Docket #: S21-182

Modeling the immune response with human distal lung organoids containing epithelial, immune and mesenchymal components

The interaction between lung epithelium, mseenchymal stroma and immune cells underlies essentially all lung pathologies, inclusive of infection, cancer and autoimmunity, for instance with cytokine storm and SARSCoV-2 infection or anti-tumor immunity in cancer. Historically, cultures of distal human lung have only included epithelium cells but no other relevant cell types, such as mesenchyme and immune cells. Thus, they are incapable of modeling the interactions between these cell types. To overcome these limitations, the Kuo lab at Stanford invented a novel and first-in-class way to grow human lung organoids containing epithelial, mesenchymal and immune compartments using an air-liquid interface (ALI) method. These proliferating human ALI organoids strongly contrast with post-mitotic monolayer 2D airway cultures by expanding for 100 days while containing diverse immune cells (T, B, macrophages). As a proof of principle, the model was used to explore the immune consequences of epithelial SARS-CoV-2 infection. Beyond infectious disease modeling, this system has applications to modeling lung pathologies (infection, autoimmunity, cancer), therapeutics testing, precision medicine and stem cell-based therapies.

Applications

- Infectious disease modeling
- Cancer immunology modeling
- Therapeutics identification

Advantages

- Allows modeling of tissue inflammation hallmark of infections
- Integration of epithelial cells with immune components
- Long-term viability (up to 100 days)

Patents

- Published Application: WO2022245971
- Published Application: 20240158755

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