UCSF School of Dentistry

Research Proposal Workshop

John C. Greene Society

2026

Why participate in research here at UCSF?

- Develop critical thinking skills
- Gain invaluable research experience
- Better understand the connection between research and clinical practice
- Work on a research project across 32 weeks
- Present your poster at Research and Clinical Excellence Day and other conferences including the AADOCR and/or IADR
- $1,500 in stipend and up to $500 for research expenses

What to expect?

- Total Commitment: July 2026 – March 2027
  - 400hrs total, spread over 32 weeks (average 12.5h/wk but ranging from 8h to 20h/wk)
- Attend monthly update meetings and workshops
- Complete progress reports (x3)
- Have IRB (if applicable) in process before applying
- Deadline to submit proposal: **May 11 2026 by 11:59pm**
  - Submission details to follow

Breakdown of the Research Proposal

I. Cover page

- Title
- Your name and email
- Your mentor's name and email
- Date of submission

II. Research Proposal ***(Limit to 4 pages PDF, 1400 words!!)***

- Specific Aims
- Research Strategy
  - Significance
  - Innovation
  - Approach
- Additional Information:
  - Resource Information and Facility/Equipment
  - Other Support for applicant/sponsor ***(if any)***
  - Recombinant or DNA Molecules ***(if any)***

III. Literature Cited

IV. Letter of support from your PI

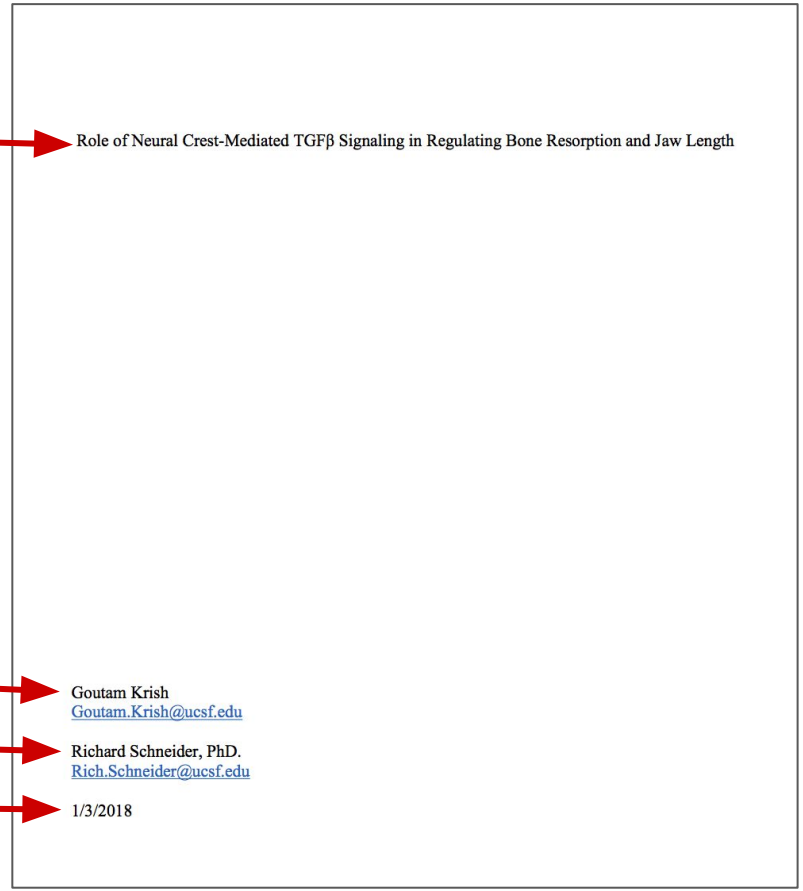
I. Cover Page

Title: Provides a specific summary of the proposed work, without too much detail

Your name and **email**

Your PI's name and **email**

Date of submission



II. Research Proposal: Specific Aims

- **Specific Aims**
- Research Strategy
  - Significance
  - Innovation
  - Approach
- Additional Information:
  - Resource Information and Facility/Equipment
  - Other Support for applicant/sponsor ***(if any)***
  - Recombinant or DNA Molecules ***(if any)***

