

# Development of an In Vitro Method for In Vivo Prediction of Regional Deposition of Nasal Powders

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# Background



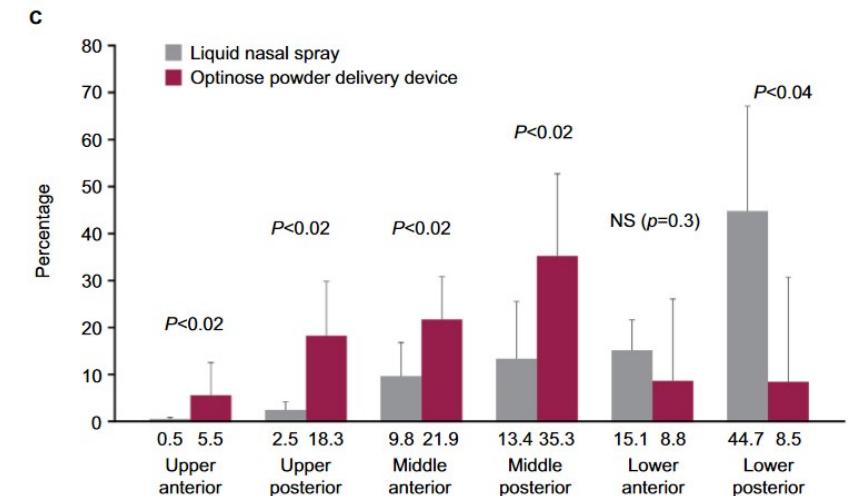
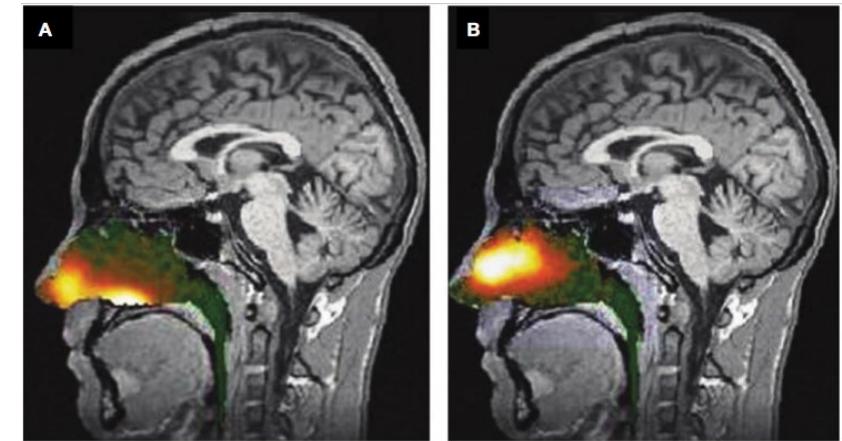
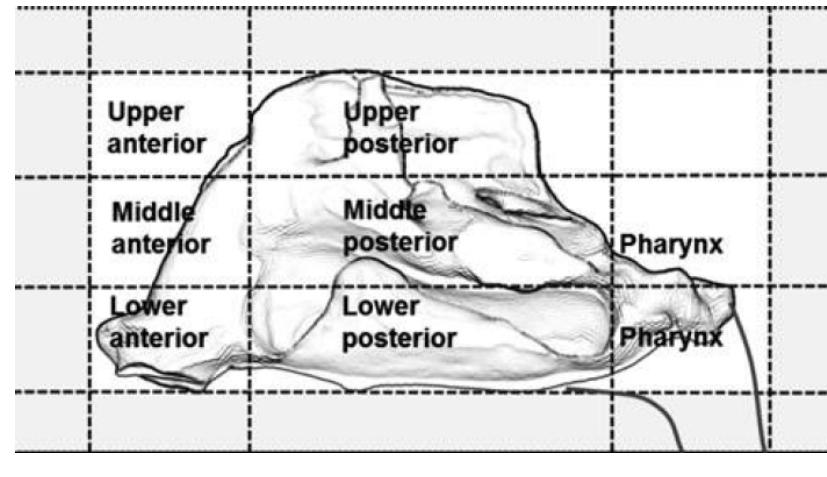
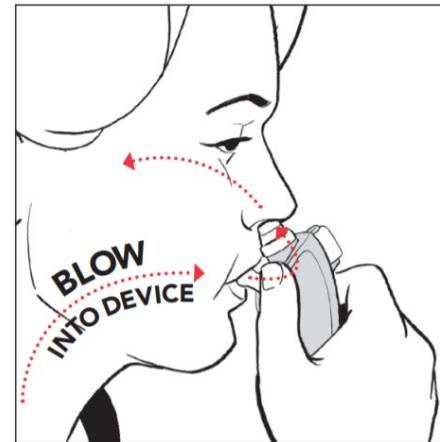
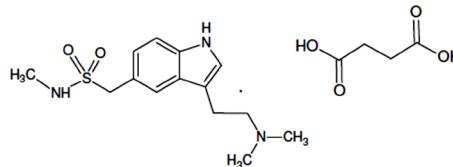
- In vitro models of realistic nasal cavities have previously been used to study regional deposition of nasal solution and suspension spray products.
- Determination of regional deposition from inhaled drugs is important for understanding in vivo performance because absorption and mucociliary clearance vary by region and some drug products may target specific regions.
- Dry powder nasal drug products have not been tested in these types of in vitro models, due to a lack of these products on the U.S. market.

