

## AAO Foundation Award Final Report

Principal Investigator	Kim, Do-Gyoon, Ph.D
Co-Investigator	Toribio, Ramiro, DVM, Ph.D, DACVIM
Secondary Investigators	
Award Type	Biomedical Research Award
Project Title	The role of bone mineralization in creep deformation
Project Year	07/01/2008-06/30/2009
Institution	Ohio State University
Summary/Abstract (250 word maximum)	<p>It was hypothesized that the degree of bone mineralization (DBM) controlled by remodeling is responsible for creep development at the bone matrix level, and variability of the DBM determines the rate of creep deformation at the organ level. In this study, using a rat model, it was observed that more nanoindentation creep occurs in the newly-formed alveolar bone adjacent to the teeth than in pre-existing bone. The traditional viscoelastic Voigt model provided an excellent curve fit for nanoindentation creep at the bone matrix of trabeculae as well as of cortical bone. Nanoindentation viscosity obtained using the Voigt model had a strong positive correlation with nanoindentation modulus. Along with the strong linear relationship between the nanoindentation modulus and DBM in previous studies, the findings in this study indicate that the DBM can control the creep behavior of bone matrix. Creep at the organ level (vertebra) was correlated with the standard deviation (SD) of the DBM histogram based on 3D micro-CT images. The SD of micro-CT-based DBM had a linear relationship with that of CBCT-based DBM. These findings supported the objective of this study, which was to establish the relationship between creep deformation and DBM based on the non-invasive 3D X-ray image analysis of bone. The results obtained from the current study will be confirmed by further investigation using a recently awarded NIH project (PI: Kim, Do-Gyoon) starting on May 1, 2009.</p>
Were the original specific aims of the proposal realized?	Yes, hypotheses of the specific aims were answered as provided in the Summary.
Were the results published? If not, are there plans to publish? If not, why not?	Kim, D-G., Shertok, D. and Yeni, Y. N., "Rate of Physiological Creep of Cancellous Bone can be Estimated by Variability of Mineralization" <i>Trans. of Orthopaedic Res. Society</i> , Vol. 34, p.1762, 2009.

	<p>Do-Gyoon Kim, Sarandeep S. Huja, Hye Ri Lee, Sarah Hueni, Boon Ching Tee., “Relationships of viscosity with hardness and modulus of bone matrix measured by nanoindentation.” Submitted to <i>Journal of Biomedical Materials Research Part A</i>, 2009.</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>Kim, D-G., Hueni, S., Tee, BC, Lee, HR, Huja, S.S., “Effect of nanoindentation holding periods on correlation of viscosity with modulus of bone matrix.” <i>BMES Fall meeting, Pittsburgh, PA, 2009 (#1256)</i></p>