Specific Aims

There are 3 essential components of a good research proposal:

- **Why** should they fund your research?
  - Novelty
  - Clinical Significance
  - Contribution to the society
- **What** are you going to do?
  - Your research hypothesis
  - Overarching goal of the project
- **How** are you going to do it?
  - Specific Aims/Methods

A. Specific Aims

Homeostasis between bone formation and bone resorption is essential in preventing craniofacial deformities such as micrognathia, where a foreshortened jaw leads to malocclusion [1-2]. Although orthodontic treatments fix the bite, the underlying cause is not well understood. The neural crest mesenchyme (NCM), which gives rise to the developing jaw, regulates gene expression during osteogenesis, mediates bone-resorption, and regulates jaw size [2-3].

To identify cellular and molecular signaling pathways that pattern the jaw skeleton, our lab has developed a chimeric transplant system using quail and duck embryos, which differ greatly in jaw size and shape. Japanese quail (*Coturnix coturnix japonica)* have significantly shorter beaks than the white Pekin duck (*Anas platrhynchos domestica*), so NCM-mediated differences in jaw development are readily identified in "quck" chimeras. Transplanting NCM from quail to duck dramatically elevates expression of bone resorption enzymes and generates chimeras with quail-like jaws [8-9]. Although our lab has determined that the NCM is crucial for determining jaw size, the underlying signaling pathways involved in mediating this process remain to be understood. One crucial signaling pathway which governs bone remodeling is Transforming Growth Factor β (TGFβ) [4-7]. We postulate that differences in bone resorption arise from species-specific differences in TGFβ signaling. Based on these results, **I hypothesize that NCM controls jaw length through differential regulation of TGFβ pathway members and its targets during development.** I will test my hypothesis in two Specific Aims:

Specific Aim 1 - Determine the extent to which NCM controls jaw length through activation of TGFβ signaling. At key stages of embryonic development in duck, quail, and chimeras, I will examine the effect of TGFβ overexpression on bone resorption using bone resorption markers, as well as assess the effects on jaw length.

Specific Aims: Example

Why: Homeostasis between bone formation and bone resorption is essential in preventing craniofacial deformities. Although orthodontic treatments fix the bite, the underlying cause is not well understood. Although our lab has determined that **A** is crucial for determining jaw size, the underlying signaling pathways involved in mediating this process remain to be understood

What: To identify cellular and molecular signaling pathways that pattern the jaw skeleton, our lab has developed a chimeric transplant system using quail and duck embryos, which differ greatly in jaw size and shape.

- **Central Hypothesis:** I hypothesize that **A** controls jaw length through differential regulation of **B** during development.

How:

- **Specific Aim 1:** Determine the extent to which **A** controls jaw length through activation of TGFB signaling
- At key stages of embryonic development in duck, quail, and chimeras, I will examine the effect of **B** overexpression on bone resorption using bone resorption markers, as well as assess the effects on jaw length.
- **Specific Aim 2:** Determine the extent to which **A** controls jaw length through inhibition of **B**.

II. Research Proposal: Significance

- Specific Aims
- Research Strategy
  - **Significance**
  - Innovation
  - Approach
- Additional Information:
  - Resource Information and Facility/Equipment
  - Other Support for applicant/sponsor ***(if any)***
  - Recombinant or DNA Molecules ***(if any)***

Significance

- Describe the **broad problem** that your research is trying to tackle
- Show the reader the **clinical importance** of your research
- Perform a literature review to determine:
  - **What** has been done
  - **How** your study will expand on current knowledge
- You can use preliminary data from your lab to support your study

Significance: Example

- **Introduction of broad problem**

  Sample Text: In the United States, craniofacial malformations are one of the most common birth defects in humans.

  - **Clinical Importance**

    An increased understanding of the mechanism behind these structural diseases would be useful for the development of preventative or therapeutic applications.

  - **What has been done?**

    However, despite progress towards identifying the genetic basis of these diseases, there is a lack of genotype-phenotype correlation, even in those with identical mutations, that makes it difficult to understand the mechanism in individual patients.

- **How your study will expand the current line of thinking?**

  This study aims to elucidate the mechanisms that control these genetic diseases and provide insight to possible preventive treatments for patients.

