Biomedical Research Award

Dr. Christine Hong, *University of California, San Francisco*

Dr. Christine Hong is a tenured Associate Professor in the Division of Orthodontics at the UCSF School of Dentistry. She currently serves as the Program Director of Post-doctoral Orthodontic Residency and the Interim Chair of Division of Orthodontics at the UCSF School of Dentistry. Dr. Hong obtained her dental education from the Harvard School of Dental Medicine and completed her orthodontic residency and M.S. in Oral Biology at UCLA School of Dentistry. In 2012, Dr. Hong received the AAOF Subtelny, Baker, Eastman Orthodontic Faculty Development Award and again in 2013 she received the AAOF Willie and Earl Shephard Orthodontic Faculty Development Award for her contribution and continued dedication to orthodontic education and basic, clinical and translational research. In 2014 and 2016, Dr. Hong received the AAOF Biomedical Research Awards on "Preclinical Evaluation of Bisphosphonates in Stability of Cleft Bone Graft". "Preclinical Evaluation of Nanodiamond-Enhanced Estrogen Delivery in Palatal Expansion", and "Role of Osteocytes in Regulating Orthodontic Tooth Movement". These AAOF awards have significantly enhanced the development of Dr. Hong's full-time academic career, furthering her potential to strengthen orthodontic education for both pre-doctoral and post-doctoral students and establish herself as an independent investigator in orthodontic research.

Project synopsis: To understand the effect of osteocytic TGFβ in OTM, we generated and tested a transgenic mouse line with the specific deletion of TGFβ receptor II in osteocytes ($T\beta RII^{ocy-/-}$). Our findings demonstrated that osteocyte-intrinsic inhibition of TGFβ signaling has significant skeletal consequences including impaired mechanosensitivity and decreased RANKL production by osteocytes. More importantly, our first results showed that defective TGFβ signaling may decrease OTM rate in $T\beta RII^{ocy-/-}$ mice, highlighting the importance of osteocyte TGFβ signaling in mechanomodulation of alveolar bone remodeling and pointing to the TGFβ pathway as a potential therapeutic target in preventing post-orthodontic relapse. However, due to TGFβ's broad and complex role in bone metabolism and OTM, a TGFβ inhibitor itself may not be the optimal clinically relevant therapy to reduce relapse. Recently, microRNAs (miRs) have gained recognition as ideal candidates for targeted therapies as they integrate distinct pathways to generate a unified biological response. However, the role of miRs in OTM or relapse is largely unknown. Using an unbiased small RNA-seq approach to profile mechanosensitive miRs in osteocytes, We have identified miR-100 as a crucial mechanosensitive regulator downstream of TGFβ signaling in osteocytes. It is hypothesized that miR-100 is an important regulator of osteocyte-specific mechanoregulation of OTM and post-orthodontic tooth stability such that mimicking its activity will mitigate orthodontic relapse.

Benefit to orthodontic education:
Orthodontic relapse remains a major clinical challenge in orthodontics. MicroRNAs have been recognized as powerful regulators of multiple pathways and cellular processes and have become ideal candidates for targeted therapies. This AAOF Biomedical Research Award study will enhance the fundamental insight into microRNA function in OTM, with clinical potential to impact orthodontic care by targeting microRNAs.

Importance of AAOF Funding:
With the support of the AAOF, Dr. Hong will be able to advance her ongoing translational research projects to answer important orthodontic clinical questions. In addition, this award will provide Dr. Hong the opportunity to accumulate preliminary data, essential for the successful recruitment of NIH/NIDCR funding with a focus on addressing orthodontic clinical questions.