# Dual and Triple Epithelial Co-culture Model Systems with Donor-Derived Microbiota and THP-1 Macrophages To Mimic Host-Microbe Interactions in the Human Sinonasal Cavities

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## SCOPE OF THE METHOD

| | |
|---|---|
| **The Method relates to** | Human health |
| **The Method is situated in** | Translational - Applied Research |
| **Type of method** | In vitro - Ex vivo |

## DESCRIPTION

### Method keywords

upper respiratory tract
host-microbe interaction
air-liquid interface
sinonasal cavities
chronic rhinosinusitis
epithelial barrier function
macrophages

### Scientific area keywords

host-microbiome interaction
biotechnology
microbiology
immunomodulation

### Method description

This is a method to study host-microbe interaction in the upper respiratory tract. A physiologically representative epithelial structure, with mucin producing and ciliated cells, is obtained by culturing respiratory epithelial cells at air-liquid interface in Transwell inserts. Optionally, macrophage-like cells, derived from monocytes, can be included to examine immunomodulation. This co-culture system can be apically inoculated with pure

strains, a defined mixture of bacteria, or donor-derived nasal microbiota. During host-microbe co-culture, typically 72 h, bacterial adhesion, growth and community composition can be measured, as well as host responses such as cytokine release and epithelial barrier functionality.

### Lab equipment

Biosafety cabinet ;
Incubator ;
Flow cytometer ;
Plate-reader ;
Electrode to measure transepithelial electrical resistance ;
Micropipettes.

### Method status

Still in development
History of use
Internally validated
Published in peer reviewed journal

## PROS, CONS & FUTURE POTENTIAL

### Advantages

- Low-tech ;
- High throughput ;
- Commercially available culture system (Transwell) ;
- Easy sampling ;
- Variety of samples ;
- Versatility of host and microbial materials that can be used ;
- Robust co-culture preserving viability of host cells and bacteria over multiple days.

### Challenges

- Labour intensive ;
- Static co-culture (accumulation of metabolites, medium acidification) ;
- Several weeks required for differentiation ;
- Low biomass samples of microbial community.

### Modifications

- Inclusion of more/other host cell types ;
- Downscaling ;
- Increasing throughput ;
- Standardized inoculum.

### Future & Other applications

- Testing of environmental contaminants (cigarette smoke) ;
- Antibiotics ;
- Live biotherapeutic products ;
- Topical treatments for upper respiratory tract diseases

## REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

### References

De Rudder C, Calatayud Arroyo M, Lebeer S, Van de Wiele T. 2020. Dual and triple epithelial coculture model systems with donorderived microbiota and THP-1 macrophages to mimic host-microbe interactions in the human sinonasal cavities. mSphere 5:e00916-19. https://doi.org/10.1128/mSphere.00916-19.

**Associated documents**

DeRudder2020_mSphere_DualTripleModelSystems_HMI_URT.pdf

**Links**

Dual and triple epithelial coculture model systems with donorderived microbiota…

**Other remarks**

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