(국문/영문)이름: 박현지/Hyun-Ji Park
(국문/영문)직위: 조교수/Assistant Professor
(국문/영문)소속: 아주대학교/Ajou University
(국문/영문)기타소속:

오가노이드 기반 분석을 통한 혈관 발달 및 재생에서의 대식세포 기능 규명

Elucidating the role of macrophages in vascular development and regeneration through organoid-based analyses

Abstract

Proper vascular development and regeneration are essential for tissue homeostasis, and their dysregulation can lead to severe outcomes such as ischemic necrosis or tumor progression. To elucidate the cellular programs governing vascular maturation, we established a cross-scale analytical framework integrating time-series single-cell transcriptomics and tissue morpho-mechanics in mouse pulmonary arteries. This approach uncovered macrophages as key regulators coordinating lumen expansion and wall remodeling during postnatal vascular growth. Using a human iPSC-derived blood vessel organoid (BVO) model, we confirmed that anti-inflammatory MGL^{high} macrophages recapitulated physiological lumen enlargement while maintaining structural integrity through balanced fibroblast and smooth muscle cell differentiation. Building upon these insights, we generated iPSC-derived macrophages spanning a functional spectrum from inflammatory to anti-inflammatory states and applied them to a human atherosclerotic BVO model. Regenerative macrophages within this system facilitated foam cell clearance, suppressed inflammation, and enhanced collagen-based vascular repair. Together, these studies establish a mechanistic and translational link between macrophage-mediated vascular development and regeneration, providing a foundation for macrophage-based immunoregenerative therapies targeting vascular diseases.

Brief Biosketch

박현지 교수는 아주대학교 첨단바이오융합대학 조교수로, 줄기세포 및 세포 외 소포체 기반 생체모사 유전자 전달을 통한 노화 및 심혈관질환의 면역재생치료제 개발 연구를 수행하고 있다. 아주대학교 학사, 연세대학교에서 석사 및 박사학위를 취득하고, 미국 Georgia Tech 및 Emory University 에서 박사후 연구를 수행하였다. Hyun-Ji Park focuses on developing immunoregenerative therapeutics for aging and cardiovascular diseases through stem cell and extracellular veslcle-mimetic gene delivery platforms. She received her B.S. degree from Ajou University, M.S. and Ph.D. degrees from Yonsei University, and completed her postdoctoral research at Georgia Tech and Emory University.