

Benefits of conducting research while completing the DDS program

- Critical thinking skills and opportunity to publish scientific papers
- NIH/NIDCR training opportunities (basic and clinical research)
- Presentation at local and national meetings and interactions with students from other universities
- One-on-one interaction with faculty and research scientist in the lab

Functional analysis of genomic islands of a periodontal pathogen *Aggregatibacter actinomycetemcomitans* (*Aa*) - Casey Chen

- >300 genomic islands were identified (via whole genome sequencing) among 33 strains of *Aa*.
- These islands were acquired via horizontal gene transfer (from phylogenetic analysis) and stably integrated in the genomes (from comparative genomic analysis), and found to be expressed in specific growth conditions (RNA-seq data).
- Hypothesis: genomic islands modulate the virulence expression of *Aa*
- Approach: genetic analysis, phenotype analysis and virulence testing in rats

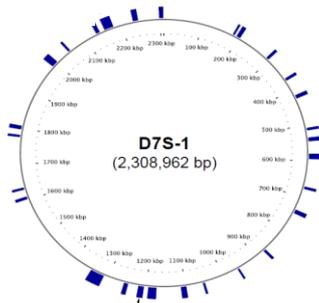
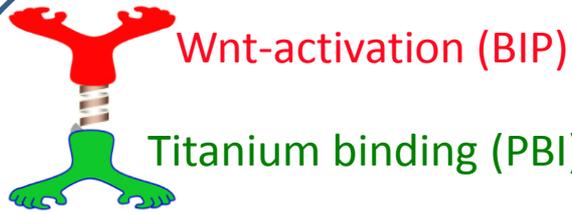
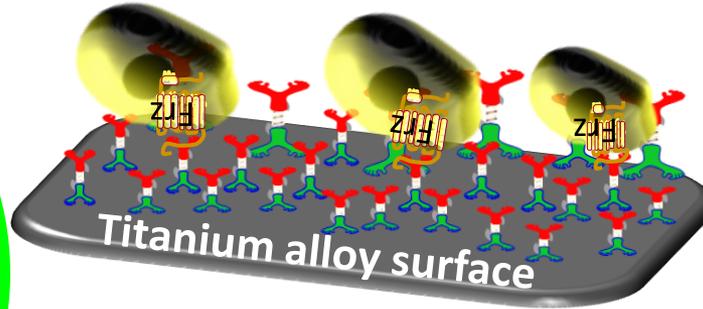
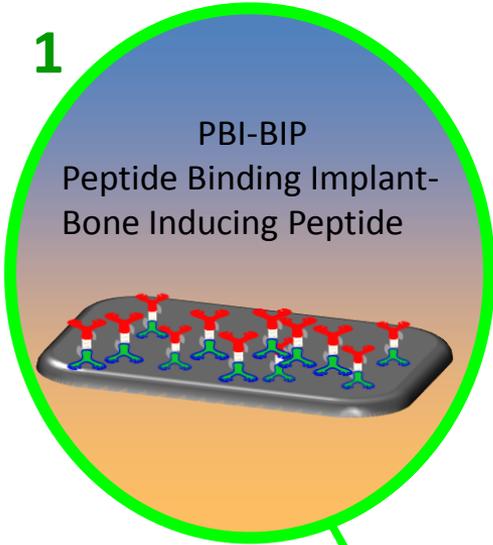


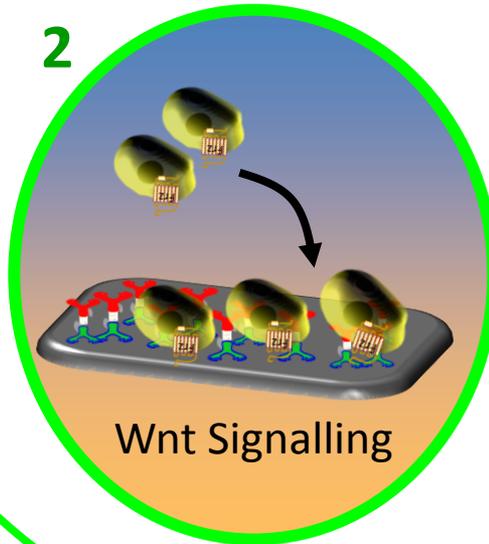
Fig. The genetic map of genomic islands (bars) of *Aa* strain D7S-1.



