clakson J, Ramsy C. NIDCR funded project: Selective vs non-selective Caries removal in Permanent teeth. Conducted within the National Dental Practice Based Research Network
- Jurasic M, Cabral H. Gibson G, Orner M, Wehler C. NIDCR funded project: Tropical Fluoride effectiveness in high careis risk adults.



# Global & Population Health

## Ending the HIV Epidemic



- Testing & Texting to Diagnose and Prevent HIV Infection in Community Health Centers (Henshaw & Beckwith)
- Feasibility of Conducting Rapid HIV testing in Dental School Settings (Mara)

## Health System Improvement



- Head Start Oral Health Promotion Model (Culler & Lituri)
- Kenya Center for Oral Health Excellence (Henshaw & Mumtaz)
- Oral Disease Prevention Model in Long Term Care: WHO Systems Thinking Framework (Henshaw & Turton)

## Global Health Care Delivery



- Nicaragua ECC Prevention (Henshaw & Culler)
- Healthy Kids & Cambodia Smiles (Turton)
- Western Australia Refugee Project (Turton)
- Eleuthera School-based Oral Health Promotion (Henshaw and Levine)

## Global Oral Health Policy



- Cambodia - National Strategic Plan (Turton)
- Somaliland - National Oral Health Survey (Turton)
- Timor Leste – Ministry of Health Standard Treatment Guidelines (Turton)
- Nicaragua - Ministry of Health ECC Prevention Guidelines (Henshaw & Culler)

# Health Policy & Health Services Research

In addition to leading the Focused Research Program on Simulation Modeling for Population Health, **Dr. Brenda Heaton** is currently Principal Investigator of four NIH research project grants (R01 DE030302; R01 DE027985; R00 DE025917; and R21 DE028993), with a major focus on applying “Complex Systems Science Approaches to Addressing Oral Health Disparities.”

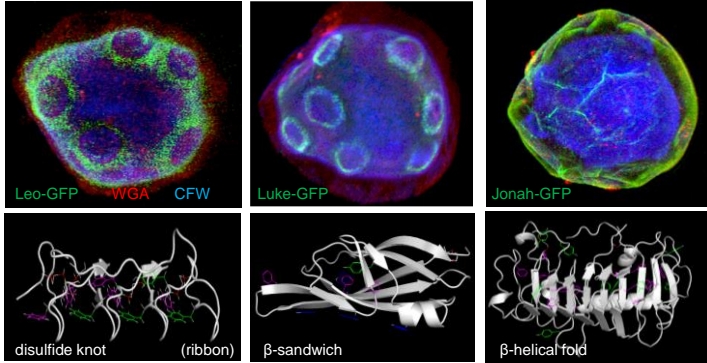
**Dr. Elizabeth Kaye**, in collaboration with **Dr. Marianne Jurasic**, Director of GSDM’s CCR, is leading an NIH-supported research project (R03 DE DE028636) on the “Effect of Overweight and Obesity on Periodontal Treatment Intensity and Cost” that is making innovative use of GSDM patient treatment center clinical data resources. Their team recently had their manuscript accepted for publication in JDR Clinical & Translational Research.

**Dr. Astha Singhal**, supported by a 5-year NIH career development award (K08 DE027720), is developing novel approaches to understand how to best develop health policies to reduce oral health disparities. Her innovative work on creating and testing synthetic indices of Medicaid adult dental benefits’ coverage and payment generosity will be presented at the AADOCR meeting in March.



