Kensaku Mizuno ／ Professor ／ Graduate School of Life Science

Profile

Dr. Kensaku Mizuno received his BSc in 1975 and MSc in 1977 in chemistry from Osaka University. After studying for a further two years in the Institute for Protein Research at Osaka University, he worked as an assistant professor during 1979-1990 in Miyazaki Medical College, where he studied the biochemistry of bioactive peptides and their precursor processing enzymes. He received his PhD in chemistry in 1983 from Osaka University. After working at the University of California, San Diego, during 1989-1990, he worked as an associate professor from 1990 to 1999 at the Faculty of Science, Kyushu University, where he studied growth factors and their receptors. He came to Sendai in 1999 as a professor at the Graduate School of Science and then the Graduate School of Life Science, Tohoku University. Dr. Mizuno's laboratory focuses on signaling mechanisms regulating cytoskeletal reorganization, cell migration and cell division. Dr. Mizuno received the Young Investigator Award from the Japanese Biochemical Society in 1988 and the Nikkei BP Technology Award in 1995.

Research Activities

In response to intracellular and extracellular stimuli, cells change their morphology and motility. Cell morphology and migration are fundamental in a variety of physiological and pathological processes, including wound healing, inflammation, embryogenesis, organogeneis, angiogenesis, and tumor metastasis. Actin cytoskeletal dynamics and reorganization play central roles in the regulation of cell shape change and migration. Prof. Mizuno and his group previously showed that cofilin, an actin-depolymerizing factor, is phosphorylated and inactivated by LIM-kinase, and that the LIM-kinase-cofilin signaling pathway plays a key role in actin filament dynamics and actin cytoskeletal reorganization. Mizuno's laboratory undertakes research on the signaling pathways that transduce extracellular stimuli to the machinery controlling actin filaments and the mechanisms by which cells spatiotemporally and coordinately regulate the actin cytoskeletal remodeling for cell migration, polarity formation, and cell division. Mizuno's laboratory also aims to elucidate the molecular mechanisms underlying chemotactic response of leukocytes, invasion and metastasis of cancer cells, angiogenesis, outgrowth of neuronal axons and dendrites, and mitotic spindle positioning and cytokinesis, all of which are regulated by cytoskeletal reorganization.

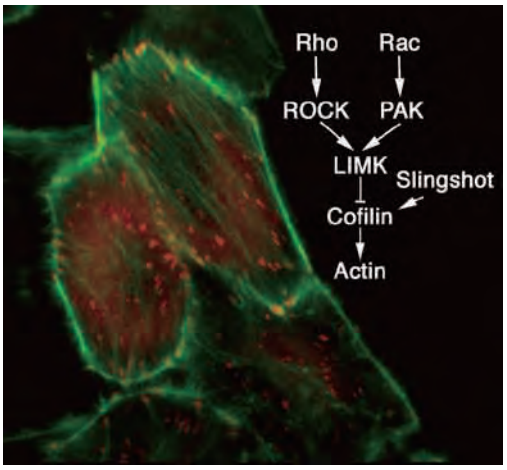

Figure 1.
Actin cytoskeleton in animal cells and its signaling pathway. Immunofluorescence image of actin filaments (green) and focal adhesion molecule vinculin (red).

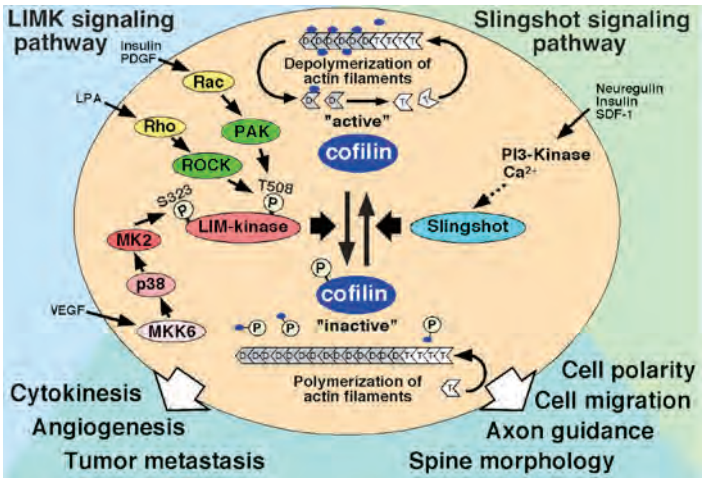

Figure 2.
Phospho-regulation of cofilin by LIM-kinase and Slingshot controls actin cytoskeletal dynamics and reorganization and thereby plays a key role in various pathophysiological processes, including chemotactic cell migration, cell division, axon guidance, and tumor invasion and metastasis.

Message

Our understanding of life had dramatically advanced late in the 20th century. The human whole genome sequence was determined at the beginning of the 21st century. In spite of the great advance in life science, most of the wonders of life are not scientifically explained. We still cannot answer the fundamental questions, such as how cells determine their shapes and sizes, how cells migrate, and how cells and organisms determine their life spans. Also we cannot explain the mechanisms of more complicated processes, such as embryogenesis and the formation of brain architecture. It is attractive and exciting for researchers to solve these many unanswered questions about the wonders of life. In scientific research, a small basic idea can often create a new field of science and make an advance in applied science and technology. It is very important for researchers to decide what theme they pursue. I strongly encourage young researchers to take pioneering and exciting themes, driven by their own interest.