


## Research Data-Base

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| <b>Research Interests:</b>   | Bone mechanics, X-ray diffraction, etc                                  |   |
| <b>Research Abstract</b>   |   |   |
| <b>Residual Strain Measurements in Bone Tissue by X-ray Diffraction Imaging</b>  |   |   |
| <p>It has been reported using non-destructive X-ray diffraction method that residual stresses exists in bone tissue. Such inherent stress in bone as residual stress is expected to accelerate bone remodeling and repair process. Stress is assumed to be one of the important factors, which accelerates the remodeling phenomenon and enables bone to adapt and restructure against additional mechanical environment. Furthermore, bones have naturally occurring holes called 'Foramina' (singular-Foramen) for blood vessels and nerves. These are rarely located as site of crack initiation or growth. From the micro- and macro-structural analysis of bovine vertebral foramen (Giri et al, 2006), a regularly organized hydroxyapatite crystals and additional cortical mass around the hole were observed. Our next attempt was to estimate the residual stresses near the foramen region if there exists any, and compare those near the foramina existing in bovine limbs.</p> |   |   |
| <p>From the diffraction data around whole Debye ring obtained from X-ray diffraction, direct relationship between the diffraction cone and lattice plane parameters can be obtained by combining elastic theory and Bragg's relation. Debye rings are distorted because of lattice plane deformation by the stress and the degree of distortion gives the basis for strain measurement. We used two dimensional digital area detector known as Imaging Plate, and measured the distortion of Debye ring from the diffracted image obtained in the imaging plate. The residual stresses at different locations near foramina of bovine femur and metacarpus samples were calculated.</p>  |   |   |