

Orthodontic Faculty Development Fellowship Award

Dr. Kyungsup Shin, *University of Iowa*

Biography

Dr. Kyungsup Shin is an Assistant Professor and the Graduate Program Director for the Department of Orthodontics at the University of Iowa. Dr. Shin received a B.S. in Chemical Engineering from Yonsei University, an M.S. in Chemical Engineering from Korea Advanced Institute of Science and Technology, a Ph.D. in Biomedical Engineering from the University of Michigan, a D.M.D. from Harvard School of Dental Medicine, and an M.S. in Orthodontics and certificate in Orthodontics from the University of Iowa. He became a Diplomate of the American Board of Orthodontics in 2016. Dr. Shin's areas of research include biomaterials and biomimetics for tissue engineering, craniofacial anomalies, cleft lip and palate, and temporomandibular joint disorders.



Project Description

About 80% of temporomandibular disorder (TMD) patients have signs and symptoms of joint disease including disc displacement, arthralgia, osteoarthritis, and post-traumatic osteoarthritis (PTOA), and the overall cost for diagnosis, treatment, and management of TMD exceeds four billion dollars per year in the United States. Especially, degenerative TMD is one of the most challenging oral and maxillofacial problems, and this disorder includes pain and dysfunction of the temporomandibular joint (TMJ) and the muscles of mastication. These degenerative disorders of the TMJ, if not successfully treated with conservative approaches, may require surgical procedures such as arthrocentesis, arthroscopy, discectomy, condylotomy, and joint replacement.

As an alternative approach to repair damaged/degenerated fibrocartilage tissue on TMJ, Dr. Shin proposes the use of extracellular vesicles (EVs) that are capable of promoting intercellular communication leading to enhanced cell recruitment, differentiation to specific cell lineage, and tissue repair. Long-term goal of his research is to develop a therapeutically useful tissue engineering approach for the clinical treatment of human degenerative TMD. Dr. Shin hypothesizes that EVs stimulate TMJ condylar fibrocartilage regeneration by promoting chondrogenic progenitor cell (CPC) chemotaxis and chondrogenesis.

Benefit to Orthodontic Education

The need for fibrocartilage/cartilage tissue regeneration is unmet and remains very challenging. The knowledge from his project could potentially contribute to across a range of fibrocartilage/cartilage tissue regeneration applications including cases of TMJ fibrocartilage, condylar degeneration and craniofacial reconstruction.

Importance of AAOF funding/help advancing career

Over the past 3-4 years, Dr. Shin's research projects have been supported by the AAOF (PFA, OFDFA and BRA for this year). BRA funding will enable Dr. Shin to generate preliminary data for future federal grant applications such as NIH/NIDCR and Department of Defense. This generous funding by the AAOF is pivotal to his research investigations and his growth as an independent research scientist and orthodontic educator.