# Research Goal

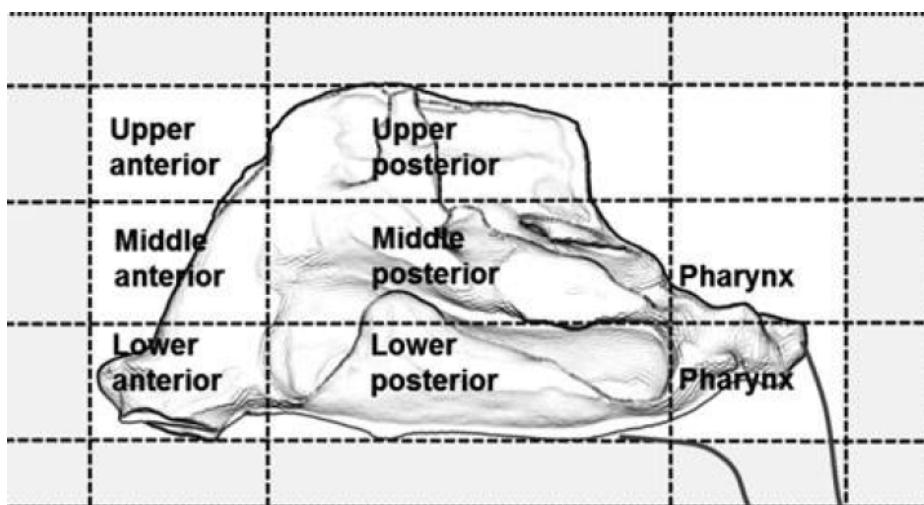
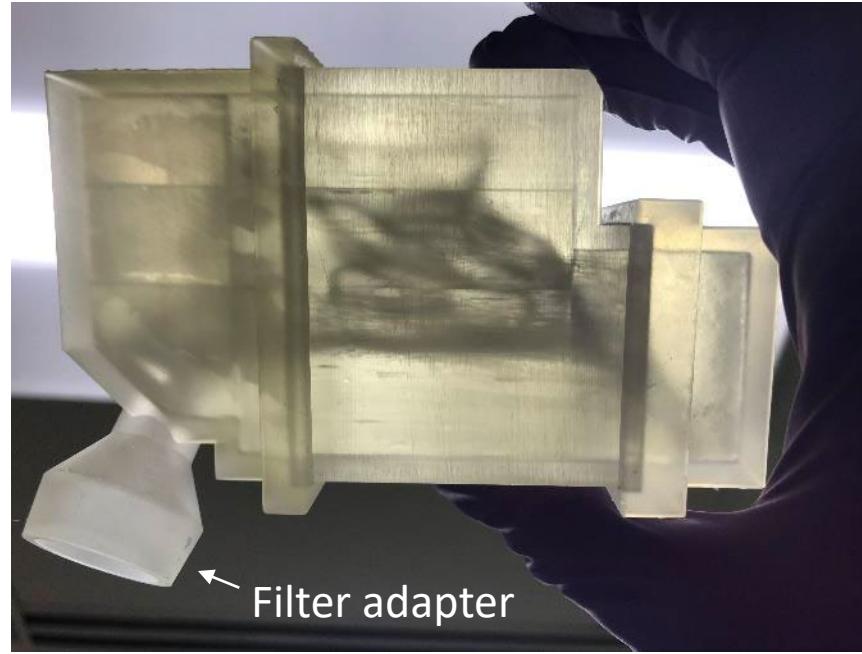
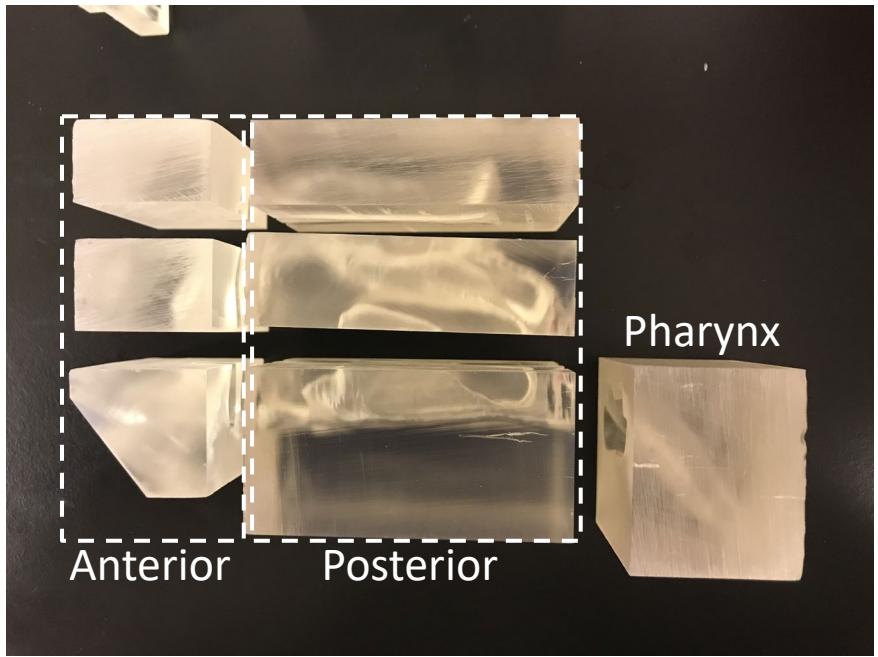
FDA

