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# MolCube-Explorer: An Integrated Platform for Lung Disease Biomarker Discovery

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Complex diseases like lung cancer, asthma, and idiopathic pulmonary fibrosis require systematic comparison of disease mechanisms for effective therapeutic target discovery. Here, we present MolCube-Explorer, a web-based platform that enables comprehensive analysis and visualization of lung disease multi-omics data. This platform integrates bulk RNA-seq (1,523 samples) and single-cell RNA-seq (47 samples) data across lung diseases, providing comparative pathway analysis using normalized enrichment score and a novel marker discovery framework that categorizes targets as progressive, suppressive, or common up or down regulators. MolCube-Explorer implements a comprehensive validation framework including lung-specific gene expression evaluation, protein structure visualization using AlphaFoldDB, AI-enhanced target annotation, and experimental feasibility assessment through human-mouse sequence similarity analysis. We validated the utility of MolCube-Explorer for our case study by experimentally identifying and validating membrane proteins as lung adenocarcinoma. The platform features an intuitive interface with interactive visualization tools that make complex multi-omics analysis accessible to researchers without extensive computational expertise. MolCube-Explorer is freely available at https://explorer.molcube.com.