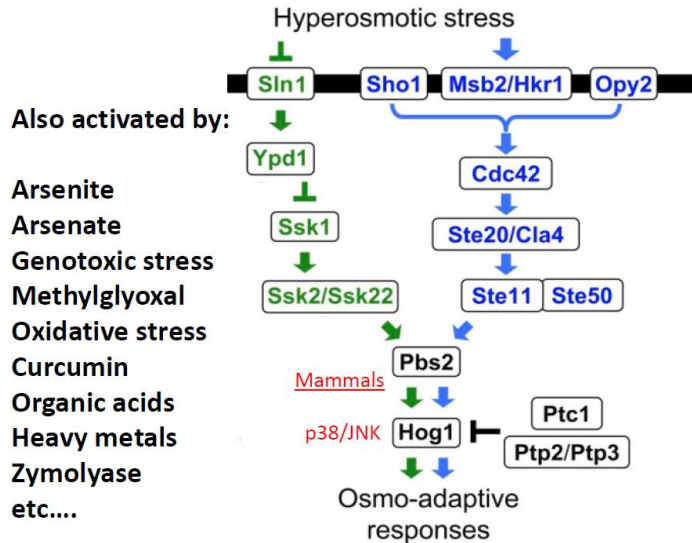
# Molecular & Cell Biology

Cyst wall proteins of protozoan parasite, *Acanthamoeba*, a cause of blindness.



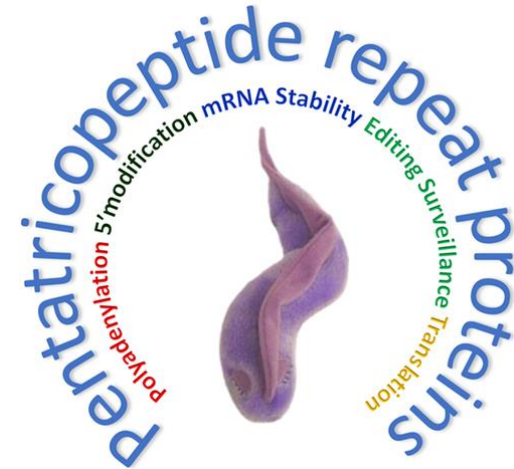
Lectins in the outer layer (Jonah), or the circular ostioles of the inner layer (Luke and Leo). John Samuelson

## Stress-activated protein kinase signaling



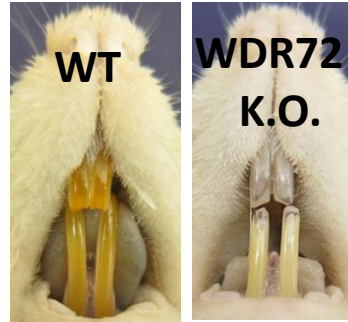
The yeast HOG pathway is activated by a wide array of stressors. David Levin

Mitochondrial mRNA processing and quality control in *Trypanosoma brucei*, the cause of African sleeping sickness.



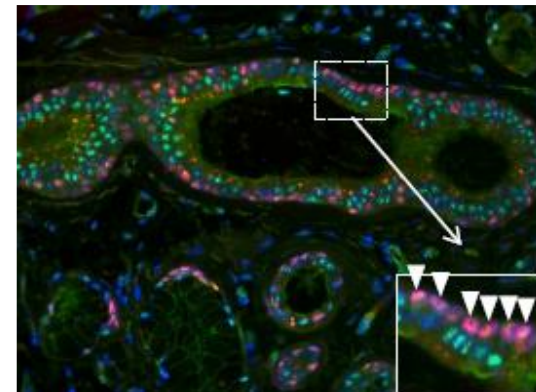
Inna Afasizheva and Ruslan Afasizhev. Wiley Interdiscip Rev RNA 2021 doi: 10.1002/wrna.1638

