



401 N. Lindbergh Blvd.  
St. Louis, MO 63141  
Tel.: 314.993.1700, #546  
Toll Free: 800.424.2841, #546  
Fax: 800.708.1364  
Cell: 314.283.1983

Send via email to: [jbode@aaortho.org](mailto:jbode@aaortho.org) and [cyoung@aaortho.org](mailto:cyoung@aaortho.org)

## AAO Foundation Final Report Form (a/o 6/30/2020)

*In an attempt to make things a little easier for the reviewer who will read this report, please consider these two questions before this is sent for review:*

- Is this an example of your very best work, in that it provides sufficient explanation and justification, and is something otherwise worthy of publication? (We do publish the Final Report on our website, so this does need to be complete and polished.)*
- Does this Final Report provide the level of detail, etc. that you would expect, if you were the reviewer?*

Please prepare a report that addresses the following:

Type of Award: Biomedical Research Award

Name(s) of Principal Investigator(s): Achint Utreja

Institution: Southern Illinois University School of Dental Medicine

Title of Project: The Effect of Raising the Bite on the Muscles of Mastication

Period of AAOF Support: 07-01-20 to 06-30-22

Amount of Funding: \$29,956

Summary/Abstract:

### **Objectives**

Posterior “bite blocks” or composite resin bonded to the occlusal surfaces of maxillary and mandibular molars, are frequently used during orthodontic treatment with fixed appliances. The increase in the vertical dimension produced by bite blocks stretched the muscles of mastication including the masseter. The objective of this animal study was to analyze the histological changes in the masseter after placement of posterior bite blocks.

### **Methods**

Six-week-old male Sprague Dawley rats were used for this study, and all animals were equally divided into experimental (EXPT) and control (CTRL) groups. Posterior bite blocks of

standardized dimensions were fabricated outside the mouth using polyvinyl siloxane molds, filtek composite resin and dental curing light. Animals were sacrificed after 7, 14 and 21 days, and the right and left masseters were dissected, embedded in optimal cutting temperature (OCT) compound and sectioned using a cryostat. The histological sections were then stained with hematoxylin and eosin and immunostained for the localization of the myogenic cell lineage markers Pax7 and myogenin.

### Results

Hematoxylin and eosin staining showed increased stretching of individual masseter muscle fibers. Immunostaining showed increased Pax7 expression at 7 days along the length of the muscle fibers with concentrations of positive cells at the muscle origin and insertion sites. Myogenin expression increased at 14 days and corresponded with a reduction in Pax7 expression. Expression of both Pax7 and myogenin decreased at 21 days. Cell proliferation peaked at 7 days and decreased after that, returning closer to control levels at 21 days.

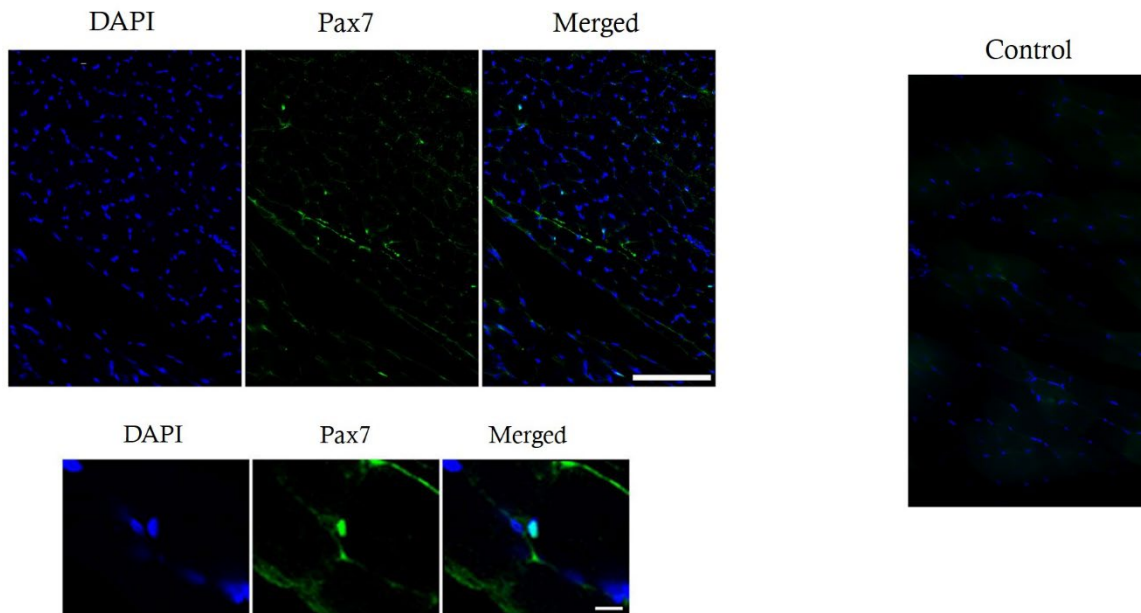
### Conclusions

Short-term change to the vertical occlusal dimension with posterior bite blocks activates the myogenic cell lineage. The adaptive response of the muscle fibers is increased cell proliferation and differentiation.