II. Research Proposal: Innovation

- Specific Aims
- Research Strategy
  - Significance
  - **Innovation**
  - Approach
- Additional Information:
  - Resource Information and Facility/Equipment
  - Other Support for applicant/sponsor ***(if any)***
  - Recombinant or DNA Molecules ***(if any)***

Innovation

- Describe what **new** information your research will contribute to the field
- If there are gaps in previous research that your study will fill, how will this expand on current project(s) being done?
- If a novel (i.e. never been done/used before):
    - Method
    - Approach
    - Assay
    - Cell Type
    - Etc.
- Is being utilized, this is where you would describe (or expand on) them

Innovation: Example

- **Introduction Broad problem**

Sample Text: From the current literature we know many genetic and environmental causes of HPE and other craniofacial malformations but we do not understand why there is variation.

- **Clinical Importance**

As stated above, the canonical Wnt pathway has a crucial role in craniofacial development.

- **What has been done?**

However, to our knowledge, previous studies have yet to analyze the Wnt-signaling pathway and its correlation to a range of phenotypes in models within the same genotype.

- **How your study will expand current link of thinking?**

Studying this pathway in a novel model of HPE that recapitulates the wide variation of craniofacial phenotypes will provide unique insight to disease variation that is currently present in human HPE.

II. Research Proposal: Approach

- Specific Aims
- Research Strategy
  - Significance
  - Innovation
  - **Approach**
- Additional Information:
  - Resource Information and Facility/Equipment
  - Other Support for applicant/sponsor ***(if any)***
  - Recombinant or DNA Molecules ***(if any)***

Approach (Materials & Methods)

- Describe each experiment to be used individually
- Should be detailed enough that someone reading can replicate
- Section should include how data will be analyzed
- If using a known or widely used protocol/assay/method, make sure you add a reference or citation

Sample Text: "Tissue samples from the mouse embryos will be processed for Western Blot and immunohistochemistry. Wnt signaling quantification will be visualized using Western blot for active β-catenin and/or immunohistochemistry for β-catenin nuclear staining. Additionally, the Wnt target gene Axin2 will be quantified in order to determine Wnt expression levels. After microCT scanning, the heads will be collected and total protein will be prepared. This will be run on an SDS-PAGE gel and transferred to a membrane for western blot analysis. Alternatively, heads will be embedded in paraffin, sectioned and stained with the antibodies to visualize the distribution of Wnt pathway activation. An estimate of the proportion of positive nuclei will be determined using Stereology." Statistical significance will be determined using One-Way ANOVA and Two-Way ANOVA.

Approach (Materials & Methods)

- Describe each experiment to be used individually
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II. Research Proposal: Additional Information

- Specific Aims
- Research Strategy
  - Significance
  - Innovation
  - Approach
- **Additional Information:**
  - **Resource Information and Facility/Equipment**
  - **Other Support for applicant/sponsor *(if any)***
  - **Recombinant or DNA Molecules *(if any)***

Additional Information

- **Resources**
  - With help from your lab or past proposals, give detailed information about your lab's resources
    - Location (**i.e.** Which campus, size of laboratory, bench space, utility rooms, core facilities, animal facilities, etc.)
    - Equipment (**i.e.** Centrifuges, Computer Hardware/Software, biosafety cabinets, etc.)
    - Storage (**i.e.** Freezers, fridges, liquid nitrogen tanks, servers, hard drives, etc.)
- **Other Support**
  - Often the grant of your PI or Post-Doc
  - If you are being co-mentored, it is usually a good idea to obtain their NIH Biosketch to submit with your application
- **Recombinant DNA**
  - If you are using recombinant DNA, state the nature of it. In detail
  - If not, simply state "Not Applicable" or "N/A"

Additional Information: Example

Sample Resources Text: "Research will be conducted in the Marcucio laboratory within the Orthopaedic Trauma Institutes at the Zuckerberg San Francisco General Hospital. The laboratory is about 2,000 square feet and has bench space for up to 16 individuals. The laboratory contains the necessary equipment for the research we will be doing, including a microscope and image capture suite, sn isolated cell culture facility, a histology suite, a surgical suite for performing animal surgery, a dark room for film development and any basic support equipment that we may need such as centrifuges, vortex, autoclaves, etc."

