

# In Vitro Characterization of Nasal Powder Drug Products

***SBIA 2022: Advancing Generic Drug Development:  
Translating Science to Approval***

***Day 2, Session 6: Current Challenges and Scientific Advancements for Nasal Products***

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CDER | US FDA

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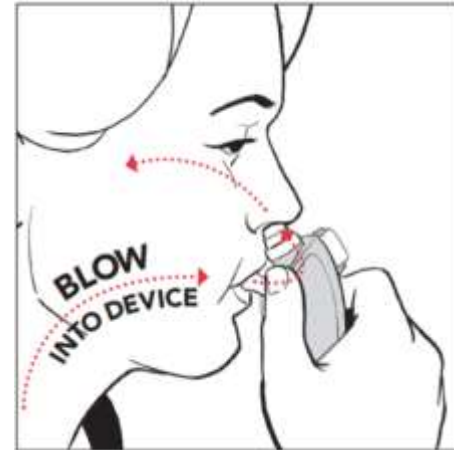
# Learning Objectives

- Describe nasal powder delivery device
- Learn about in vitro characterization using laser diffraction and subsequent data
- Explore preliminary in vitro data on nasal powder delivery into 3D printed nasal cavity model

# Nasal Powder Delivery Device



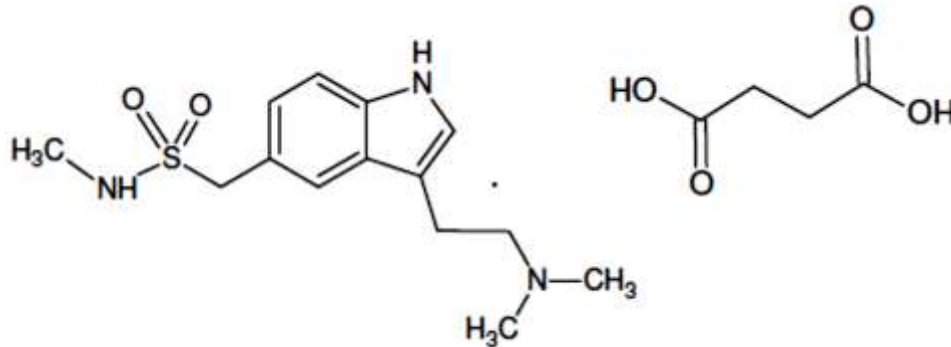
- Breath-actuated delivery device
- Capsules contain 11 mg of sumatriptan base in disposable nosepiece



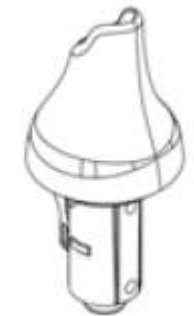
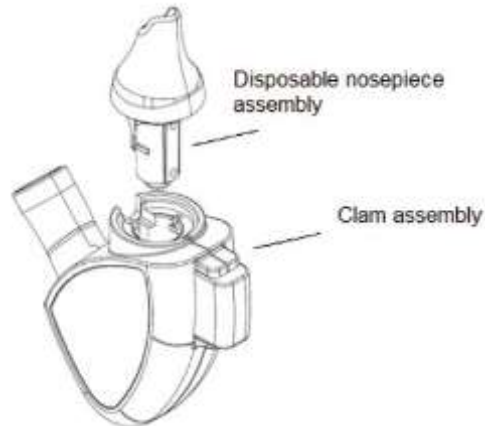
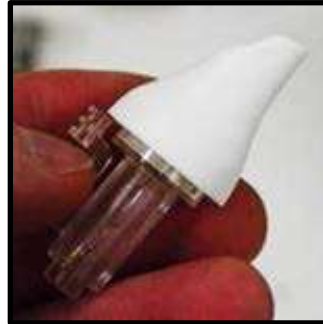
# Nasal Powder Delivery Device



