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강연제목: 폐질환 치료를 위한 흡입형 나노의학/

Inhalable nanomedicine for the treatment of pulmonary diseases

Abstract:

Treatments for lung adenocarcinoma, a type of non-small-cell lung cancer that accounts for about 40% of all lung cancers, are generally administered intravenously, thus causing systemic side effects and poor pulmonary delivery. Inhalation therapy has been investigated to overcome these limitations; however, it shows limited delivery of drugs to the distal lung region, rapid clearance by alveolar macrophages, and immune responses due to synthetic materials. In this talk, I will introduce inhalable nanotherapeutics to treat lung adenocarcinoma using exogenous pulmonary surfactant (PS) that are lipid-based, clinically used, and easy to fuse with the endogenous PS layer in the alveolar space. We prepared PS-based nanovesicles (PSNVs) using the thin-film hydration method followed by extrusion. PSNVs interacted selectively with alveolar type II cell-derived adenocarcinoma cells in vitro and retained long in the alveolar space of mice after inhalation, presumably due to the incorporated PS proteins. Furthermore, inhalation treatments of paclitaxel-loaded PSNVs significantly inhibited the tumor growth in the lungs of the orthotopic lung cancer mouse model established by intratracheally injection of A549 cells into nude mice, compared with free paclitaxel and paclitaxel-loaded synthetic NVs. These results suggest that the use of PSNVs for inhalation delivery of a wide range of therapeutic agents has great potential for the treatment of various lung diseases, including lung adenocarcinoma.

Brief Biosketch

Ji-Ho Park is Associate Professor of Bio and Brain Engineering at Korea Advanced Institute of Science and Technology (KAIST) South Korea. He holds Affiliate appointments in the Graduate School of Medical Science and Engineering, and the Institute of Health Science and Technology at KAIST. He received a B.S. degree in Materials Science and a M.S. degree in Medical Science from Yonsei University (South Korea). He then moved to the USA and received his Ph.D. degree in Materials Science from University of California, San Diego under the direction of Professor Michael Sailor in 2009. He joined the faculty in the Department of Bio and Brain Engineering at KAIST in 2010, after postdoctoral studies at University of California, Berkeley under Professor Peidong Yang. He was promoted to Associate Professor in 2015. He is the recipient of Young Investigator Award from the Korean Society of Medical and Biological Engineering. He is the author of over 120 research publications in journals including Nature Materials, Nature Nanotechnology, Nature Communications, and PNAS, in subjects related to nanomedicine, drug delivery, and biomaterials. He has 30 patents or patents pending.