AAO Foundation Award Final Report

Principal Investigator	Dawei Liu DDS MS PhD
Co-Investigator	
Secondary Investigators	
Award Type	Robert M. Ricketts Sunflower Orthodontics Fellowship Award
Project Title	Role of Mechanical Force in External Apical Root Resorption (EARR) During Orthodontic Tooth Movement: A Cellular / Molecular Approach
Project Year	2006
Institution	Marquette University School of Dentistry
Summary/Abstract (approximately 250 words)	With the support of the 2006 Robert M. Ricketts Sunflower Orthodontics Fellowship Award, I have achieved the proposed goals of my career development. In the funding year, I was directing four core courses of orthodontics for undergraduates and postgraduates. I was engaged in planning curriculum, lecturing, and supervising residents in clinic. In addition, I supervised and participated in several research projects by orthodontic residents. Towards research, I have constructed a mechanobiology lab and implemented several experiments focusing on the roles of mechanical loading in External Apical Root Resorption (EARR). We have found that mechanical load (fluid shear stress - FSS) quickly increased the release of early signaling molecules such as ATP and PGE_2, which mediated the up-regulation of production of anabolic bone markers such as cycloxgenase-2 (COX-2), ostepontin (OPN), osteoprotegerin (OPG) and down-regulation of catabolic bone marker – receptor activator of nuclear factor kappa B ligand (RANKL). The results mark the anabolic role of FSS, for the first time, in prevention and repair of EARR. Preliminary data of this project have been presented on several scientific meetings as listed below. Accordingly, scientific papers and a research grant for NIH funding is under construction. Presentations and publications: D Liu. A Novel Insight into the Cellular Mechanism of External Apical Root Resorption (EARR). J Musculoskelet Neuronal Interact 2006; 6(4):395-396 (This paper won the 2006 Alice L. Jee Memorial Young Investigator Award, American Society of Bone and Mineral Research on the 36th International Sun Valley Workshop on Skeletal Biology, Jul 30-Aug 2, 2006)

	D Liu. Biological Responses of Cementoblasts to Hypoxia In Vitro. 28th American Society of Bone and Mineral Research, September 15-19, 2006, Philadelphia, PA, USA D Liu. How Does Hypoxia Induce the External Apical Root Resorption? 36th American Association of Dental Research, March 20-25, 2007, New Orleans, LA, USA D Liu. Mechanism of Mechanically-Induced External Apical Root Resorption in Orthodontics. 107th American Association of Orthodontists, May 18-22, 2007, Seattle, WA, USA D Liu. Cellular Mechanism of External Apical Root Resorption in Orthodontics. (Invited for oral) 100th European Orthodontic Society, June 19 - July 23, 2007, Berlin, Germany D Liu. Mechanism of fatigue-loading induced external apical root resorption (EARR). (in preparation)