May 11, 2018

The Japan Society of Mechanical Engineers
Hokkaido Branch
"Biomechanics Research Meeting"
33rd Seminar

Chairman: Toshiro Ohashi

The Biomechanics Research Meeting will sponsor presentations by Dr. Naotaka Nakazawa from Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University. Faculty members, graduate students, and undergraduates are encouraged to participate in the seminar.

Date&Time: May 25, 2018, 14:00 - 15:00

Place: Room#A6-68, Faculty of Engineering, Hokkaido University

Speaker: **Dr. Naotaka Nakazawa**

Program-Specific Assistant Professor, Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University

Title: **Cellular responses to mechanical influences of the extracellular environment**

Cells in our body respond to various mechanical influences such as substrate rigidity, mechanical confinement, fluid shear stress, mechanical force between cell-cell adhesion etc.. Cellular responses to such mechanical stimulations have important roles to modulate many physiological processes. In this talk, I introduce two stories focusing on substrate rigidity and mechanical confinement.

Substrate rigidity affects physiological processes through mechano-chemical signals from focal adhesion (FA) complexes that subsequently modulate gene expression. We found that shuttling of FHL2 between FAs and the nucleus depends on matrix mechanics. In particular, on soft surfaces or after the loss of force, FHL2 moves from FAs into the nucleus and concentrates at RNA polymerase II sites causing an increase in *p21* gene expression that will inhibit growth on soft surfaces. At the molecular level, shuttling requires FHL2 phosphorylation by active FA kinase (FAK). Thus, we suggest that FHL2 phosphorylation by FAK is a critical, mechanically dependent step in signaling from soft matrices to the nucleus to inhibit cell proliferation by increasing *p21* expression (Nakazawa *et al.*, 2016, *PNAS*).

Recently we have started new project focusing on mechanical confinement during brain development. Cortex formation in the brain is developed through migration of newly born neurons in crowded neural tissue. High resolution time-lapse observation reveled that neuronal migration was accompanied by dynamic motion of nucleus such as rotation and change of its shape. Latest study from our group suggests that a point force by microtubule motors drives nuclear motions during neuronal migration in confined space (Kure *et al*., 2018, *Development*). On the other hand, nuclear stiffness is also expected as an important factor to induce neuronal migration. I am going to share preliminary results about nuclear stiffness in the migrating neurons.

Contact:
Toshiro Ohashi, Faculty of Engineering, Hokkaido University
Tel&Fax: 011-706-6424, Email: ohashi@eng.hokudai.ac.jp