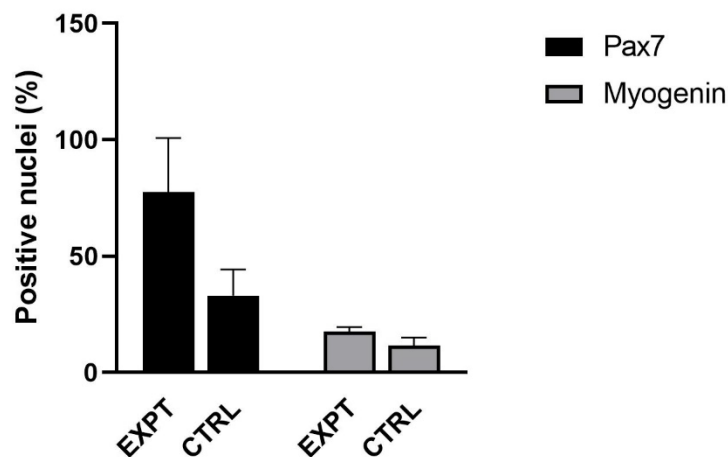
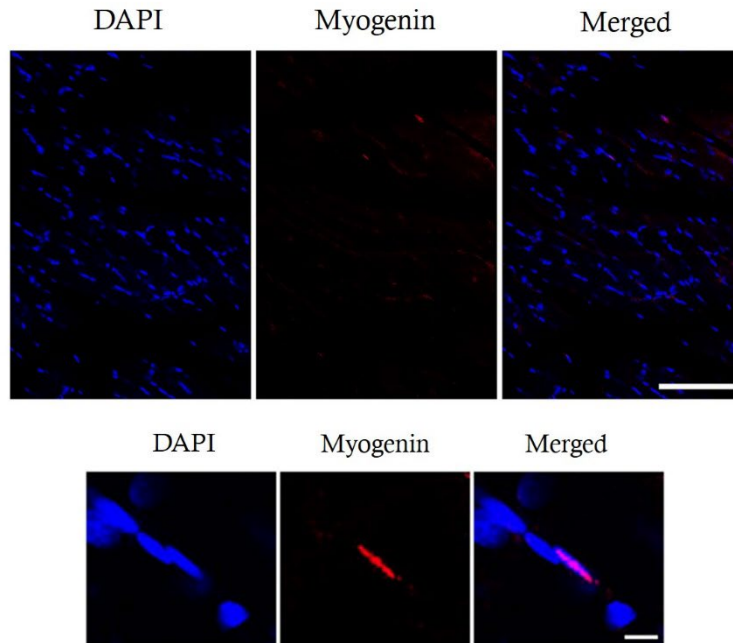
#### Detailed results and inferences:

- In the EXPT group, the number of Pax7-positive nuclei was higher compared to the CTRL group
- Myogenin-positive nuclei appeared in similar numbers
- Pax7-positive nuclei are closer to the tendon insertion

## Pax7 expression



# Myogenin expression



Respond to the following questions:

1. Were the original, specific aims of the proposal realized? **Yes, the specific aim of the proposal was realized.**
2. Were the results published? **The data are being analyzed and a manuscript is in preparation for submission.**
  - a. If not, are there plans to publish? **Yes**
3. Have the results of this proposal been presented? **Yes, the results were presented at the 2022 AADOCR/CADR Annual Meeting in Atlanta, GA in March 2022, and published in a special issue of the Journal of Dental Research.**

**The results were also presented in April 2022 Annual Research Day of the Southern Illinois University School Dental Medicine.**

- a. If so, list titles, author or co-authors of these presentation/s, year and locations
    - The Effect of Posterior Bite Blocks on the Masseter Muscle. A. Utreja, A. De Maria, A. Kullar, F. Al Khatib, D. Welch, *J Dent Res Vol #101*(Spec Iss A):0188, (<https://iadr.abstractarchives.com/abstract/51am-3668539/the-effect-of-posterior-bite-blocks-on-the-masseter-muscle>)
    - The Effects of Posterior Bite Blocks on Brux-Like Motor Patterns. M. Wolf, M. Moore, Y. Won, M. Plotner, A. Utreja, D. Welch, *J Dent Res Vol #101*(Spec Iss A):0188, (<https://iadr.abstractarchives.com/abstract/51am-3665798/the-effects-of-posterior-bite-blocks-on-brux-like-motor-patterns>)
  - b. Was AAOF support acknowledged? **Yes, AAOF support was acknowledged in all presentations.**
4. To what extent have you used, or how do you intend to use, AAOF funding to further your career? **Over the past few years, AAOF funding has been extremely helpful to me in conducting research. I greatly appreciate the Foundation's unwavering support of faculty at all stages of their academic careers. I would like to use AAOF funding to both strengthen existing research collaborations and seek out new ones to help advance my career.**

Accounting for Project: \$1,654 leftover funds