## Genetics of Amelogenesis Imperfecta



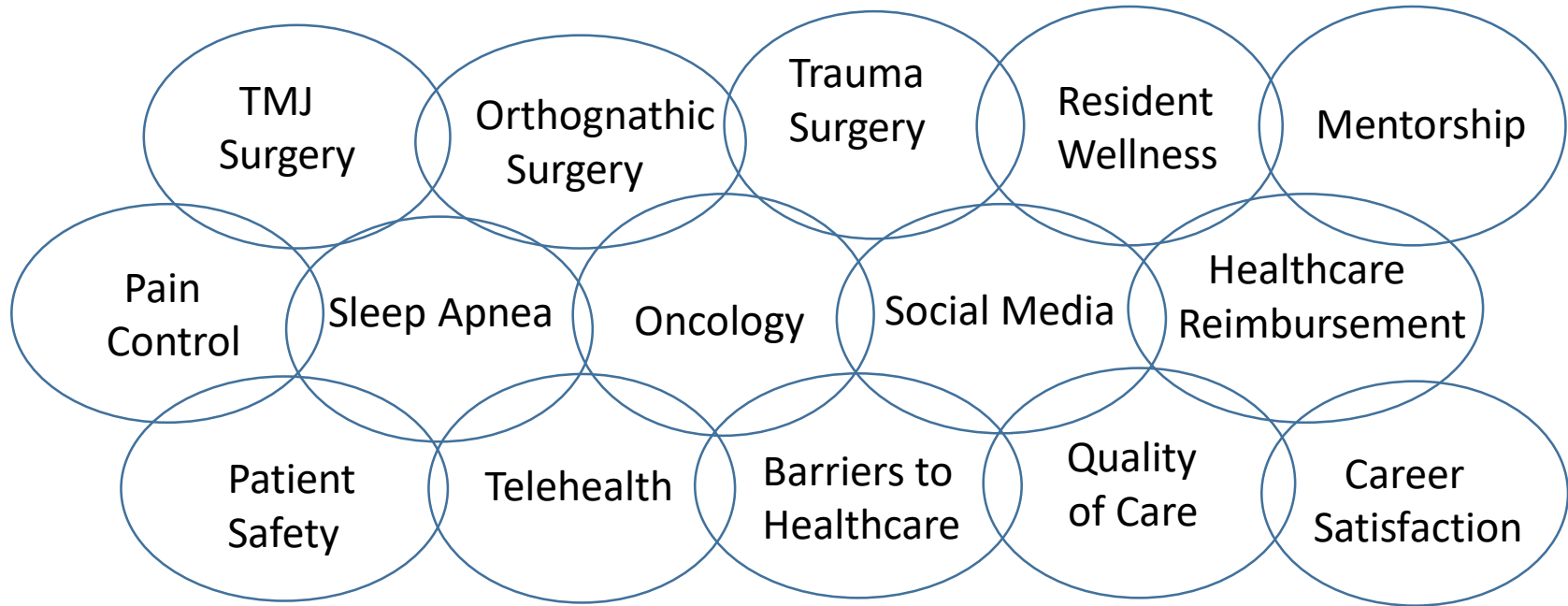
Yoshiyuki Mochida

## Role of p63 in Sjögren's Syndrome

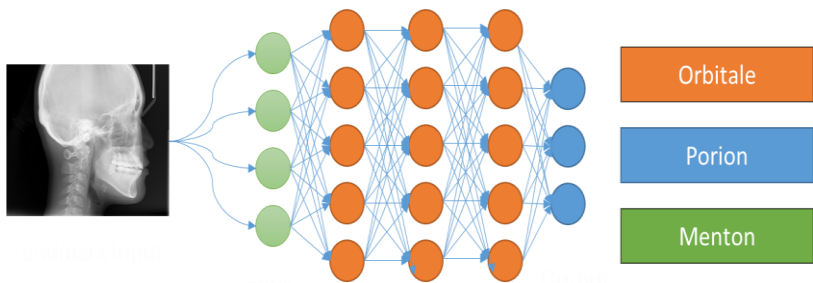


The p63 protein (pink) is highly expressed in the ductal epithelial cells of SS salivary glands. Makoto Senoo