1

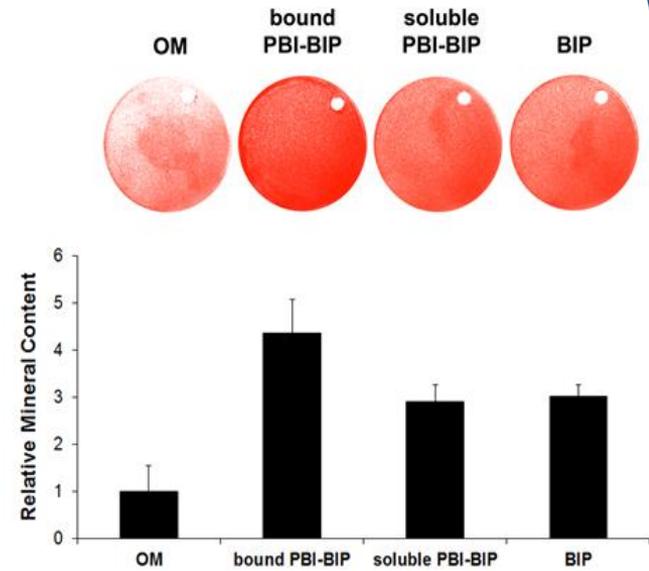
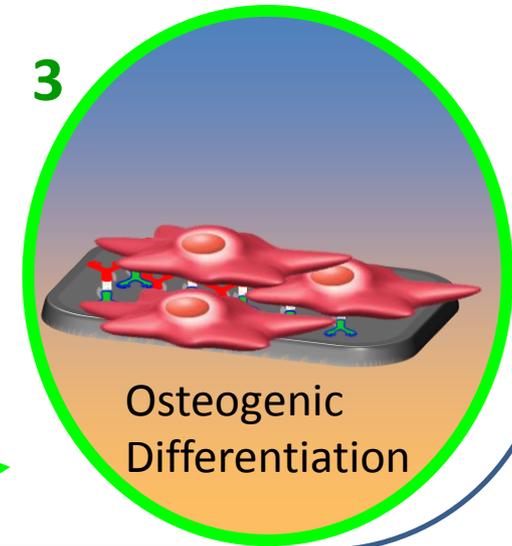


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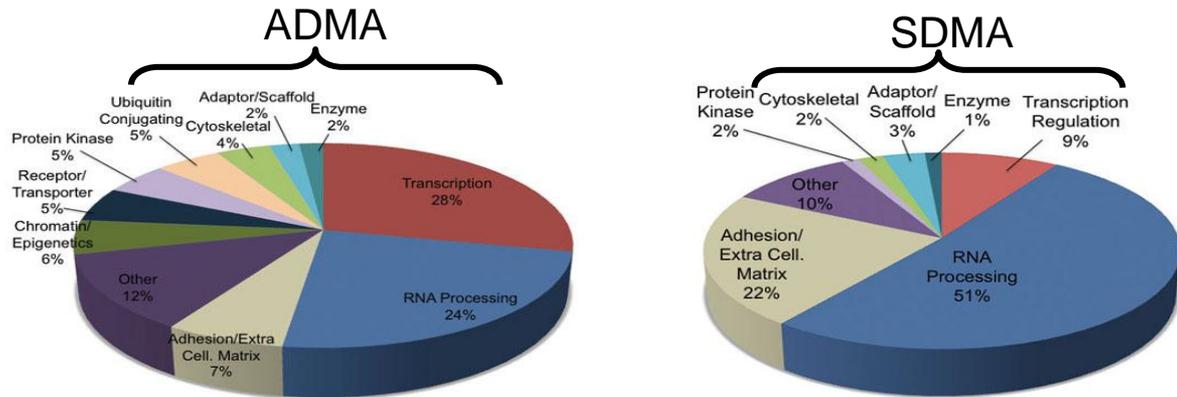
Regulate stem cell fate

3

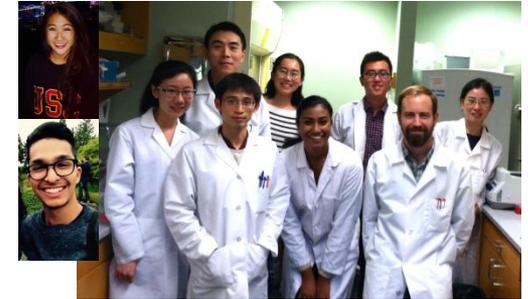


Jian Xu Lab – We study protein methylation in signal transduction, craniofacial development and injury repair