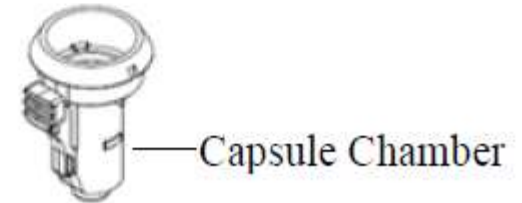
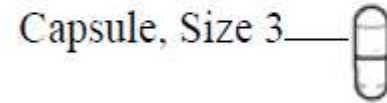
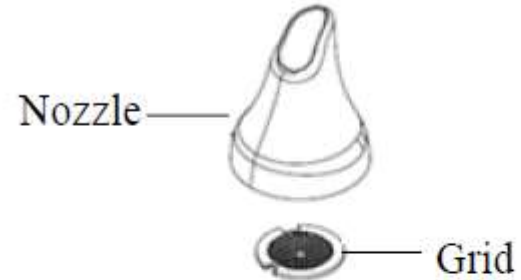
- Formulation is 15.4 mg sumatriptan succinate (equivalent to 11 mg sumatriptan base)
- Use for acute treatment of migraine in adults
- No excipients present



# Nasal Powder Delivery Device



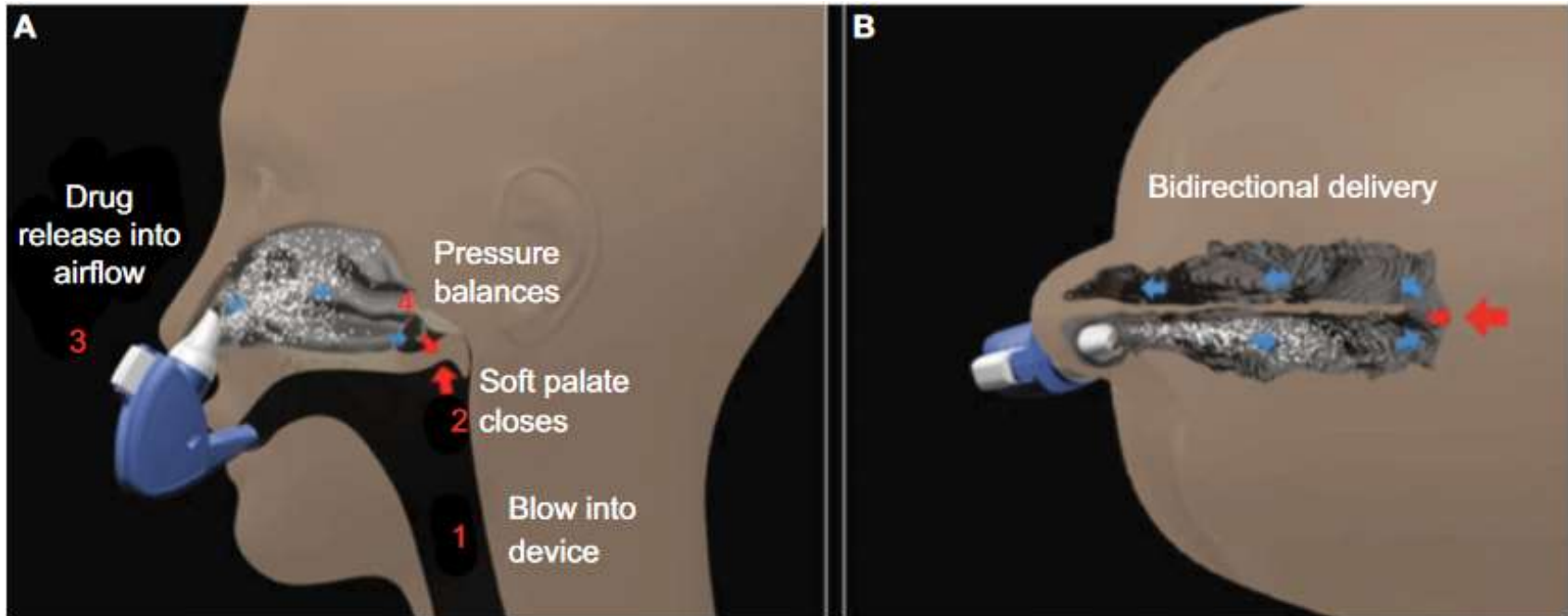
Nosepiece



# Nasal Powder Delivery Device

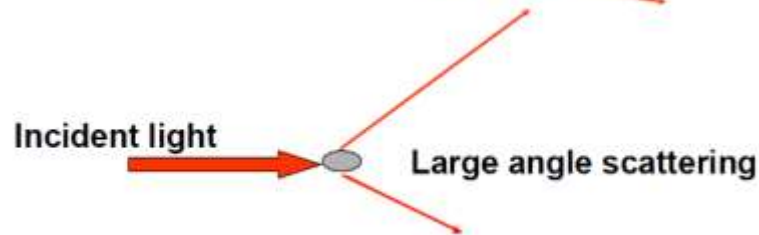
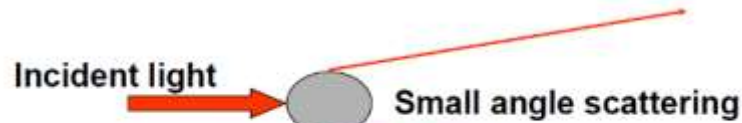
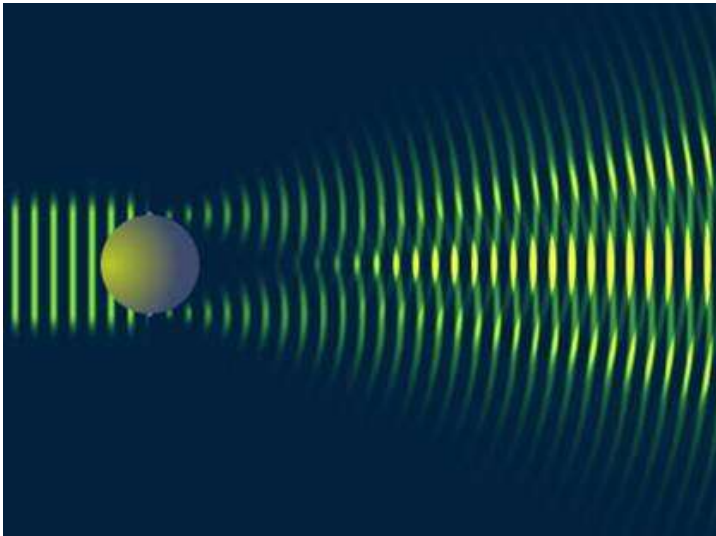


- Bidirectional delivery

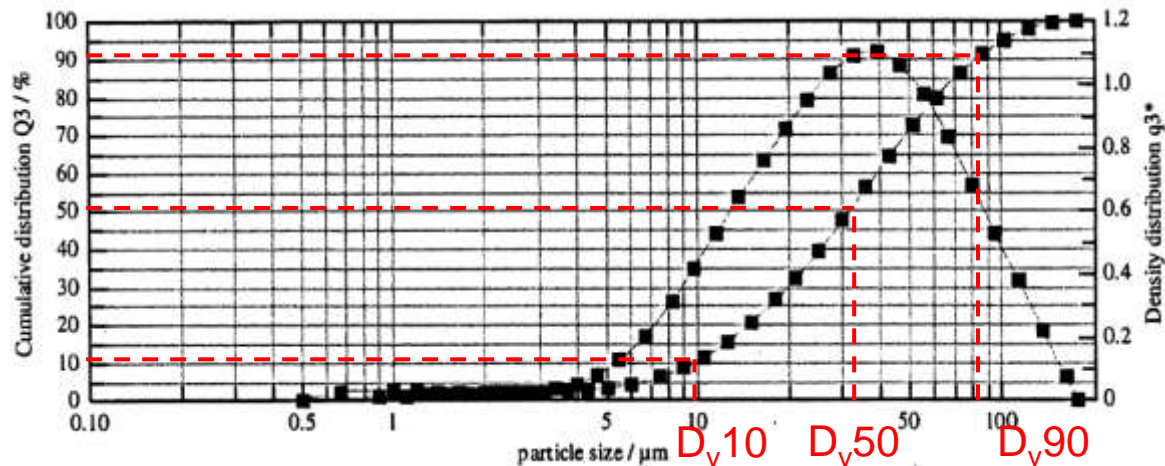
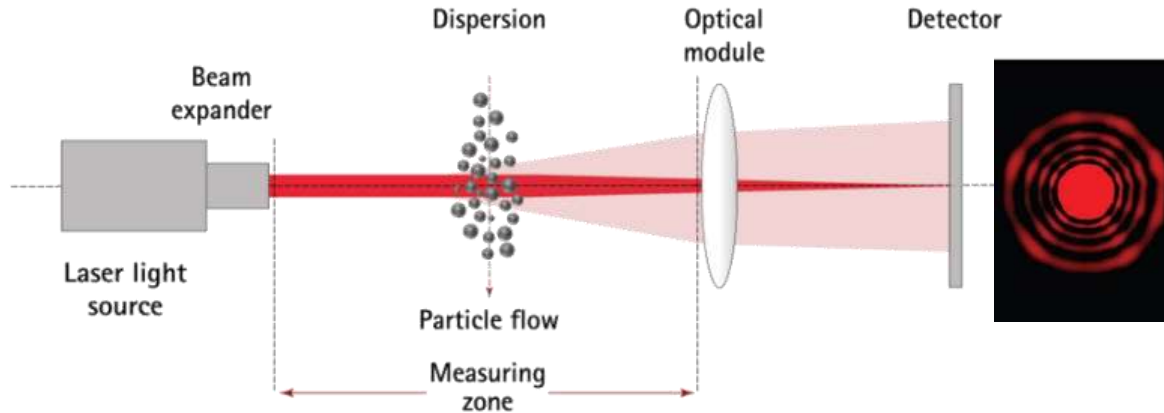


