

# 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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## Contact person

Charlotte De Rudder

## Organisation

**Name of the organisation** Ghent University (UGent)

**Department** BW25 - Biotechnology

**Country** Belgium

## SCOPE OF THE METHOD

<b>The Method relates to</b>	Human health
<b>The Method is situated in</b>	Translational - Applied Research
<b>Type of method</b>	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

Corresponding author: Tom.VandeWiele@UGent.be

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