

Research Theme: Actin Cytoskeleton, Mechanobiology & Cell Cycle
Research Project Title: Mechanistic studies of eukaryotic actin cytoskeleton regulation via a novel reconstitution system
Principal Investigator/Supervisor: Asst/Prof Yansong Miao
Co-supervisor/ Collaborator(s) (if any): NA
Project Description
<p>a) Background</p> <p>In eukaryotes, actin filament forms intracellular arrays to provide mechanical forces that power diverse cellular processes, by exerting forces on the membrane for endocytosis, polarized cell growth, cancer cell invasion, cell mobility and immune-response. To run specific processes at particular situation, cells generate distinct actin filament networks in a common cytoplasm. Also, at different cell cycle stages, actin filaments also present in different organization and shapes. Branched actin filament networks are nucleated by the Arp2/3 complex, which concentrate at sites of clathrin-mediated endocytosis in a structure called an actin patch, and at the leading edge of motile cells. In contrast, bundles of unbranched actin filaments, which sometimes mediate vesicle trafficking, or form myosin-containing contractile bundles, are often nucleated by formin proteins. Each type of these F-actin networks maintains precise dynamic nucleation, elongation, and depolymerization, which are regulated by many actin interacting proteins (AIPs) at different steps.</p> <p>Certain AIPs are specifically bind to either branched or unbranched actin filaments, while some other AIPs bind both actin filaments in a cooperative and competitive manners. Even on the same type of actin filaments, presence of the pre-bound AIP on F-actin could also affect the subsequent recruitment of other AIPs. Understanding such fantastic actin machinery is extremely important for understanding the foundation of many cellular processes. However, many molecular mechanisms about how these critical regulations of AIPs in eukaryotic cells work remains unclear.</p>
<p>b) Proposed work</p> <p>We have several exciting projects going on to understand how the cell regulates individual AIPs, respectively, to assembly into different types of actin networks for specific cellular processes. We are currently using an integrated approach to address above questions, including a novel in vitro reconstitution system, fluorescence imaging based cell biology, mass spectrometry, genetics and biochemistry methods. (please see more details at https://yansongmiao.wordpress.com/)</p>
<p>Supervisor contact: If you have questions regarding this project, please email the Principal Investigator: yansongm@ntu.edu.sg</p>
<p>SBS contact and how to apply: Associate Chair-Biological Sciences (Graduate Studies) : AC-SBS-GS@ntu.edu.sg Please apply at the following: http://admissions.ntu.edu.sg/graduate/R-Programs/R-WhenYouApply/Pages/R-ApplyOnline.aspx</p>