Sample Additional Support Text: NIH R01DE019638

Sample Recombinant DNA Text: "IDH1 wild type and R132H mutant IDH1 NIH 3T3 mouse fibroblast cells for mammalian expression are currently available from Dr. White. Recombinant IDH1 is in a plasmid for bacterial expression and we will use site-directed mutagenesis to produce the IDH1-R132H mutant for bacterial expression."

III. Literature Cited (References)

- **In text Citation Example:** “Each year craniofacial birth defects cause several abnormalities including micrognathia and retrognathia, leading to a shortened jaw [10-12]”
- The full reference goes on separate page after the research strategy
- Doesn’t count towards page limit!

1. Eke, P.I., et al., *Prevalence of Periodontitis in Adults in the United States: 2009 and 2010*. Journal of Dental Research, 2012. **91**(10): p. 914-920.
2. Kebschull, M., R.T. Demmer, and P.N. Papapanou, *"Gum bug, leave my heart alone!"--epidemiologic and mechanistic evidence linking periodontal infections and atherosclerosis*. Journal of dental research, 2010. **89**(9): p. 879-902.
3. Madianos, P.N., Y.A. Bobetsis, and S. Offenbacher, *Adverse pregnancy outcomes (APOs) and periodontal disease: pathogenic mechanisms*. Journal of Periodontology, 2013. **84**(4S): p. S170-S180.
4. Lundberg, K., et al., *Periodontitis in RA—the citrullinated enolase connection*. Nature Reviews Rheumatology, 2010. **6**(12): p. 727-730.
5. Karpinski, T.M., *Role of Oral Microbiota in Cancer Development*. Microorganisms, 2019. **7**(1).
6. Van Dyke, T.E., *The management of inflammation in periodontal disease*. J Periodontol, 2008. **79**(8 Suppl): p. 1601-8.

Do's and Don'ts

- **Do** make sure to obtain a ***letter of support*** from your mentor as early as possible!
- **Do** be concise! Have clear objectives!
  - **DON'T:** Too many details on minor issues, or not enough details on major issues
    - Keep in mind, your research plan needs to fit within 4 pages. This is super short!
  - What you think is important may not be as important to reviewers. **Do** have peers, graduate students or your PI to read your over your application before submission
- Quality of text and presentation
  - **DON'T:** Sloppy grammar and typos reflect a lack of professionalism and will affect the reviewers' decisions.
  - **DO** Keep the tense and pronouns (**i.e.** I vs. We) consistent

Do's and Don'ts (Cont.)

- **Do** be assertive and confident!
  - Besides your mentor, you will be the #1 expert on your research. Be confident about your project and its success!
- **Do** have preliminary data
  - Not essential, but your plans will look more feasible and convincing with preliminary data
- **Do** Edit, edit, edit!
  - Although your mentors may be helping you, it is ultimately up to you to make sure your proposal is free of mistakes and ready for submission.
- **DON'T procrastinate!**
  - Don't wait until the last minute to start! Communicate with your mentor early on to make sure they will be accessible during the break to help you write your proposal.
  - The deadline is right in the beginning of August. Your mentor may be on vacation and might not be accessible.

Grant Awarding Criteria

Reviewing criteria for selecting UCSF SoD Research Fellows:

1. **Approach:**
    a. Presence of a testable hypothesis
    b. Suitability of the design and methods
2. **Significance:**
    a. Does the project address an important problem or a critical barrier to progress in the field?
3. **Training potential:**
    a. Anticipated student research experience in participating in the project
4. **Clarity/organization of proposal**

IMPORTANT: Study proposals **must be written by the student,** with help from the mentor. Proposals solely written by the mentor will not be accepted as part of the research experience for the student is the development of a research protocol.

Example Fellowship Proposals Below:

https://ucsf.box.com/s/r443fg46b74adr3xidh1rm2mny3apgok

John C. Greene Society

PEER EDITING

WORKSHOP

Have your research proposals reviewed by previous D0/D2 Research Fellows!

Food provided!

4/23
5PM
CS-0101

Thank You and Good Luck!

UCSF School of Dentistry