2025 Biomedical Research Award
Dr. Yan Jing, Texas A & M University

I am a clinician-scientist who is well trained in both basic and clinical sciences directly linked to mandibular biology and orthodontics. My research focus on craniofacial biology, especially TMJ development and diseases.

Cell transdifferentiation from one type of mature cells to another occurs in many processes including gastrulation, neural crest and somite dissociation, craniofacial development, wound healing, and tumor metastasis. Using cell lineage tracing in mice, we have found that chondrocyte-derived bone cells are the major source of postnatal condylar development and maxillary transverse growth. This cell transdifferentiation plays a key role in mandibular condyle growth and maxillary transverse growth under a direct regulation of mechanical loading. However, due to the small skeletal size of mice, it is challenging to conduct long-term orthodontic and orthopedic procedures on them. In contrast, rats have larger bodies and organs, allowing for easier and more accurate surgical procedures, mechanical stimulation, and tissue collection. More importantly, rats are physiologically, morphologically, and genetically closer to humans, which makes them better suited than mice for biomedical and clinical studies.

The goal of this proposal is to determine the role of chondrocytes during normal maxillary and mandibular growth by creating a compound **rat** line *Aggrecan(Acan)*-CreERT2; *R26R*Tomato (AcanLineage) with CRISPR-Cas9. Our central hypothesis is that the AcanLineage rat can efficiently trace the chondrocyte lineage and their offspring *in vivo*; and that the contributions of chondrocyte-derived osteogenesis during normal growth of the maxilla and mandible in rats are similar to those in mice. Our study is significant because it will establish a novel, low-cost transgenic rat line as a solid foundation for the development of effective orthodontic and orthopedic treatment strategies. This will ultimately help orthodontists manage craniofacial growth and improve treatment effects and stability.

As a clinician-scientist, I deeply value the AAOF's unwavering commitment to advancing orthodontic research and fostering innovation within the field. The Foundation's support not only empowers early-stage investigators to pursue novel ideas but also strengthens the bridge between clinical practice and scientific discovery—an essential foundation for meaningful progress in orthodontic care. In my own career, previous AAOF funding has been instrumental in advancing both my research and educational contributions to the field. It enabled me to gain a deeper understanding of craniofacial biology and biomechanics, generating evidence-based insights. It allowed me to produce critical preliminary data and expand the scope of my research, which ultimately led to the successful acquisition of NIH funding. Additionally, AAOF awards provided me great opportunities to develop mentorships with residents and students, allowing them to engage in translational research and fostering the next generation of clinician-scientists in orthodontics. These highlight the pivotal role the AAOF plays in supporting impactful, translational research and in shaping the next generation of orthodontic education.