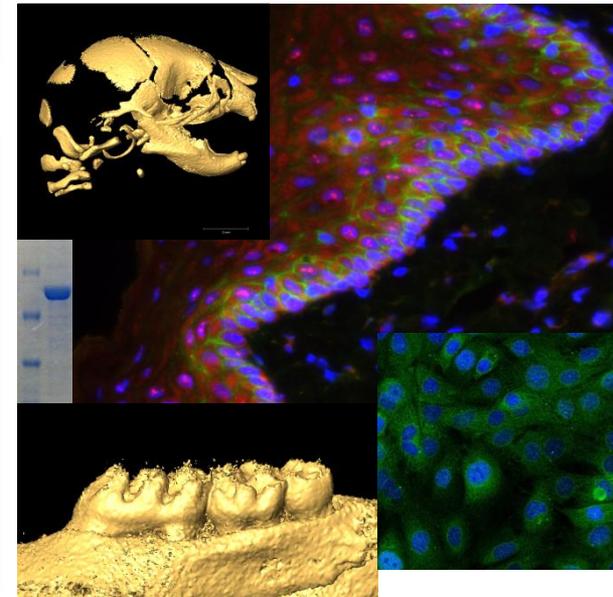
Cellular functions of Protein Arginine Methylation:



Lab member:



Sample images from our work:



Research Approach:



Biochemical approaches



Cell Culture



- Tooth movement model
- Periodontitis model
- Mouse genetic models

NAVAZESH RESEARCH OPPORTUNITIES

Potential Research Opportunities:

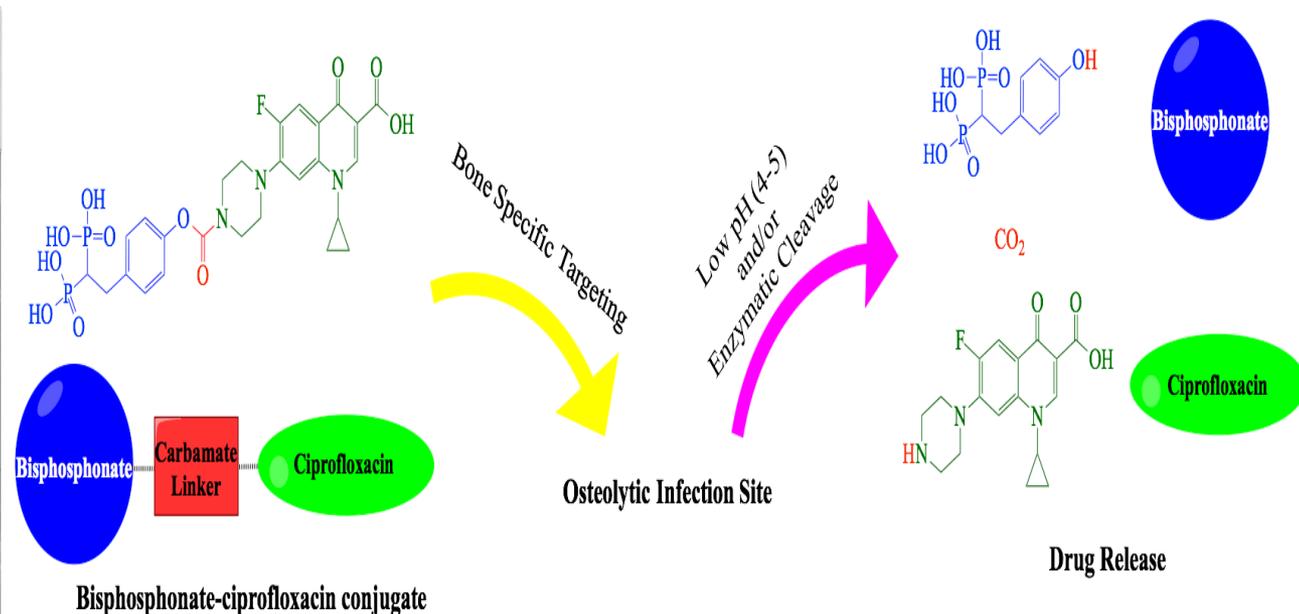
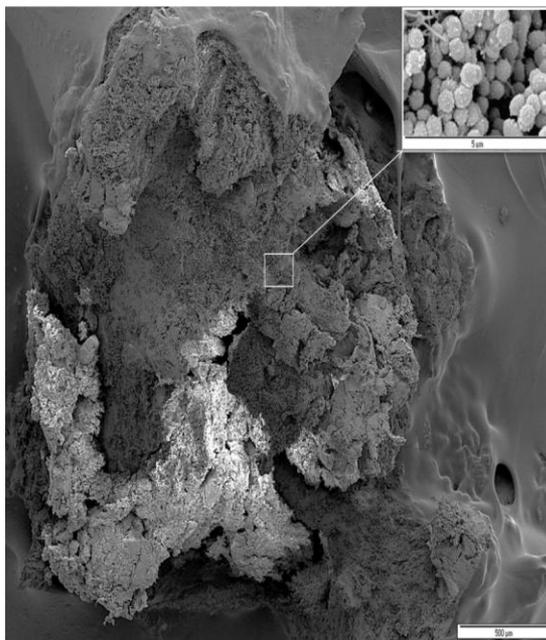
- Education, Evaluation and Outcomes Assessment
- Evidence-based Decision Making
- Inter-professional Education
- Educational Pedagogies
- New Technologies and Innovation
- Student Perceptions and Attitudes
- Salivary Diagnostics
- Saliva in Health & Disease

