MedPharm

CASE STUDY

Case Study: Advancing Nasal Drug Delivery Through Predictive Modeling (MedCast®)

Improving in vitro relevance and enabling more predictive nasal drug development

www.medpharm.com

The Challenge

Nasal drug development presents unique challenges related to drug distribution, permeation, and clearance. Traditional in vitro models often fail to accurately replicate human nasal physiology, limiting their predictive value.

Standard approaches rely on excised animal tissue or simplified physical models, which can be nonviable, misleading, or lack anatomical realism. As a result, data generated from these systems may be inconclusive or poorly correlated to in vivo performance.

Approach

MedPharm developed and applied advanced in vitro models to better replicate human nasal conditions and improve predictive accuracy:

- Developed fully differentiated reconstructed human nasal epithelium (RNE)
- Replicated key physiological features, including mucus production, ciliary activity, and barrier function
- Compared RNE performance to traditional ovine tissue models
- Generated statistically significant and more informative permeation data
- Built CT-based nasal cast models (MedCast®) using human scan data
- Created anatomically accurate nasal structures with custom segmentation
- Optimized materials to better represent drug delivery conditions
- Assessed regional drug deposition across the nasal cavity
- Demonstrated improved correlation between in vitro and in vivo performance

Outcome

- Established a more physiologically relevant nasal testing model
- Generated more predictive and statistically robust data
- Improved understanding of drug distribution and deposition
- Enhanced confidence in in vitro to in vivo correlation (IVIVC)
- Enabled better-informed formulation and device decisions
- Reduced risk associated with nasal drug development

Why This Matters

Traditional nasal models often fail to replicate human physiology, limiting their predictive value. By developing advanced in vitro systems such as MedCast®, MedPharm generates more accurate, human-relevant data. This improves in vitro to in vivo correlation, supports better decision-making, and reduces development risk.