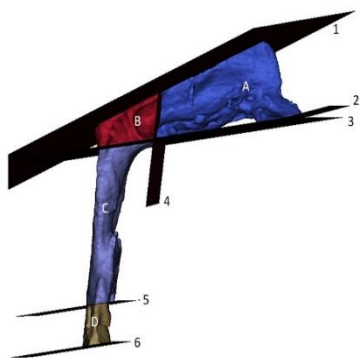
# Oral & Maxillofacial Surgery



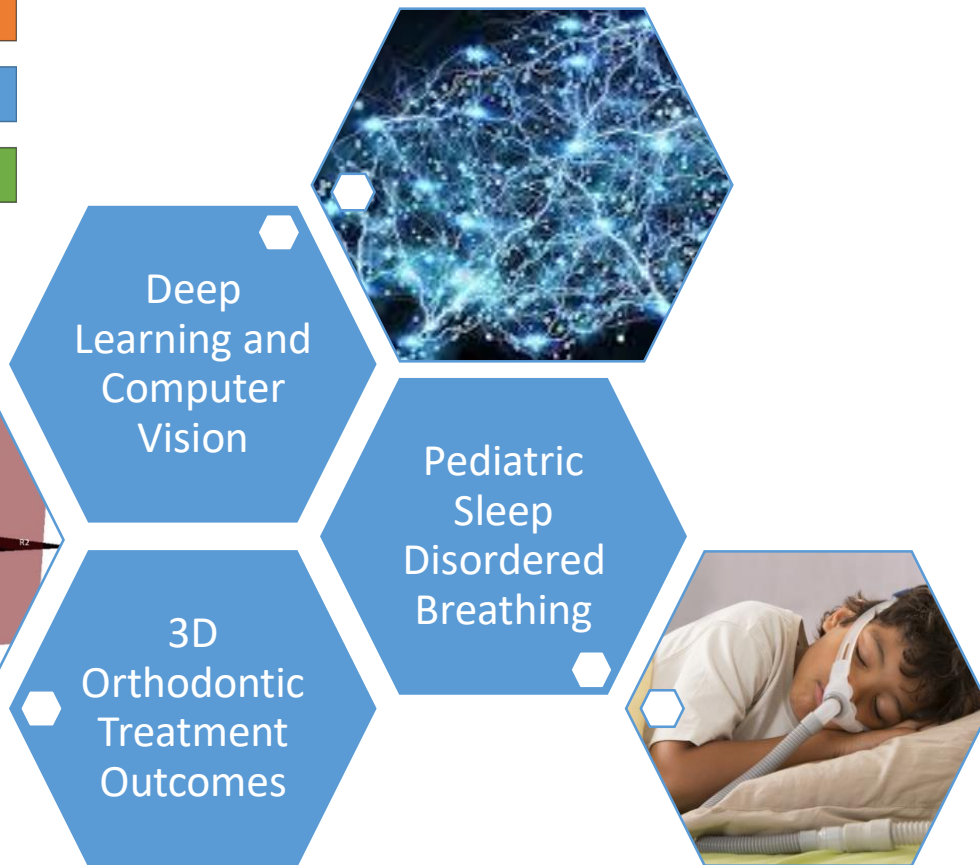
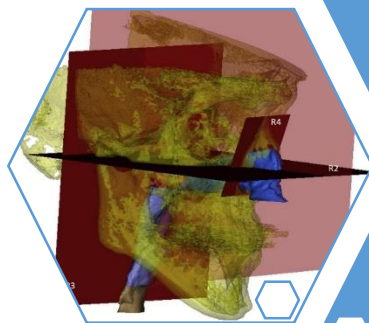
# Orthodontics & Dentofacial Orthopedics