Test an in vitro method using sumatriptan nasal powder (Onzetra Xsail) while varying methodology to best represent in vivo gamma scintigraphy measurements from the literature (Djupesland and Skretting, 2012).

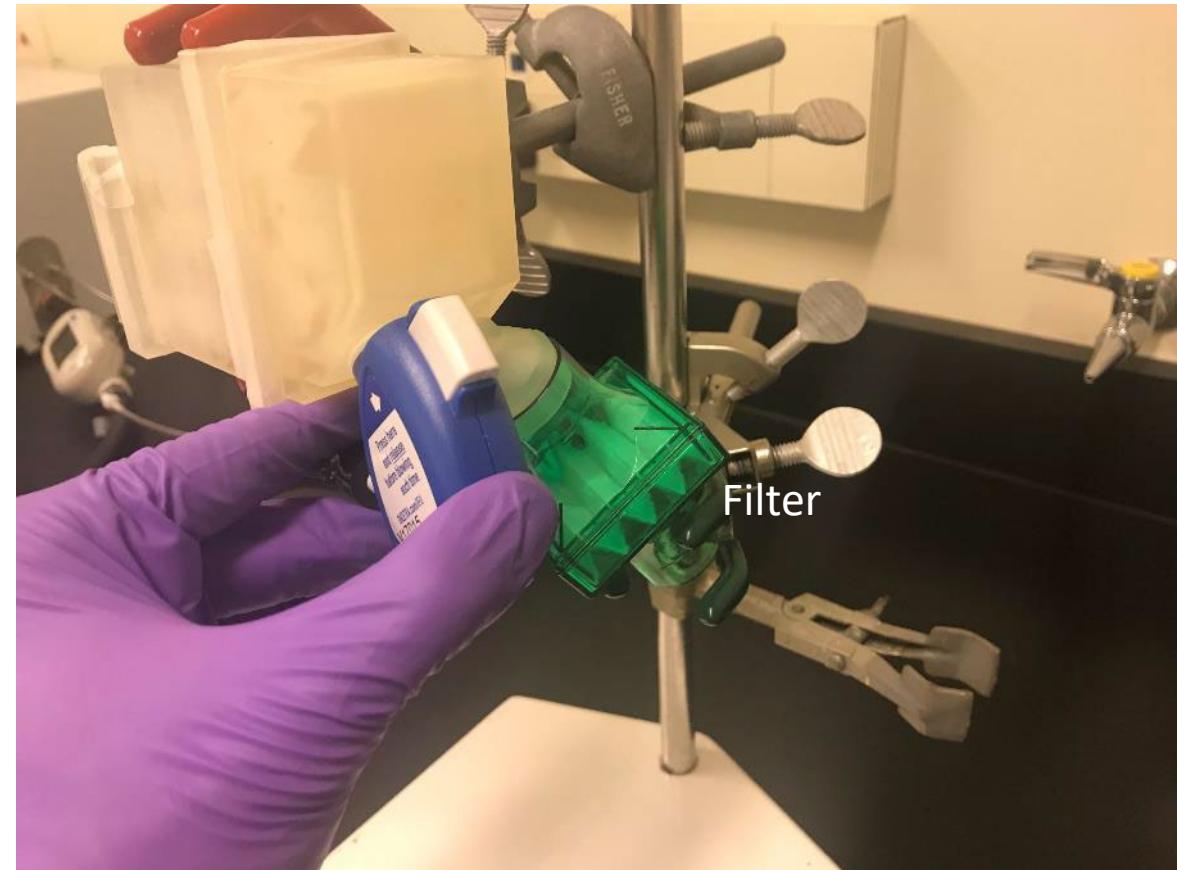
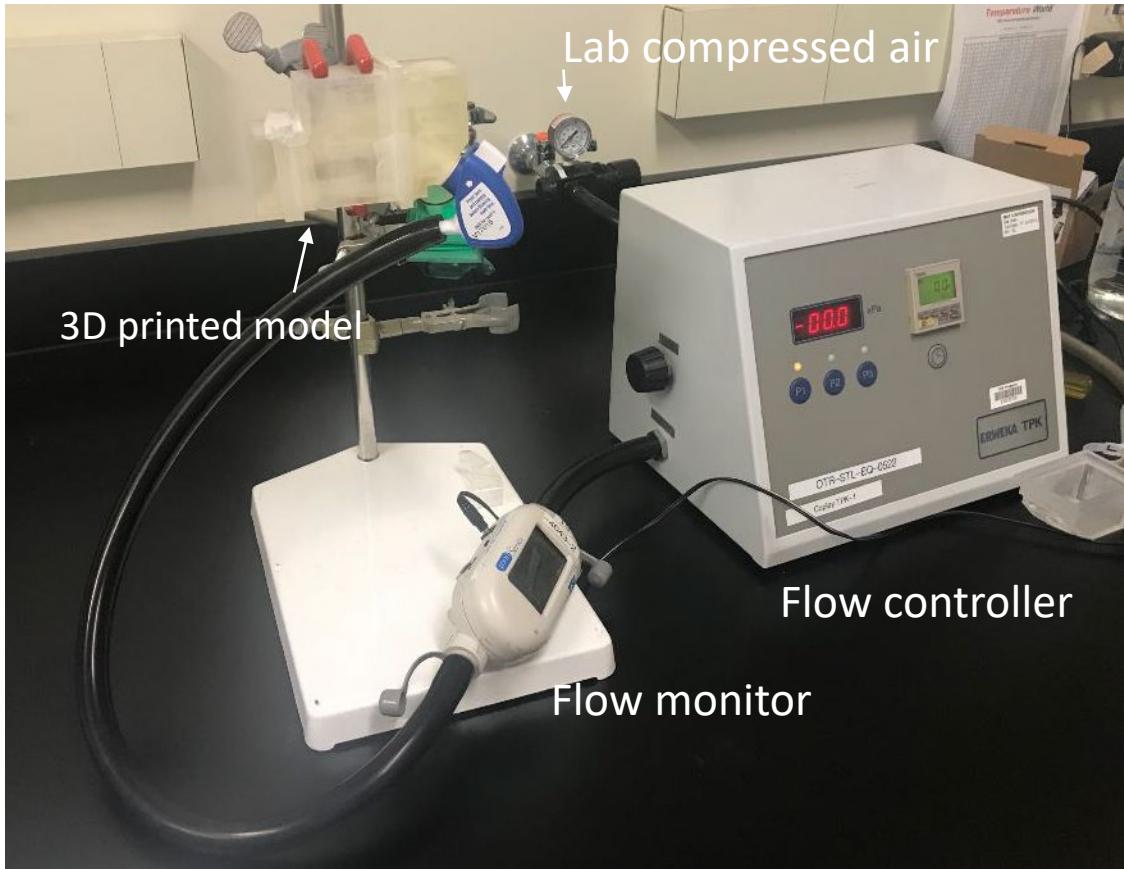
Onzetra Xsail (API = sumatriptan succinate)



