

AAO Foundation Award Final Report

Principal Investigator	Dawei Liu DDS MS PhD
Co-Investigator	
Secondary Investigators	
Award Type	Willie and Earl Shepherd Fellowship Award
Project Title	Role of Mechanical Force in External Apical Root Resorption (EARR) During Orthodontic Tooth Movement: A Cellular / Molecular Approach
Project Year	2007
Institution	Marquette University School of Dentistry
Summary/Abstract (250 word maximum)	<p>With the support of the 2007 Willie and Earl Shepherd Fellowship Award, I have achieved the proposed goals of my career development. In this funding year, I continuously directed core courses in orthodontics for undergraduates and residents. I was engaged in planning curriculum, lecturing and supervising predoctoral students and orthodontic residents in the clinic. In addition, I supervised and participated in thesis projects of orthodontic residents. For my own research, based on what I achieved in 2006, I completed several experiments focusing on the mechanism of the role of mechanical loading in External Apical Root Resorption (EARR). We found that low intensity pulsed ultrasound (LIPUS, a form of mechanical load) activated MAPK (ERK1/2) and increased COX-2 production in cementoblasts and osteocytes, which mediated the up-regulation of anabolic bone markers - osteoprotegerin (OPG) and sclerostin (SOST), and simultaneous down-regulation of catabolic bone marker – receptor activator of nuclear factor kappa B ligand (RANKL). Interestingly, the responses of osteocytes were found to be more pronounced than those of cementoblasts. The remarkable results led us to propose a mechanism of LIPUS's prevention of root resorption; that is, LIPUS promotes cementogenesis but more importantly increases osteoclastic alveolar bone resorption which indirectly alleviates the compression-induced hyalinization in periodontal ligament – a pathological basis for the formation of root resorption. These data have been presented at several scientific meetings listed below. Also, a research grant for NIH funding is being developed.</p>
Were the original,	Yes. To our surprise we found more than what we hypothesized.

<p>specific aims of the proposal realized?</p>	
<p>Were the results published? If not, are there plans to publish? If not, why not?</p>	<p>The manuscripts are in preparation now.</p>
<p>Have the results of this proposal been presented? If so, when and where? If not, are there plans to do so? If not, why not?</p>	<p>D Liu. (2008) A Novel Mechanism of Ultrasound' Effects on Orthodontic Root Resorption. 37th American Association of Dental Research, April 2-5, Dallas, TX, USA</p> <p>D Liu. (2008) Low Intensity Pulsed Ultrasound (LIPUS) Synergistically Modulates SOST and OPG/RANKL in Osteocytes in Vitro. 54th Orthopedic Research Society meeting, March 2-5, San Francisco, CA, USA</p>