# In Vitro Laser Diffraction

- Obtains fast volume-weighted particle size distributions (PSD)



# In Vitro Laser Diffraction



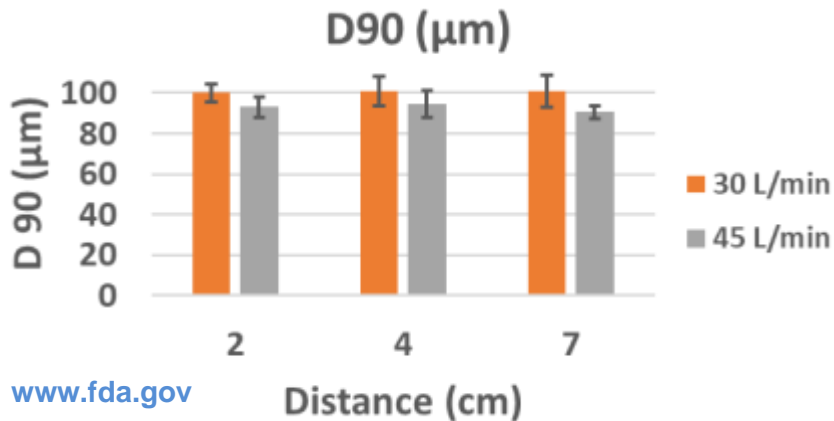
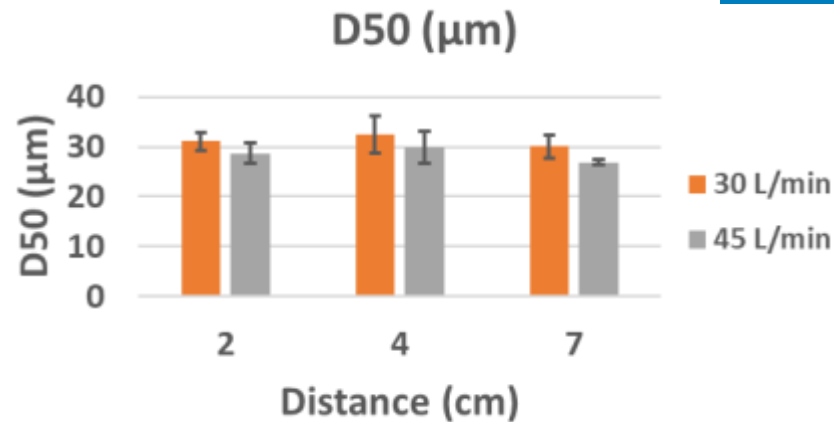
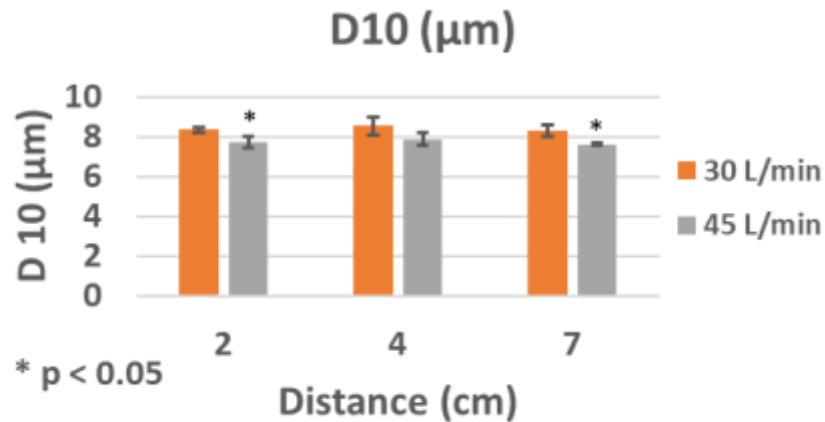


