



CASE STUDY

Improving Nasal Drug Development with Reconstructed Nasal Epithelium (RNE)

Developing a physiologically relevant in vitro model to improve prediction of nasal drug delivery performance

The Challenge

Intranasal drug delivery offers rapid systemic absorption and direct access to the central nervous system. However, successful development requires accurate modeling of nasal epithelial barrier function.

Traditional models rely on ex vivo animal tissue, which lacks key physiological features and can produce highly variable or misleading results.

Approach

MedPharm developed a human-derived in vitro model to better replicate nasal physiology and improve predictive performance:

- Developed reconstructed nasal epithelium (RNE) from primary human nasal epithelial cells
- Cultured and differentiated cells into functional nasal epithelium
- Replicated key physiological features, including mucus production, ciliary motion, and tight junction barrier function
- Verified model performance using TEER and morphological assessment
- Applied formulations apically and measured basolateral transport
- Compared performance to traditional animal tissue models
- Benchmarked results against clinical nasal delivery data
- Demonstrated alignment in relative drug exposure (Cmax trends)

Outcome

- Established a fully differentiated human nasal epithelial model
- Reduced variability compared to traditional animal tissue models
- Enabled detection of statistically significant formulation differences
- Generated more reliable and physiologically relevant data
- Improved formulation screening and selection
- Enabled evaluation of key biological processes (mucus transport, metabolism)
- Increased confidence in clinical translation

Why This Matters

Traditional nasal models often fail to capture human physiology, limiting their predictive value. By developing a reconstructed human nasal epithelium model, MedPharm provides more reliable, clinically relevant data to support better decision-making and reduce development risk.