Knowledge, Skills and Tools That May Be Used:

- Protection of Human Subjects and Institutional Review Board Processes
- Data Management
- Descriptive Data Analysis
- Epidemiologic Methods
- Meta-analysis

navazesh@usc.edu

Design, synthesis, and antimicrobial evaluation of a novel bone-targeting bisphosphonate-ciprofloxacin conjugate for the treatment of osteomyelitis biofilms – Parish Sedghizadeh



Osteomyelitis is a major problem worldwide, and is devastating due to the potential for limb-threatening sequelae and mortality. Osteomyelitis pathogens are bone-attached biofilms, making antibiotic delivery challenging. Here we describe a novel osteoadsorbent bisphosphonate-ciprofloxacin conjugate, utilizing a ‘target and release’ chemical strategy, which demonstrated a significantly enhanced therapeutic index versus ciprofloxacin for the treatment of osteomyelitis in vivo. In vitro antimicrobial susceptibility testing of the conjugate against common osteomyelitis pathogens revealed a strong bactericidal profile and sustained release of the parent antibiotic over time. Conjugates incorporating a bisphosphonate and an antibiotic for bone-targeted delivery to treat osteomyelitis biofilm pathogens is a promising approach to providing high bone-antimicrobial potency while minimizing systemic exposure. Sedghizadeh et al. accepted by