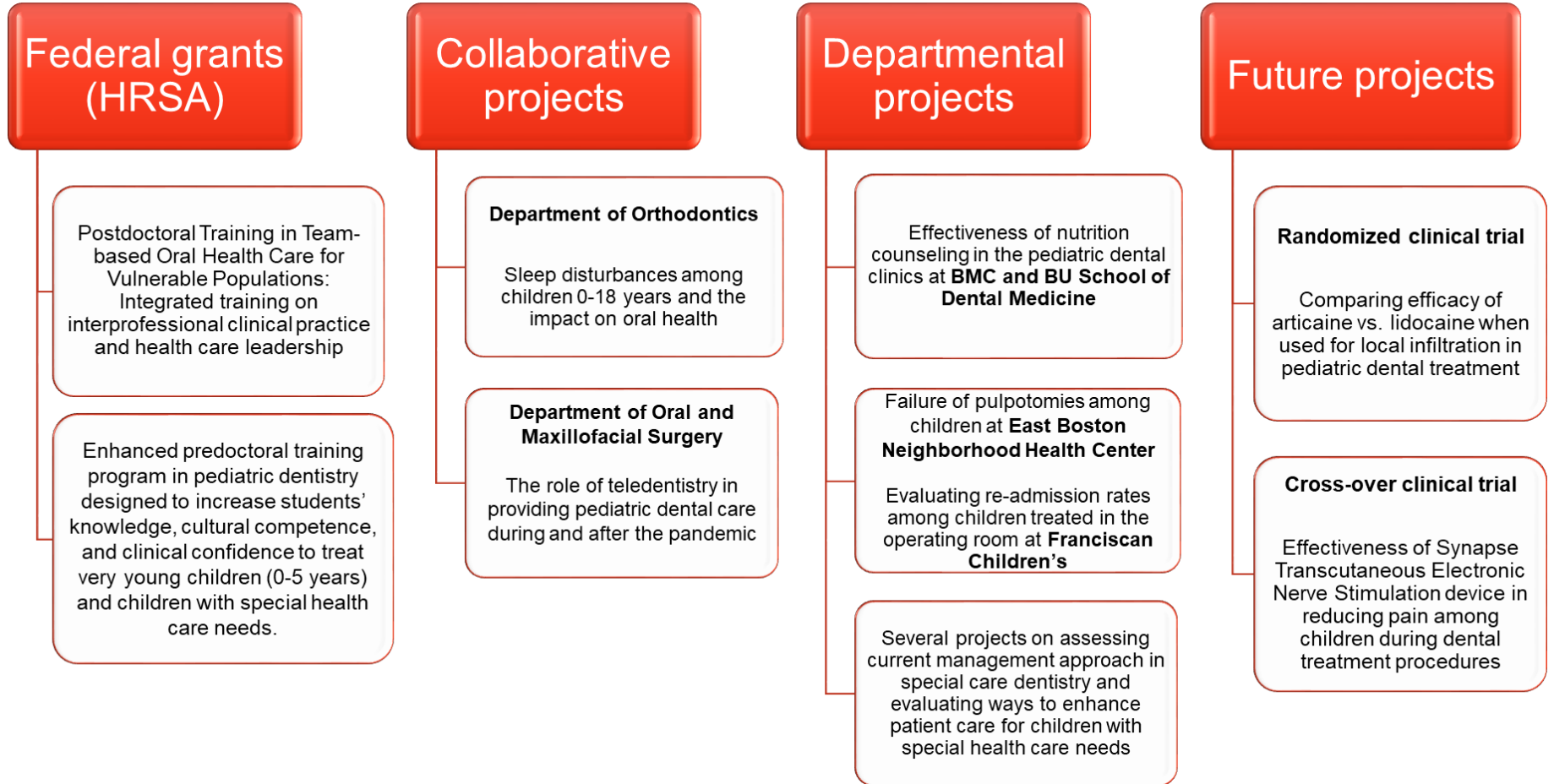
Convolutional Neural Network Schema for Cephalometric Landmark Identification



3D Airway segmentation pre- & post-expansion



# Pediatric Dentistry



# Periodontology

## Yun Ma, MD, PhD

- Periodontal Pathogen-Induced **Chronic Inflammation** and Development of **Alzheimer's**
- **Distribution of Sympathetic Nerve** in Distinct Skeletal Elements along Aging and its Correlation with **Age-related Bone Loss**.

