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국문 강연제목: 폐암 면역치료 반응 예측을 위한 환자 유래 오가노이드 기반 종양-면역 미세환경 모델의 정량적 시공간 분석

영문 강연제목: Quantitative spatiotemporal analysis of patient-derived organoid-based tumor-immune microenvironment model in lung cancer for immunotherapy response prediction

Abstract(영문):

The tumor-immune microenvironment (TIME) plays a crucial role in cancer progression and treatment response, yet establishing physiologically relevant in vitro TIME models remains challenging. Here, we developed a novel multi-modal analytical platform using lung cancer patient-derived organoids co-cultured with autologous lymphocytes to accurately recapitulate TIME dynamics. Our platform integrates multiplexed immunofluorescence for spatial immune analysis, real-time holotomography for visualization of cellular interactions, and genomic profiling. Quantitative spatiotemporal characterization, combined with machine-learning-driven integration of multi-modal data, successfully identified predictive immune signatures correlating with clinical immunotherapy outcomes. This integrated platform provides a robust tool for predicting patient-specific treatment responses, particularly for immunotherapy, and represents a promising approach toward personalized therapeutic strategies in lung cancer.

Brief Biosketch (간단한 이력, 연구/대외활동 소개,국문/영문)

Dr. Mahn Jae Lee's research focuses on developing advanced *in vitro* models using organoid technology and innovative imaging platforms to investigate complex interactions within the tumor immune microenvironment. He earned his Ph.D. in Medical Science and Engineering from KAIST, a Medical Degree from Kyung Hee University, and a Bachelor's degree in Physics from KAIST. His expertise spans spatial biology, advanced microscopy, computational image analysis, and deep learning, contributing significantly to personalized medicine and translational biomedical research. Dr. Lee's findings have been featured in prominent journals, including *Nature Methods*, *Nature Cell Biology*, and *Experimental & Molecular Medicine*, and he actively shares his work at international scientific conferences.