NanoCosmos: Extracellular Vesicles as Small Biological Systems for a Bigger Impact on Medicine

Yong Song Gho

Professor, *Department of Life Sciences, Pohang University of Science and Technology (POSTECH), Pohang, Republic of Korea*
Director, *Global Research Institute for Exosome, POSTECH, Pohang, Republic of Korea*

The secretion of nano-sized lipid bilayered extracellular vesicles is a universal cellular process occurring from simple organisms to complex multicellular organisms. Recent progress in this area has revealed that extracellular vesicles play multifaceted pathophysiological functions by delivering the complex messages between cells and organisms, suggesting that extracellular vesicles are NanoCosmos, i.e., extracellular organelles that play diverse roles in intercellular and interkingdom communication. This presentation briefly introduces our last 20 year's comprehensive research on extracellular vesicles derived from host, bacteria, diet, and environments including their physical, biochemical, and biological complex properties (http://evpedia.info). Then, this presentation focuses on our recent progress in novel extracellular vesicle-mimetic technologies for targeted drug delivery, theragnostics, and epigenetic reprogramming as well as for adjuvant-free, non-toxic vaccine delivery system against bacterial infection. Furthermore, bacterial extracellular vesicle-based cancer immunotherapy will be introduced. Based on the concept of emergent properties of heterogeneous extracellular vesicles, future research directions to decode the complexity of extracellular vesicle-mediated intercellular communication network [either at the single vesicle level or at a systems level as a whole, and the secret of life] and future perspectives of extracellular vesicle-based theragnostics will be introduced.