## Xiaoren Tang, PhD

- Effect of **Enamel Matrix Derivatives (EMD)** on cytokine/kinase/Factors gene expression in Osteoblast Cell
- **LIF (LPS induced factor)** as an important **transcriptional factor** functions in LPS-induced signaling pathway
- **ROLE OF TNFAIP1 IN REGULATION OF LPS/TNF-DEPENDENT PATHWAY**

## Serge Dibart, DMD

- **Bone bio-modification following RAP (Regional Acceleratory Phenomenon)**
- **Deep Learning-based Quantification of the RAP** following Piezoelectric Bone Surgery

## Al Price, DMD

- **Optical accuracy And Robot assisted Implant placement**
- **Analysis of normal Facial CBCT anatomy** in selected populations





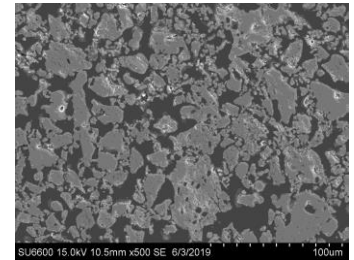
# Restorative Sciences & Biomaterials

Applied Research: New Materials Development and Analysis for Clinical Applications

Pre-Doctoral and Post-Doctoral Training: Over 150 MS/DScD in past 10 years from every GSDM clinical department, MatScEng, and 31 countries

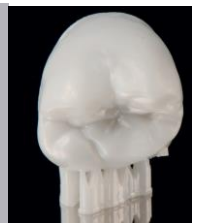
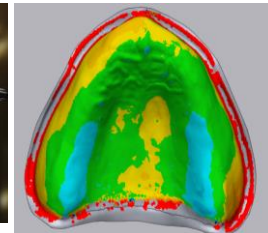
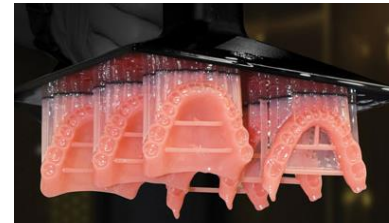
## Dental Restorative Materials

Bioactive Interpenetrating Phase Ceramics  
Multilayered Zirconia



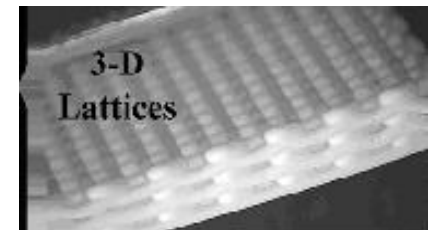
## Rapid Manufacturing Applications

3D Printing of Ceramics and Polymers



## Molecular Biocompatibility

Material-Tissue Interactions  
Tooth and Bone Regeneration  
Tissue Matrix Scaffolds

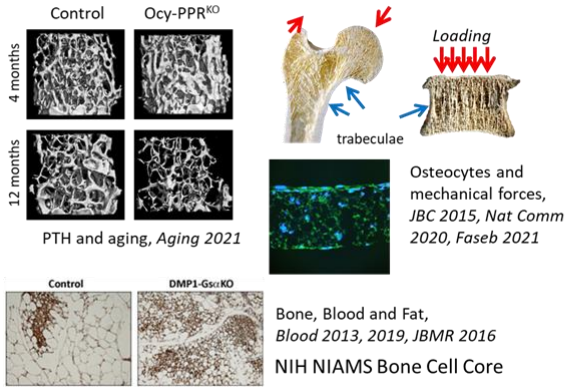


## Novel Remineralization Materials



# Translational Dental Medicine

## Bone mechanical forces, hormonal cues and aging



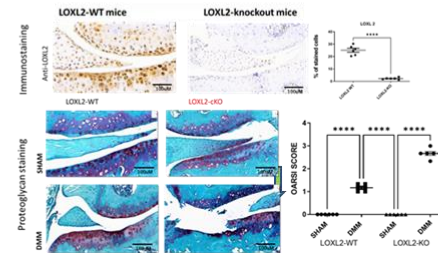
The Divieti Pajevic lab uses in vitro and in vivo mouse models to study the effects of mechanical forces, hormones (PTH) and aging on bone homeostasis

