Biomedical Research Award

Dr. Sumit Yadav, *University of Connecticut Health Center*

Dr. Yadav is an Associate Professor in the Division of Orthodontics at University of Connecticut Health Center. He is a board-certified orthodontist and currently acts as a research director for the orthodontic residents. He has published over 70 peer reviewed journal papers. Currently, working with musculoskeletal biologist at UCONN Health Center, he is expanding his research arena and has been devising novel therapeutic strategies for the treatment of degenerative diseases of the TMJ.

Project Synopsis:

Osteogenesis Imperfecta (OI) is characterized by low bone mass that predisposes affected individuals to musculoskeletal fragility. Individuals with OI have genetic mutations in type I collagen (Col1A1 and Col1A2), which serve a structural function. The Mandibular Condylar Cartilage (MCC) and the subchondral bone of the Temporomandibular Joint predominantly expresses type I collagen. However, no research has been conducted focusing on the structure and phenotype of the MCC and the subchondral bone in OI individuals. Transforming growth factor ß (TGFß) is involved in growth, differentiation, and development of musculoskeletal tissues. Recently it has been shown that aberrant TGFß activity is the major mechanism behind OI and the exact mechanism behind atypical TGFß activity in OI is still unknown. Thus, the long-term goals of this project are to evaluate the mechanism behind aberrant TGFß signaling, and to determine the effects of administration of anti-TGFß on the structure and phenotype of the MCC.

The specific aims of this research are to characterize and understand the structure of the MCC and subchondral bone in OI mice.

Benefit to Orthodontic Education:

Osteogenesis Imperfecta (OI) is a genetic disease causing varying degree of musculoskeletal fragility. This proposal aims to understand the structure and ultrastructure of the MCC and the subchondral bone of TMJ in OI mice. In spite of the well-known effects of OI on bone, other musculoskeletal tissues containing type I collagen (mandibular condylar cartilage and the subchondral bone of the temporomandibular joint) have not been studied. Temporomandibular joint (TMJ) is a bilateral synovial joint and is the most commonly used joint during function (chewing, speaking, yawning) and parafunction (clenching and bruxism). Mandibular condylar cartilage (MCC) is a fibrocartilage (cartilage of TMJ), unlike hyaline cartilage of the knee. The MCC and the subchondral bone of the TMJ predominantly express type I collagen, while collagen type II is minimally present. Our preliminary data, in the MCC of the OI mice showed cellular disorganization and initial degeneration of the MCC in younger mice. As there are no effective clinical treatments for degenerative changes in the MCC and the subchondral bone, there is an unmet need to understand the structure and ultrastructure of the MCC to devise clinically effective approaches to treat joint degeneration in OI individuals.

Importance of AAOF Funding:

The AAOF Biomedical Research Award will provide me the opportunity to publish preliminary data, which will be essential to launch my career as a funded NIH clinical orthodontist scientist with a focus on basic science questions related to clinical issues in orthodontics.