Contribution ID: **91** Type: **Talk**

Nanoscopic bone imaging for computational fluid dynamics in osteoporosis research

Friday, 16 September 2011 16:55 (15 minutes)

Bone undergoes continuous turnover or remodeling, where the well-coordinated action of all the bone cells keeps bone tissue healthy. Bone diseases, aging, and disuse detrimentally affect remodeling, causing severe bone loss and consequent fragility, as observed in osteoporotic patients.

Osteocytes, the most abundant bone cells, orchestrate bone remodeling and act as bone mechanosensors. However, the actual mechanotransductive pathway is still under debate. One likely pathway is the fluid flow within the lacuno-canalicular network (LCN), where osteocytes reside. Yet, due to the remote location within the mineralized bone matrix and small dimensions (~ 100 nm), the LCN could not be assessed in 3D1 so far.

Due to a recent advent of new imaging techniques at nanoscopic resolutions, such as ptychographic CT2 and serial FIB/SEM3, we could now assess the LCN quantitatively in 3D. This allows computational simulations based on realistic LCN models to investigate load-induced fluid flow at a sub-cellular level, triggering bone mechanobiology.

Bibliography:

1. Schneider P. et al. Bone 2010;47:848-58.
2. Dierolf M. et al. Nature 2010;467:436-9.
3. Schneider P. et al. Bone 2011;49:304-1.

Please specify the session

imaging

Please specify poster or talk

talk

Primary author: Ms CHIAPPARINI, Ilaria (Institute for Biomechanics, ETH Zurich, Zurich)

Co-authors: Dr DIAZ, Ana (Swiss Light Source (SLS), Paul Scherrer Institut (PSI), Villigen, Switzerland); Dr MENZEL, Andreas (Swiss Light Source (SLS), Paul Scherrer Institut (PSI), Villigen, Switzerland); Dr GUIZAR-SICAIROS, Manuel (Swiss Light Source (SLS), Paul Scherrer Institut (PSI), Villigen, Switzerland); Mr MEIER, Matias (Institute for Biomechanics, ETH Zurich, Zurich, Switzerland); Dr BUNK, Oliver (Swiss Light Source (SLS), Paul Scherrer Institut (PSI), Villigen, Switzerland); Dr SCHNEIDER, Philipp (Institute for Biomechanics, ETH Zurich, Zurich, Switzerland); Mr GASSER, Philippe (Electron Microscopy ETH Zurich (EMEZ), Zurich, Switzerland); Prof. MUELLER, Ralph (Institute for Biomechanics, ETH Zurich, Zurich, Switzerland)

Presenter: Ms CHIAPPARINI, Ilaria (Institute for Biomechanics, ETH Zurich, Zurich)

Session Classification: Imaging

Track Classification: Imaging