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EpiAirway | Data Sheet

Features

- 3D Model of Respiratory Tract Tissue
- Human Bronchiole-Like
- Pseudostratified Morphology
- Cilated Apical Surface
- Mucin Producing
- *In Vivo*-Like Barrier
- Tight Junctions Formed
- Highly Reproducible
- Easily Handled Cell Culture Inserts or High Throughput Plates
- Cost Effective Preclinical Screening
- Asthma, COPD and Smoker Tissues Available

Validation & Pre-Validation

- Nasal Drug Delivery Optimization
- Respiratory Infection Studies
- Asthma and Allergy
- Inhalation toxicology
- Drug Formulations
- Environmental Agents
- Occupational Chemicals
- Nanomaterials

The EpiAirway Model

Mattek's EpiAirway System consists of normal, human-derived tracheal/bronchial epithelial cells (TBE) which have been cultured to form a multi layered, highly differentiated model which closely resembles the epithelial tissue of the respiratory tract. Histological cross-sections of both the *in vitro* tissue and a normal human bronchiole reveal a pseudostratified epithelial structure (Figure 1).

Transmission electron microscopy shows numerous microvilli and cilia on the apical surface of the cultures and confirm the presence of tight junctions (Figure 2). Transepithelial electrical resistance of the tissue is similar to *in vivo* tissue. Mucins are secreted at the apical surface (Figure 3).

The EpiAirway cultures are grown on cell culture inserts at the air-liquid interface, allowing for gas phase exposure of volatile materials for airway inflammation and irritant studies. This convenient format also allows the facile measurement of transepithelial permeability for inhaled drug delivery studies. The tissues can also be used to investigate mechanisms of bacterial infection of the respiratory tract (Figure 4). These and other studies involving asthma, cytokine responses, or various airway disorders can be performed using the EpiAirway tissue.

Various pharmaceutical laboratories are actively seeking alternatives to expensive and time consuming pre-clinical animal testing. Many companies have initiated EpiAirway testing to assess the ability of candidate compounds to modulate specific respiratory properties of interest. A growing body of data demonstrates that EpiAirway provides a cost-effective means of assessing various respiratory tract issues while avoiding species extrapolation and the use of laboratory animals.

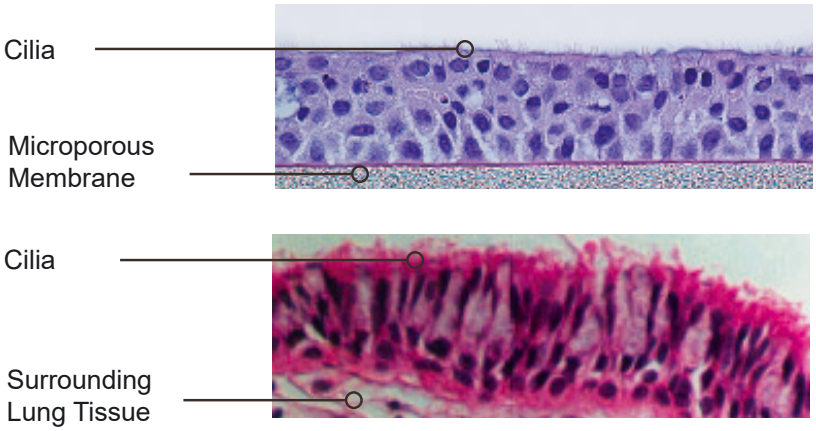
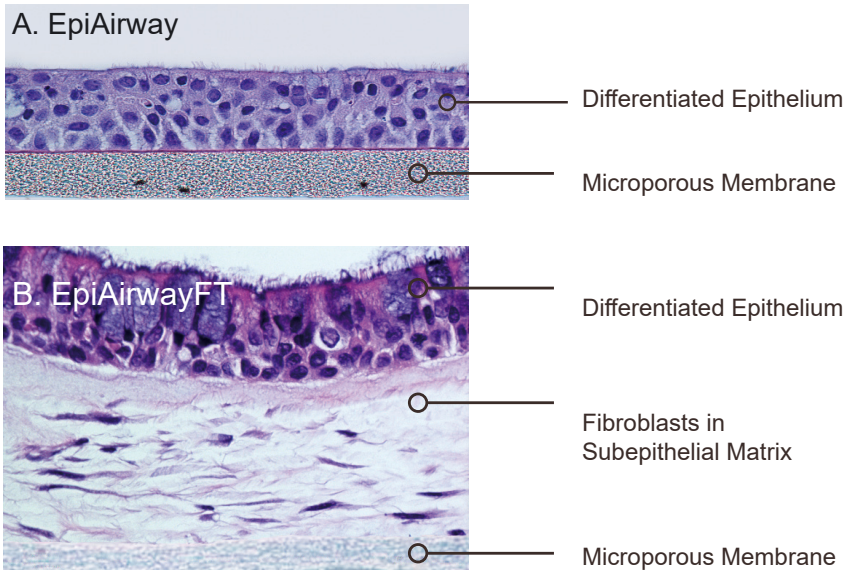


Figure 1. H&E stained cross sections of A) EpiAirway tissue and B) normal human bronchiole. Both tissues exhibit pseudostratified, mucociliary morphology.



