

AAO Foundation Award Final Report

Principal Investigator	Bo Hou
Co-Investigator	
Secondary Investigators	
Award Type	Orhan C. Tuncay Teaching Fellowship Award
Project Title	The role of primary cilia in the responses of MSCs to mechanical stress
Project Year	2012-2013
Institution	Boston University Goldman School of Dental Medicine
Summary/Abstract (250 word maximum)	<p>Skeletal tissues use mechanotransduction to convert mechanical forces into biochemical signals, which is important for maintaining bone health and homeostasis as seen in orthodontic tooth movement. A proficient physiological environment to study cell behavior in response to mechanical stress is achievable by using a 3D cell culture model. The objective of this study is to evaluate cellular changes of mesenchymal stem cells (MSCs), precursors to osteoblasts and chondrocytes, in response to mechanical forces. 3D culture system was developed by seeding MSCs in fibrinogen/thrombin gel matrix with half of the gel subjected to tensile stress (force gel) and the other half floated in the culture medium (control gel). After ten days of culture, gels were embedded in paraffin and sections were examined with various markers and evaluated using confocal and episcopic microscopy. Distinct cellular morphology was observed in control gel and force gel. H & E and F-actin staining of force gel cells revealed long extensions along the same direction as the applied mechanical stress, while the control gel cells remained round without organized extracellular fibrils. Stained with acetylated tubulin, primary cilia of force cells were on average three times longer than those of control cells. It is well known that the number and length of primary cilia change in response to lack of mechanical stimulation but this is the first evidence that cells under tensile stress have longer straight primary cilia. It is possible that such changes will aid in mechanosensing of the environment and provide improved adaptation.</p>
Were the original, specific aims of the proposal realized?	Yes (please see summary).

<p>Were the results published? If not, are there plans to publish? If not, why not?</p>	<p>Manuscript is in preparation to be submitted to a dental related journal.</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>This study was presented at 2013 AADR/IADR in Seattle, WA. In addition, abstract has been submitted to 2014 AADR/CADR in Charlotte, NC.</p>
<p>To what extent have you used, or how do you intend to use, AAOF funding to further your career?</p>	<p>AAOF has been very helpful to my career development. The funding from AAOF has allowed me to make significant progress in my research, mentor a dental student on this project and be actively involved in the research community.</p>