# 3D Printed Nasal Model



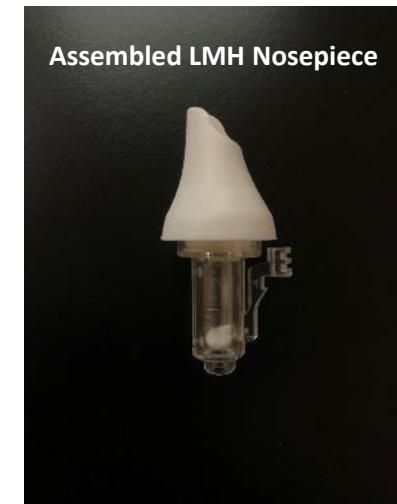
# Experimental Setup



# Method Details



- Positive air pressure applied to Onzetra Xsail device at **100 L/min** for **3 seconds** (user is instructed to blow for 2-3 seconds according to the instruction pamphlet). No vacuum applied.
- **One nosepiece** was used per run (16 mg lactose monohydrate).
- All 3D printed nasal regions were dipped in a **1:2 glycerol:methanol mixture** and allowed 1+ hours to dry prior to collection.
- 10 mL of diluent was used to wash each part post run.
- **Diluent/Mobile Phase:** 18 MΩ water (degassed).
- HPLC equipped with a resin-based column (300 x 7.8 mm) and Refractive Index Detector (RID) used for detection.

