COINS Seminar #21

"Polymer coatings for dynamic adjustment of specific and non-specific interactions for cell culture"

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Date: Tuesday, October 25, 2016
Time: 3:00pm – 4:00am (Open at 2:30pm)
Venue: 3F Rm#3001, Innovation Center of NanoMedicine (iCONM)
Capacity: 30 people

Registration: By sending an email to <jimukyoku-coins@kawasaki-net.ne.jp> including your "Name", "Affiliation, Division, Position" and "email address".

—Abstract—

Tools providing in situ control of the formation of patterns on surfaces are highly in demand for sensors, cell biology, and tissue engineering, to orient cell migration, proliferation. These surfaces must initially be repellent to cells and proteins (stealthy), and become prone to cell adhesion, or specific binding upon non-toxic stimulation. Reaching this goal is however technically challenging, and needs usually to combine advanced microfabrication with surface chemistry. To make such patterning more versatile, we tailored copolymer chains that spontaneously bind from their water solutions onto most usual materials (e.g. petri dish, glass plates, etc…), form biocompatible dense hydrophilic brushes, and afford stimuli-triggered patterning. Conversion of the properties of patches was achieved by either exposing the surface to solutions of bioorthogonally reactive small molecules, or by temperature variation.

Poly(L-Lysine)-graft-poly(ethyleneglycol) copolymers (PLL-g-PEG) are cationic chains successfully used to coat, upon physisorption most anionic surfaces. In aqueous solutions, the resulting monolayer of PEG imparts the substrates with a high resistance to adsorption of proteins. Patterns were formed by burning this layer with deep UV, and subsequent (re)coating of the uncoated regions with another grafted PLL derivative. This approach allowed photopatterning at micrometer resolutions for advanced spatial control. Using PEG grafts that carried azido groups, we obtained reactive patterns surrounded by a non-reactive PEGylated surface. Attachment of molecules, or proteins was triggered on demand on the initially repellent azido-presenting pattern, by copper-free "click" addition with alcyne-attached fluorophores, biotin, or peptides. The reaction with RGD peptide was for instance implemented in the presence of cells floating above the surface, thereby triggering with high temporal resolution cell adhesion, or migration. To allow a dynamic on/off control of the interactions with the patterns, we used alternatively PLL carrying temperature-responsive grafts that undergo a transition from well-hydrated, protein-repellent state to hydrophobic state above 32°C. These PLL-PNIPAM copolymers allowed us to thermo modulate cell adhesion.

Organizer: Center of Innovation (COI Program) by JST, Center of Open Innovation Network for Smart Health (COINS), Chairman: Horacio Cabral, Associate professor, Department of Bioengineering, School of Engineering, The University of Tokyo
For more information: Please email to "COINS Research Support Office" <jimukyoku-coins@kawasaki-net.ne.jp> Web: http://coins.kawasaki-net.ne.jp/

<Venue access>
Name: Innovation Center of Nanomedicine (iCONM)

Address: 3-25-14, Tonomachi, Kawasaki-ku, Kawasaki 210-0821, JAPAN

Access by train:
Keikyu-Kawasaki Sta. to Kojima-Shinden Sta. by Keikyu-Daishi Line (ride time about 10 minutes) and Walk about 15 minutes to iCONM (See below access map)

Access by bus
"Bus stop on East Terminal at JR Kawasaki Sta."
1) No. 20 bus stop (KAWASAKI TSURUMI RINKO BUS Co.,LTD)
川 (kawa) 02 line; Tonomachi terminal, to "Tonomachi" bus stop (ride time about 30 minutes), walk about 3 minutes to iCONM from the bus stop
2) No. 20 bus stop (KAWASAKI TSURUMI RINKO BUS Co.,LTD)
川 (kawa) 02 line; Ukishima-Bashi terminal, to "King Sky Front Irigchi" (ride time about 20 minutes), walk about 5 minutes to iCONM from the bus stop
3) No. 16 bus stop (KAWASAKI TSURUMI RINKO BUS Co.,LTD)
川 (kawa) 03 line; Ukishima-bus terminal, to "King Sky Front Irigchi" (ride time about 30 minutes), walk about 5 minutes to iCONM from the bus stop

Access Map