

# human induced pluripotent stem cells derived airway epithelium

*Commonly used acronym: iPSC*

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## 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
<b>This method makes use of</b>	Animal derived cells / tissues / organs

## DESCRIPTION

### Method keywords

Human induced Pluripotent Stem Cell

differentiation

airways

lung epithelial cells

## Scientific area keywords

Induced pluripotent stem cells  
human airways  
3D organoid models  
Chronic obstructive pulmonary disease  
asthma  
epithelial cells  
co-culture

## Method description

We devised a simple and reliable method for reprogramming peripheral blood mononuclear cells into hiPSC and then to differentiate them into air-liquid interface bronchial epithelium (iALI) within 45 days. Of note, this method does not involve any cell sorting step. We reprogrammed blood cells from one healthy control and three patients with very severe COPD. The mean cell purity at definitive endoderm and ventral anterior foregut endoderm was >80%, assessed by CXCR4 and NKX2.1 expression respectively. vAFE cells from all four hiPSC differentiated into bronchial epithelium in air-liquid interface (ALI) conditions, with large zones covered by beating ciliated, basal, goblets, club cells and neuroendocrine cells, as found *in vivo*.

## Lab equipment

Flow cytometry,  
Biosafety cabinet,  
Microscopy phase contrast,  
Fluorescence PCR,  
Matrix (geltrex, matrigel),  
Transwell insert for culture,  
Transepithelial/transendothelial electrical resistance.

## **Method status**

History of use

Internally validated

Published in peer reviewed journal

## **PROS, CONS & FUTURE POTENTIAL**

### **Advantages**

Robust, efficient and reproducible protocol

Human normal lung development modeling and diseases modeling

Stem cells: renewable and sustainable source of airway epithelial cells

High-Yield Human Induced Pluripotent Stem Cell-Derived airway epithelial cells

Personalized medicine

High input pharmacological screening

Genome editing CRISPR Cas9 technology

### **Challenges**

Cost,

Mandatory to check regular genetic stability of stem cells during culture maintenance,

Derivation of clinical grade iPSC culture and derived therapeutic cells.

### **Modifications**

Optimization of differentiation protocol,

Co-culture with other cell type such as immune cells

### **Future & Other applications**

Disease modeling cell therapy

## REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

### References

Differentiation protocol from the team PMID: 35954266 iPSC cell lines derived PMID: 34624616 , PMID: 33099111, PMID: 30296669 Kotton DN protocol lab: PMID: 35781291, PMID: 35499347 Gotoh Lab: PMID: 34798066

### Associated documents

## PARTNERS AND COLLABORATIONS

### Organisation

**Name of the organisation** VIB - UGent

**Department** Center for Center for Inflammation Research

**Specific Research Group or Service** Laboratory of Immunoregulation

**Country** Belgium

**Geographical Area** Flemish Region

**Name of the organisation** IRMB INSERM 1183

**Department** IRMB INSERM 1183

**Country** Belgium

**Geographical Area** Flemish Region

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