Research Aid Award

Dr. Sheng Wang, *Ohio State University*

Dr. Sheng Wang is a 2nd year orthodontic resident at the Ohio State University College of Dentistry. He obtained his dental degree, orthodontics training, master's degree and Ph.D. from Sichuan University in China. He moved to the U.S. in 2015 and worked as a postdoc fellow at the University of Maryland, Baltimore until 2021, before he joined tOSU. During his time as a postdoc fellow, Dr. Wang's research focused on neuroscience, specifically the interactions between neuro-immune and neuroskeletal in craniofacial bone. He has more than 25 publications (cited 430+), including 3 publications in the Journal of Dental Research (1 of them is the cover paper in July 2022), American Journal of Orthodontics and Dentofacial Orthopedics, Journal of neuroscience, et al. His research focus in orthodontic residency emphasizes accelerating tooth movement/enhancing anchorage by regulating bone remodeling.

Orthodontic forces therapeutically induce mechanical stimuli and inflammation in the periodontium, which is inevitably accompanied by pain. In the past one hundred years, it has been well known that aseptic inflammation regulates biological process of bone resorption during orthodontic tooth movement (OTM). Many studies considered orthodontic pain directly induced by orthodontic force, and it is amplified by following inflammatory responses such as the release of neurogenic and pro-inflammatory mediators. Other research elucidates that neurological pain can reprogram genes in T-cells and modulate tissue inflammation and bone resorption. In periodontium, a quarter of sensory nerves contain both transient receptor potential vanilloid 1 (TRPV1), a receptor for capsaicin (an active component of chili peppers), and Piezo2 (a mechanosensitive ion channel). Our preliminary finding showed that TRPV1 expression increased with application of orthodontic force. Pharmacologically blocking out TRPV1 response decreased tooth movement. Although our data implies an important role of peptidergic afferents (e.g., TRPV1-contaning neuron) in orthodontia, it is unclear how mechanical forces trigger TRPV1 expression. Therefore, we hypothesize that orthodontic pressure can furnish with discomfort (e.g., sourness and pain) via Piezo2 activation, which then promotes TRPV1 expression and orthodontic force-induced alveolar bone remodeling. This project is significant because it promises to elucidate enigmatic linkage between orthodontic force induced pain and alveolar bone remodeling by demonstrating the role of sensory nerves and mechanosensitive ion channel Piezo2 in initiating orthodontic tooth movement. The findings may make it possible to develop novel

therapeutic strategies for accelerated tooth movement by manipulation of sensory afferents.

AAOF RAA for Dr. Wang research project will provide the innovative insight into the neuroskeletal interaction in alveolar bone remodeling. Through his work, he hopes to offer a novel strategy for accelerating tooth movement or enhancing anchorage by regulating sensory afferents. This award from AAOF will cover most of expenses for his project. Outcomes from this project will further aid the beginning of his future research projects in AAOF and NIH. Support from AAOF will allow him to develop his research and academic career. Dr. Wang is excited to contribute to orthodontics as an orthodontist-scientist throughout his career.