3D lung epithelial models to study host-pathogen interactions

Commonly used acronym: *3D lung models*

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Organisation

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SCOPE OF THE METHOD

The Method relates to	Human health
The Method is situated in	Basic Research, Translational - Applied Research
Type of method	In vitro - Ex vivo
Specify the type of cells/tissues/organs	alveolar epithelial cells, bronchial epithelial cells from patients with lung disease or healthy individuals

DESCRIPTION

Method keywords

in vivo-like models
organotypic
host-pathogen interactions
inflammation
Pseudomonas aeruginosa
microbiome
cytotoxicity
host-associated biofilms
preclinical drug development
antibiotic activity

Scientific area keywords

microbiology
antibiotics
cystic fibrosis
Chronic obstructive pulmonary disease

infectious disease
biofilm
lung disease

Method description

Three-dimensional (3D) lung epithelial cell models mimic key aspects of the parental tissue, including apical-basolateral polarity and barrier function (Barrila et al. 2010, PMID: 20948552). These 3D cultures are generated using the rotating wall vessel (RWV) bioreactor system, allowing host cells to grow and differentiate on porous ECM-coated microcarrier beads in an optimized suspension culture. Upon differentiation, cultures can be transferred into multi-well plates, to enable targeted throughput and high reproducibility. 3D lung cell cultures can be applied to study various aspects of the infectious disease process, enabling to evaluate both host and bacterial behavior during host-pathogen interactions under physiologically relevant conditions. The developed models are also useful for testing new or existing antimicrobial agents, as bacterial susceptibility to antimicrobials is different in the 3D lung models compared to conventional assays (Crabbé et al. 2017, PMID: 28256611; Rodriguez-Sevilla et al. 2018, PMID: 29648588; Grassi et al. 2019, PMID: 30800115; Crabbé et al. 2019, PMID: 31034512).

Lab equipment

In addition to basic cell culture equipment, specialized bioreactors are needed to generate the described 3D lung cell cultures.

Method status

Published in peer reviewed journal

PROS, CONS & FUTURE POTENTIAL

Advantages

- *In vivo*-like characteristics ;
- Targeted throughput ;
- High reproducibility.

Challenges

- More expensive than conventional (2D) assays ;
- Expertise and equipment needed.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

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