Single-cell Molecular Profiling of Cancer

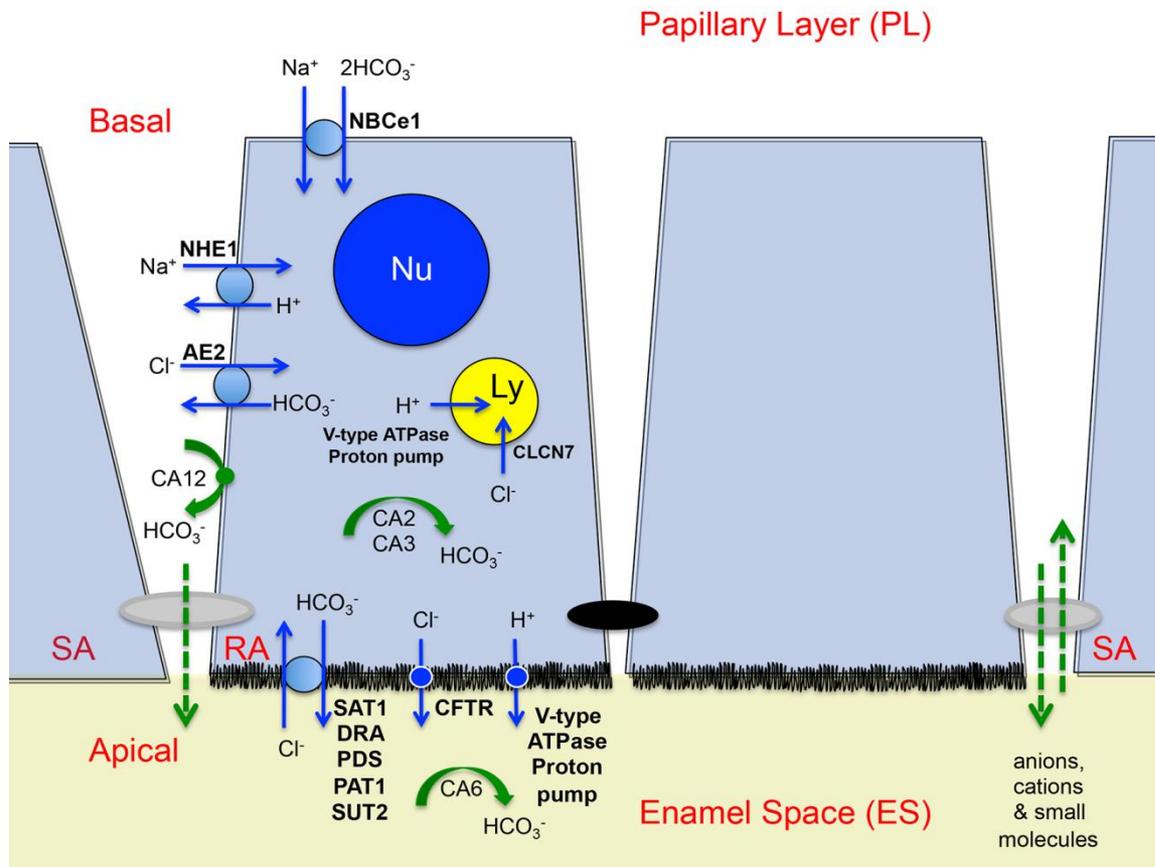
❖ **Molecular characterization of circulating tumor cells (CTCs)**

CTCs are cancer cells that are shed by a primary tumor into the vasculature and remain in circulation until they are deposited in distant sites, which leads to metastasis. Molecular characterization of CTCs offers considerable promise not only as a prognostic marker but, more importantly, as a predictive marker of response to treatment and to select patients for targeted therapies.

❖ **Molecular foundation of treatment resistance in neuroblastoma**

To identify the drug-resistance mechanism in neuroblastoma, we cluster molecularly similar cells into a “digital clone” with single-cell technology. The molecular profiles of resistant clones can be developed into sensitive PCR assays for early detection of drug-resistance at diagnosis, and for personalized therapies to overcome treatment resistance.

Michael Paine: Physiology of enamel-forming cells. The ongoing work is focused primarily at identifying ion channels, pumps and exchangers of ameloblasts that are involved in maintaining physiological pH levels in the forming enamel. Many of these ion channels, pumps and exchangers have been linked to human and dental disease.



Investing in the **FUTURE** of kids

Face Up To Unresolved Research Enigmas of Kids

Why do **Neurocristopathies** occur (CHARGE and BFLS)?
Can we **prevent** or **alleviate** the consequences of birth defects?

Why are **Children** born with **Cancers** like **Neuroblastoma**?

How does the cancer **sometimes** regress on its own?

Why does it **regress** only sometimes?

B
A
J
P
A
I
lab
CCMB

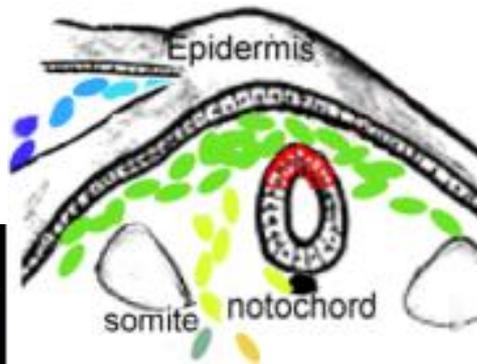


Tiffany Eddie

I.

Embryonic
Disease
models:
Frog/fish

NCC in
human
embryo

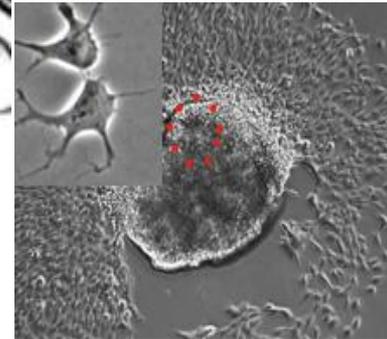


Cross section showing
NCC migrating from
neural tube

Human

NCC

'made in CCMB'



II.

