Institute of Medical Biology
A*STAR

Seminar Announcement

- All Are Welcome -

Speaker : **Dr Takeshi Shimi**
Department of Cell and Molecular Biology at Northwestern University, Feinberg School of Medicine in U.S.A

Title : ***"Three-dimensional Structure and Organization of the Nuclear Lamina Revealed by Nanoscale Resolution Microscopy"***

Date : **15 December 2014 (Monday)**

Time : **3:00pm – 4:00pm**

Venue : **Creation Theatrette, Matrix Level 4, Biopolis**

Host : **Dr Brian Burke**
(Tel: 64070421; e-mail: brian.burke@imb.a-star.edu.sg)

Abstract:
In mammalian cell nuclei, the nuclear lamina is an important structural element of the nuclear envelope (NE), which associates with heterochromatin at the nuclear periphery. The major components of the lamina are the A-type lamins (LA and LC) and the B-type lamins (LB1 and LB2). However, the structural organization of these lamin isoforms within the lamina remains unclear. Elucidating the distribution of each lamin isoform in the lamina is essential for understanding their structural and functional interactions with peripheral heterochromatin. In order to study this, Structured Illumination Microscopy combined with total internal reflection fluorescence microscopy (TIRF-SIM) and 3D Structured Illumination Microscopy (3D-SIM) have been performed on WI-38 human diploid and mouse embryonic fibroblasts (MEFs). Interestingly, LA, LB1, LB2 and LC form distinct fibrillar structures which appear to be separate from each other and overlapping at their ends to form complex meshworks. Using LB1 null MEFs, we also show that the lamina meshworks formed by LB2 fibrils become abnormally enlarged compared to WT MEFs. These LB2 fibrils coalign with heterochromatin structures as indicated by staining with anti-H3K27me3. These results suggest that LB1 is not only involved in organizing the structure of lamina but also important for the organization of heterochromatin proximal to the lamina. To go one step further in determining nanoscale structures of the lamina, nuclei of vimentin null MEFs have been imaged in situ by advanced cryo-electron tomography, which reveals that the major filamentous structures in the lamina are not 10 nm in diameter but rather are < 5 nm in diameter. We propose that these lamin nanofilaments probably associate laterally to form the lamin fibers resolved with SIM and TIRF-SIM. Our results demonstrate that the lamin fibers assemble into a complex hierarchical network which changes its structure and function regionally within the nuclear lamina.

About the Speaker:
Dr Takeshi Shimi is a research assistant professor in the Department of Cell and Molecular Biology at Northwestern University, Feinberg School of Medicine in U.S.A. After he received his Ph.D at Osaka University in Japan in 2005, he has joined the laboratory of Prof. Robert D. Goldman as a postdoctoral fellow. He has been long committed to studying structural links between the nuclear envelope and chromatin in mammalian cells using various advanced microscopic techniques. Currently, he is analyzing the detailed structure of the lamina by super resolution microscopy.