## LOXL2 in osteoarthritis and regeneration

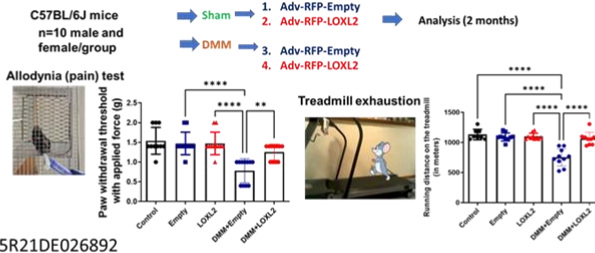
### Novel Destabilized medial meniscus model



### LOXL2 knockout mice destroy cartilage after DMM



### LOXL2 gene therapy reduces pain and restores knee joint function

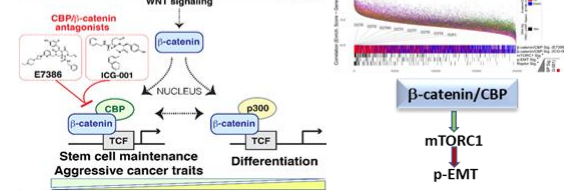


**Academic Collaborations:** SDM Endodontics, BUMC Biochemistry, Computational Biomedicine, Cancer Center, College of Engineering: BU nano & Biomedical Engineering, Sargent College; Harvard, UCSF, ECMC, Tulane, Oslo

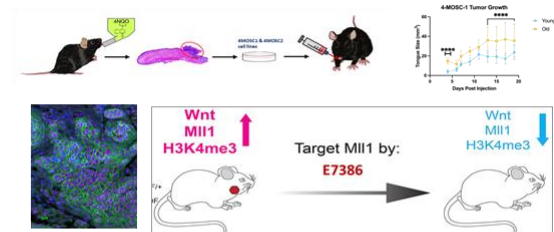
**Industry Collaborations:** Eisai Co., Ltd, Endologic



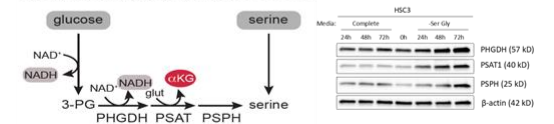
## The $\beta$ -catenin/CBP Axis in the Evolution of Head and Neck Cancer



### Aging in OSCC Development and Progression

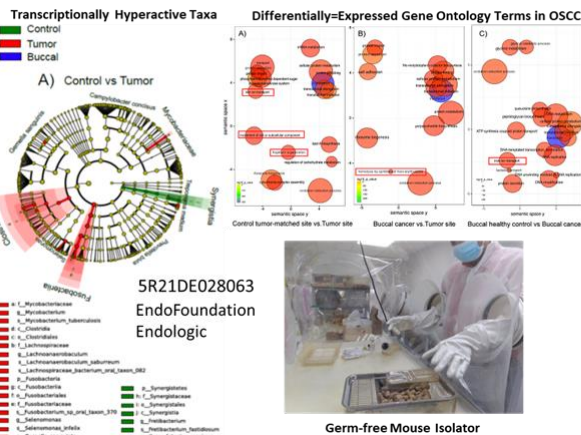


### Metabolic Regulation of HNSCC Cell Plasticity/Cell Fate Identity



1R01DE030350 3R01DE030350-01A1S1 Eisai Co., Ltd.

## Oral Microbiome in oral cancer and chronic systemic diseases





# Research at GSDM

***THANK YOU***