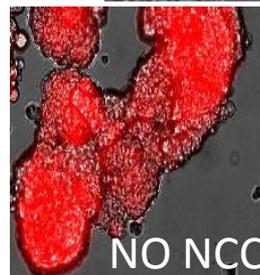
Stem cell
disease
models
in a dish

understanding
disease

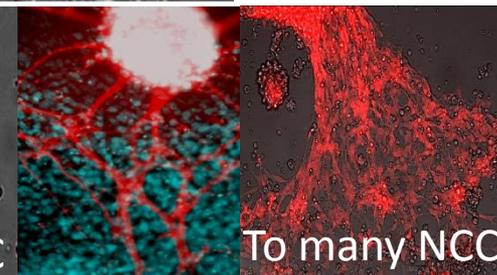
drug screen

finding
modifiers

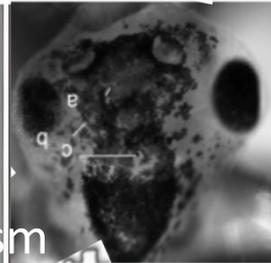
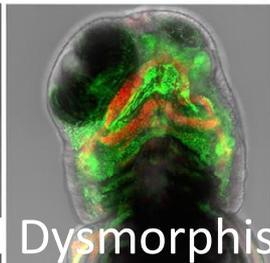
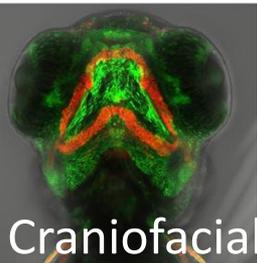
Stem cells for
replacement
therapy



NO NCC



To many NCC



Craniofacial Dymorphism

Amy Merrill Lab: We study disease mechanisms of skeletal birth defects



The skeleton:

Wonderfully adaptable organ system that supports and protects vital organs, allows for movement, and underlies the basis for physical appearance

Questions we are answering:

1. What regulates cell fate of skeletal progenitors?
2. How are bones patterned?
3. How are bones linked to other tissue types?
4. What regulates joint formation?

Goal: #FightOnForACure

Our approach:

1. Starting point of discovery- events to study rare developmental learn about normal processes.



2. Model rare disorders in mice and avian embryos:



Our team of scientists:



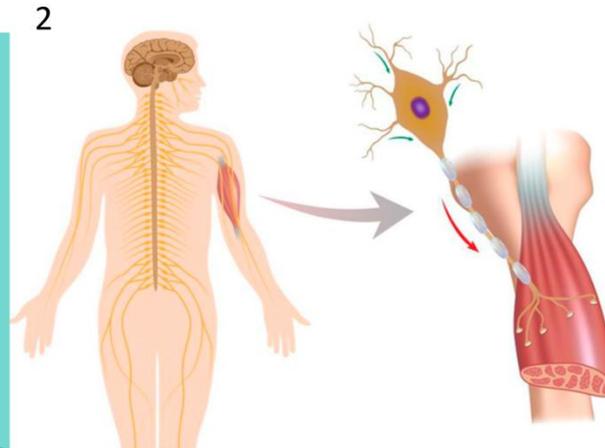
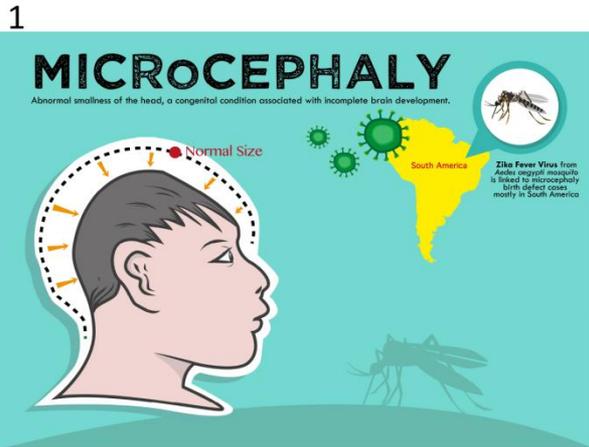
Jianfu Chen Lab

