BDR SEMINAR in Kobe

"CDB SEMINAR" and "QBiC SEMINAR" have been renamed "BDR SEMINAR".

Hideki Nakamura

The Johns Hopkins University School of Medicine

Friday, November 9, 2018

13:30-15:00, 7F Seminar Room, DB Building A

Synthetic biological approach to biomolecular condensates

"making" and "breaking" the non-membrane-bound intracellular structures at will

Summary

Biomolecular condensates are a class of intracellular structures that is drawing growing attention in recent cell biology researches[1]. They are defined as intracellular structures that grow to micrometer in size without any lipid bilayer boundaries surrounding them. The lack of physical boundary allows biomolecular condensates to assemble and disassemble in a dynamic fashion through characteristic phase behaviors of component molecules, unlike conventional organelles. Examples of the condensates range from well-described and basic physiological structures, such as nucleolus and RNA granules, to pathophysiological inclusions found in many neurodegenerative diseases. Although the importance of the condensates is thus implied, functional roles of their dynamic behavior have yet to be clearly demonstrated, mainly due to the lack of experimental paradigms that can manipulate the processes in living cells.

We recently developed two molecular tools, iPOLYMER[2] and intracellular actuator, that can synthetically "make" and "break" a well-studied example of biomolecular condensate, stress granules, respectively. These tools enabled us to manipulate relevant biophysical processes, i.e. protein sol-gel phase transitions and actin polymerization-dependent force generation, in living cells. In the talk, I will briefly introduce both tools, focusing on the basic principles of action and the results obtained in living cells so far. I will further discuss the possible applications of the tools in biomolecular condensates studies, as well as future perspective of synthetic biology approaches in cell biology.

1. Banani et al., Nature Rev. Mol. Cell Biol. (2017) 8(5):285-298
2. Nakamura, Lee, et al., Nature Materials (2018) 17(1):79-89

Host: Hiroshi Hamada
Organismal Patterning, BDR
hiroshi.hamada@riken.jp
Tel:078-306-3002 (ext:3325)

RIKEN BDR

RIKEN Center for Biosystems Dynamics Research (BDR)