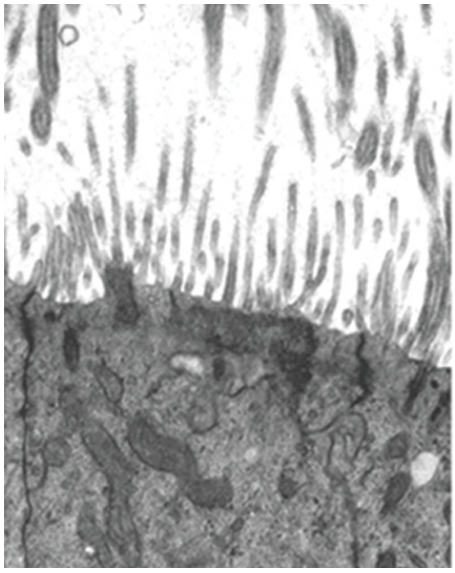


Figure 2. H&E stained histology of: A) EpiAirway™ (AIR-100) and B) Full-thickness EpiAirwayFT™ (AFT-100) tissues. EpiAirway tissues contain normal human bronchial epithelial cells; EpiAirwayFT includes tracheal/bronchial fibroblasts in a collagen gel matrix. Transmission electron micrography of C) tight junction and D) cilia on apical tissue surface (Magnification = 20,000X). Both tissues exhibit a pseudo-stratified, muco-cilliary phenotype typical of native tracheal/ bronchial and nasal tissue.

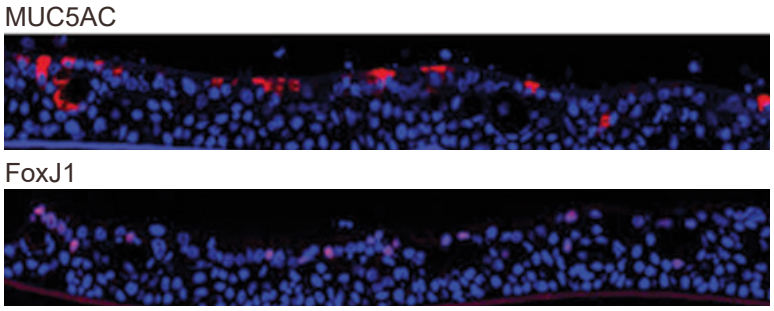


Figure 3. Fully differentiated EpiAirway contains mucin producing goblet cells and ciliated cells. Cross sections of EpiAirway (AIR-100) were stained for MUC5AC, a marker of goblet cells, and FoxJ1, a marker of ciliated cells. Red: MUC5AC or FoxJ1; Blue: DAPI stained nuclei.

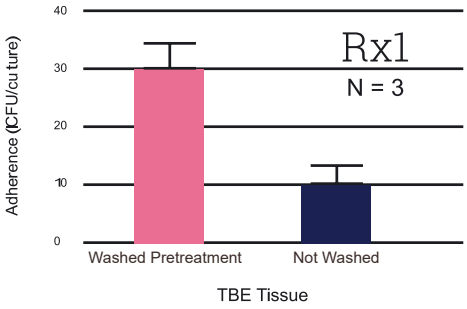


Figure 4. Bacterial adherence – The effect of mucin secretion on adherence of S. pneumoniae to EpiAirway tissues for non-encapsulated strain Rx1. Bacteria/epithelia cell ratio was 15:1. EpiAirway tissues were washed 3X with HEPES buffered saline to remove surface secreted mucin (or left unwashed) prior to exposure to bacteria. (Data graciously provided by MedImmune, Inc.).

Permeation Enhancer	TEER Decrease (%)	MTT Tissue Viability (%)	Permeation (Fold Increase)
NFL 1	**99**	**81**	**135**
NFL 2	**84**	**91**	**37**
NFL 3	**95**	**84**	**25**
NFL 4	50	100	3
NFL 5	0	100	3
NFL 6	6	100	3
NFL 7	**97**	**80**	**34**
NFL 8	85	89	8
NFL 9	**78**	**100**	**25**
NFL 10	92	53	14

Table 1. Use of EpiAirway for optimization of inhaled drug delivery formulations. Permeation enhancers (NF1-NF10) were used to increase the permeability of Interferon α2b (MW = 19 kD) through the EpiAirway tissue. Opening of tight junctions was monitored using TEER and tissue viability was determined using MTT. Optimal formulations (high tissue viability and high increase in permeability) are highlighted in blue. Data kindly provided by Nastech Pharmaceuticals, Inc.

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