Research directions

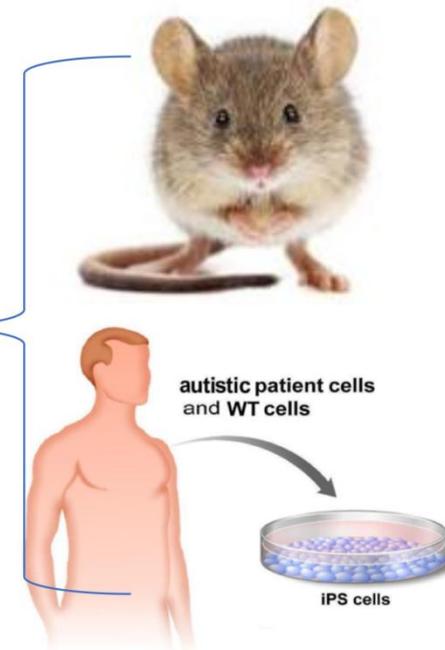
chenlab.usc.edu

1. Genetic and environment induced brain & craniofacial defects

2. Bone-muscle cross talk in Amyotrophic Lateral Sclerosis (ALS)



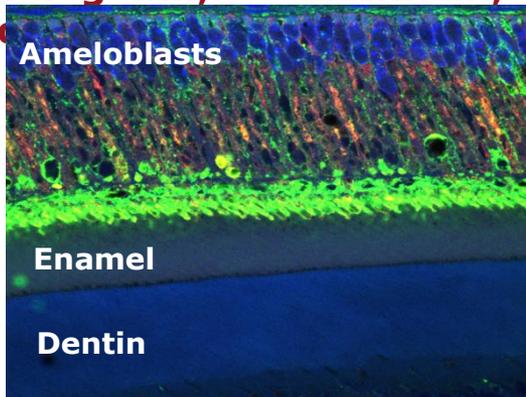
Model



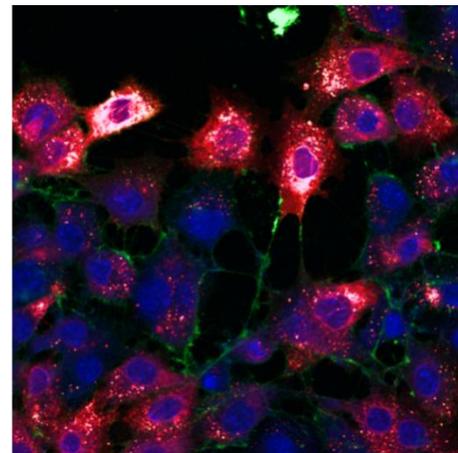
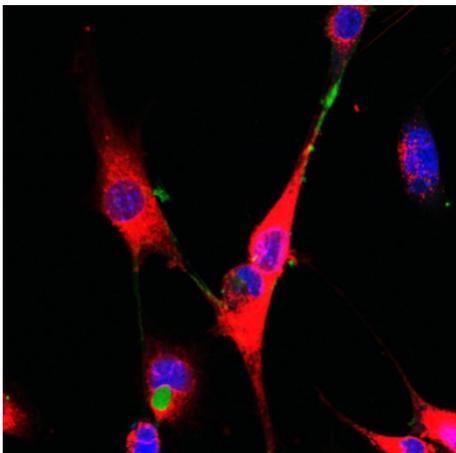
Prof. Janet Oldak

Matrix-mediated enamel formation

- To understand the molecular mechanism of enamel formation with an emphasize on the structure, function and interactions of the enamel matrix: **amelogenin, enamelin, ameloblastin, and pro**



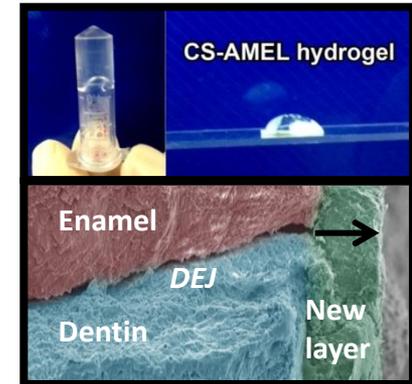
In-vivo visualization of amelogenin (Green) - ameloblastin (Red) interaction in developing mouse incisors. (Unpublished data; Rucha Bapat, More reading: Mazumder et al., J. Dent. Res. 2016.)