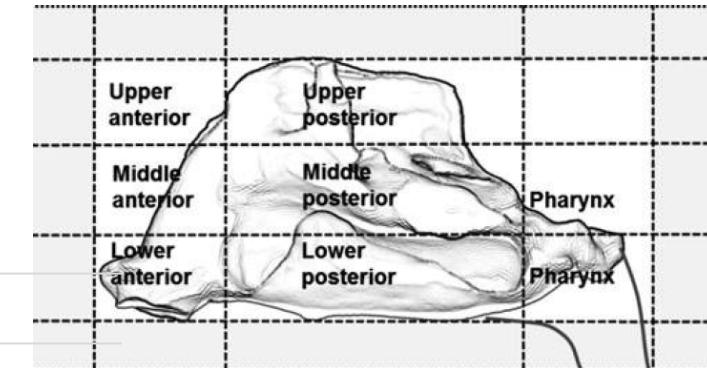
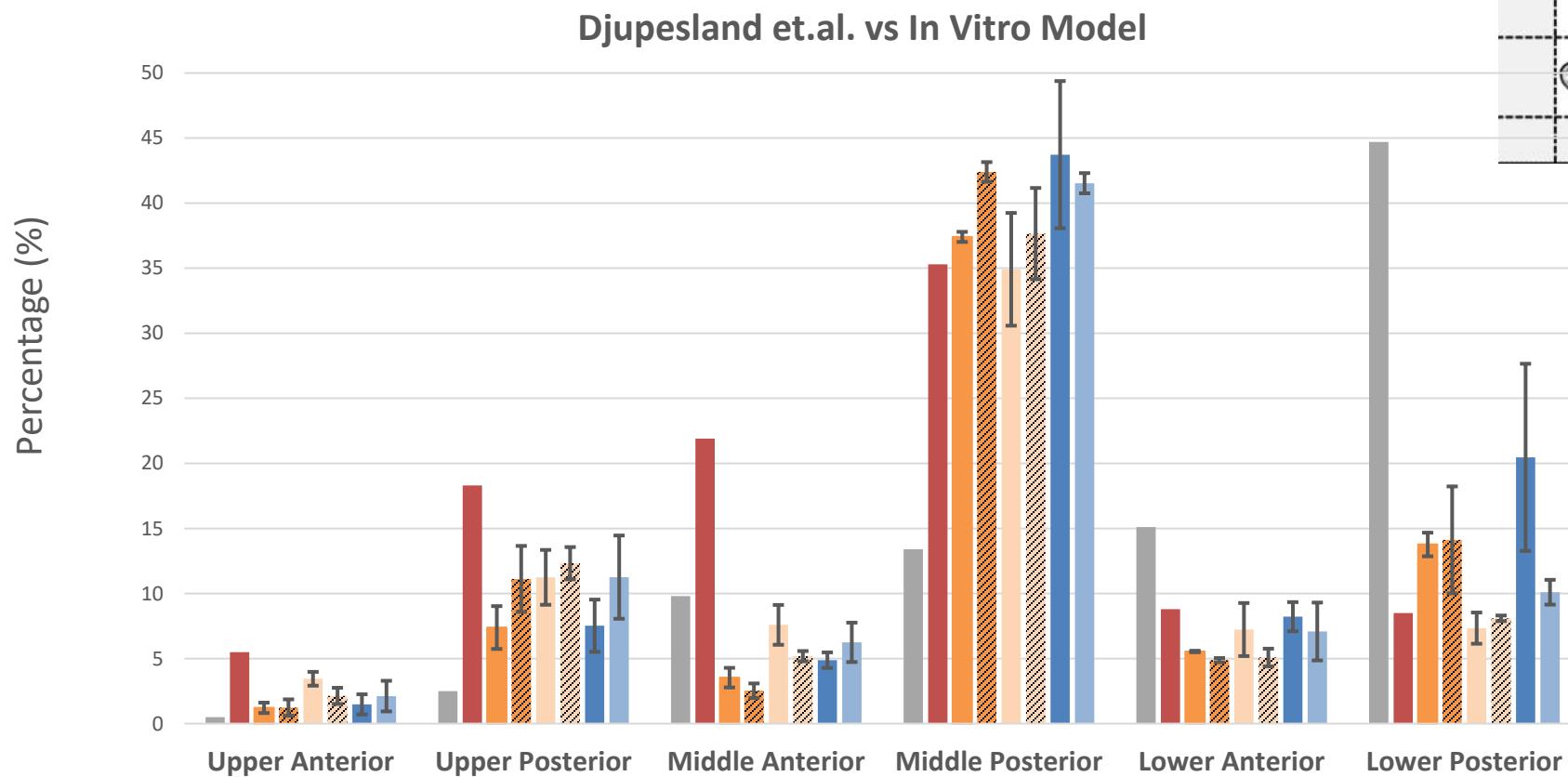


# Lactose Monohydrate Results



Particle size distribution ( $\mu\text{m}$ )			LH210
D10	D50	D90	
2.7	16	41	

Particle size distribution ( $\mu\text{m}$ )			LH100
D10	D50	D90	
58	132	214	



- Spray
- Optinose
- LH210 R-Nostril
- LH210 R-Nostril Humid
- LH210 L-Nostril
- LH210 L-Nostril Humid
- LH100 R-Nostril
- LH100 L-Nostril

# Conclusions



- The in vitro method developed in this study using a nasal cavity model showed a good in vivo representation for regional deposition of nasal powders.
- The method may be insensitive to substance type, but additional data would be needed to confirm this claim.