AAO Foundation Award Final Report

Principal Investigator	Siew-Ging Gong
Co-Investigator	Craig Simmons, PhD Morrison Manolson, PhD Dorrin Nilforoushan, DMD Andrea Heckler, DMD
Secondary Investigators	N/A
Award Type	Center Award
Project Title	Development of a three-dimensional *in vitro* model system to study orthodontic tooth movement
Project Year	July 2007 to June 2008, No-cost extension till June 2009.
Institution	University of Toronto Faculty of Dentistry
Summary/Abstract (250 word maximum)	Orthodontic tooth movement (OTM) occurs as a consequence of complex changes in the supporting structures of the tooth in response to biomechanical forces. Many of these changes in the tooth and its supporting structures are not understood due partly to the relative absence of easily accessible model systems. Our long-term goal is to translate basic understanding of the cellular and molecular events during OTM to facilitate greater control and manipulation of tooth movement in orthodontic patients. Our immediate objective is to develop an *in vitro* model system of orthodontic tooth movement that replicates the complexity of the *in vivo* geometry of the tooth supporting apparatus but with the controllability of an *in vitro* system. This objective is based on the hypothesis that the three-dimensional model of tooth movement will have the capacity to represent the cellular and structural elements of the human periodontal ligament (PDL). To achieve this objective, we have three aims: 1. *To develop a three-dimensional model system that incorporates analogues of tooth, alveolar bone, and a three-dimensional PDL. 2. To correlate the spatial distribution of RANKL, ALP, and Runx2 expression in the PDL with local tissue strains predicted by finite element analysis.* 3. *To compare in vitro model results to an in vivo model of OTM.* We anticipate that our assembled interdisciplinary team will be able to generate results that will ultimately translate to improved orthodontic care and delivery. Furthermore, our research endeavors will provide an important avenue for the training and mentoring of future orthodontic educators.
Were the original, specific aims of the proposal realized?	Yes.
Were the results published? If not, are there plans to publish? If not, why not?	Yes. 1. Brooks PJ, Nilforoushan D, Manolson MF, Simmons CA, Gong SG (2009). Molecular markers of early orthodontic tooth movement. *Angle Orthodontist.* 79(6):1108-13. 2. Brooks, P., Heckler, H., **S-G. Gong.** Exogenous M-CSF accelerates orthodontic tooth movement by targeting preosteoclasts. *Archives of Oral Biology*. *Provisional acceptance.*

	3. Heckler A, Gong SG, Simmons CA. *In vitro* model of orthodontic tooth movement. *Manuscript in preparation.*
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?	Yes. 1. AAO Annual meeting 2. American Association of Dental Research/IADR Annual Meeting July 2008 3. AADR/IADR 2009