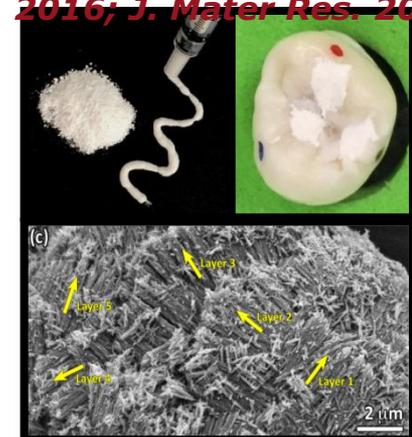
Ameloblastin, one of the key matrix proteins for enamel formation, is a cell membrane binding protein. Red: cell membrane; blue: nucleus; green: ameloblastin. (Dr. Jingtan-Su; unpublished data)

Biomimetic Tooth Repair

- To develop biomimetic strategies for the creation of enamel-like materials for tooth repair.



Amelogenin-based matrix for superficial enamel reconstruction (J. Mater. Chem. 2015; J. Biomed. Eng. Inform. 2016; J. Mater Res. 2016.)

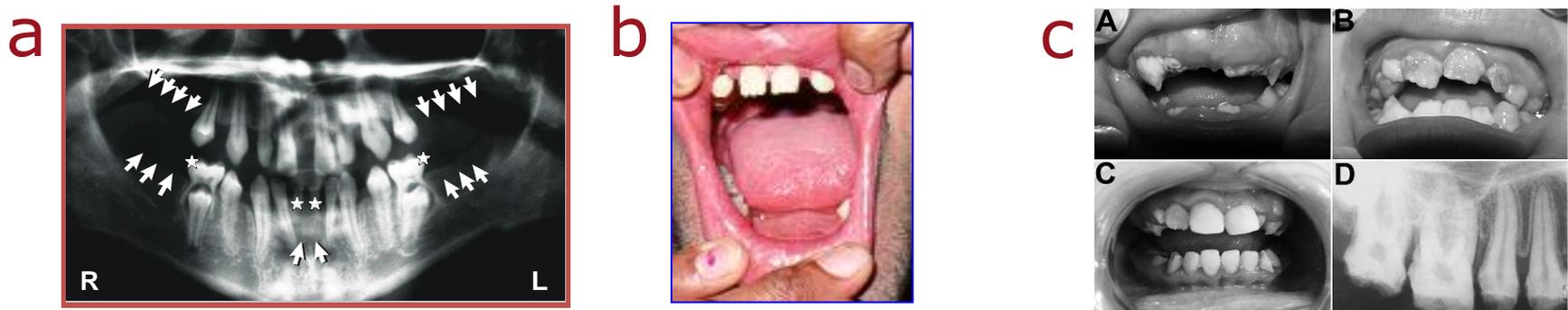


Layered monetite-chitosan composite as a potential bulk enamel-mimetic material (ACS Biomater. Sci. Eng. 2016.)

Laboratory of Pragna Patel, Ph.D

Goal: To discover genetic basis of dental and craniofacial defects

- The lab has previously mapped mutations underlying:
 - (a) severe hypodontia involving missing molars (mutations in PAX9)
 - (b) missing incisors (EDA1)
 - (c) amelogenesis imperfecta (chromosome 8q24)



- Have you seen or heard of a patient with a dental or craniofacial anomaly
 - Does the condition track in the family?
 - How many other affected family members are there?
 - What is the inheritance pattern?
 - Is the phenotype novel?
 - Even if it is not novel, could it be a different mutation within a gene previously associated with the defect? This could still be a useful study!
 - Using genomic technologies, these types of patients can be characterized in the Patel lab

Stephen Yen and MinKyeong Lee
(min.lee@usc.edu, syen@usc.edu,)

Children's Hospital Los Angeles, CCMB
Orthodontics and Oral Surgery

Areas of Research:

Clinical: Cleft palate nasopalveolar molding and alternative care outcomes, bone graft outcomes, orthognathic surgery and orthodontic outcomes,

Database: secondary database analysis of national databases, development of a digital archive of craniofacial patients, conebeam CT comparisons

Translational: novel therapies-light-mediated and surgically-mediated orthodontic tooth movement, novel distraction devices, programmable expanders, custom devices for children with unusual craniofacial anomalies

Genetic studies on Pierre Robin sequence and hemifacial microsomia with Dr. Sanchez.