# In Vitro Laser Diffraction



- What effect does distance from the laser beam have on PSD?
- What flow rate is optimal for activation of the device?

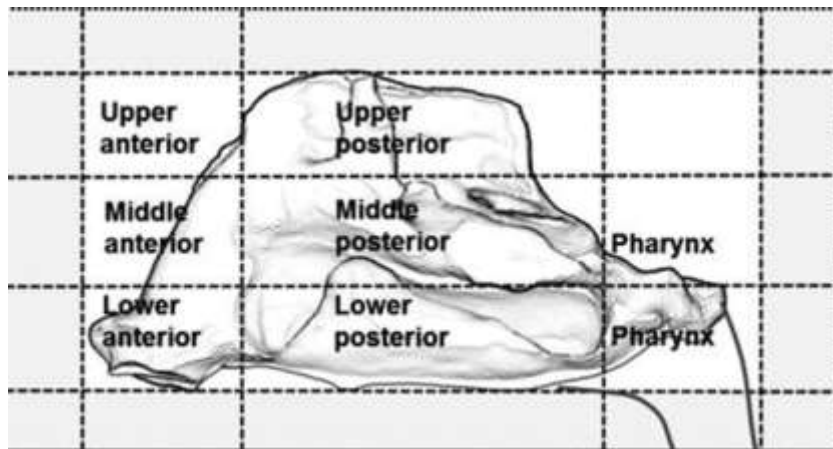
# In Vitro Laser Diffraction



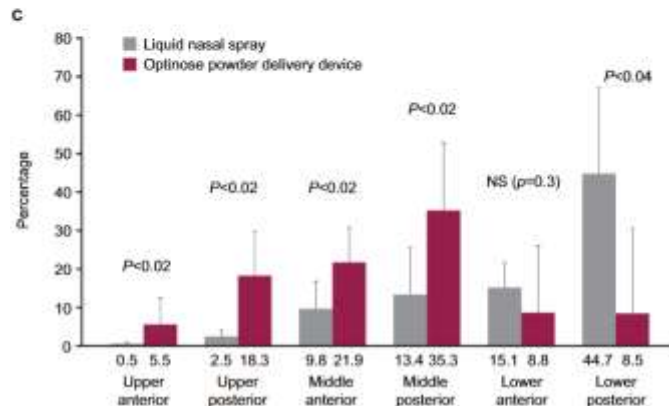
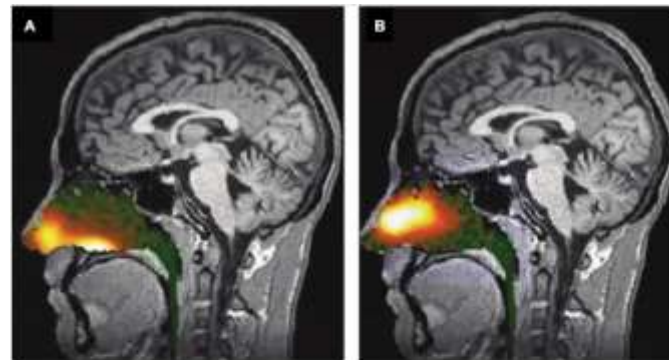
- 15 L/min was insufficient for actuation of the device.
- Statistical difference for  $D_{v10}$  at different flow rates (2 cm, 7 cm)

# In Vitro Nasal Model

- Nasal liquid vs powder delivery

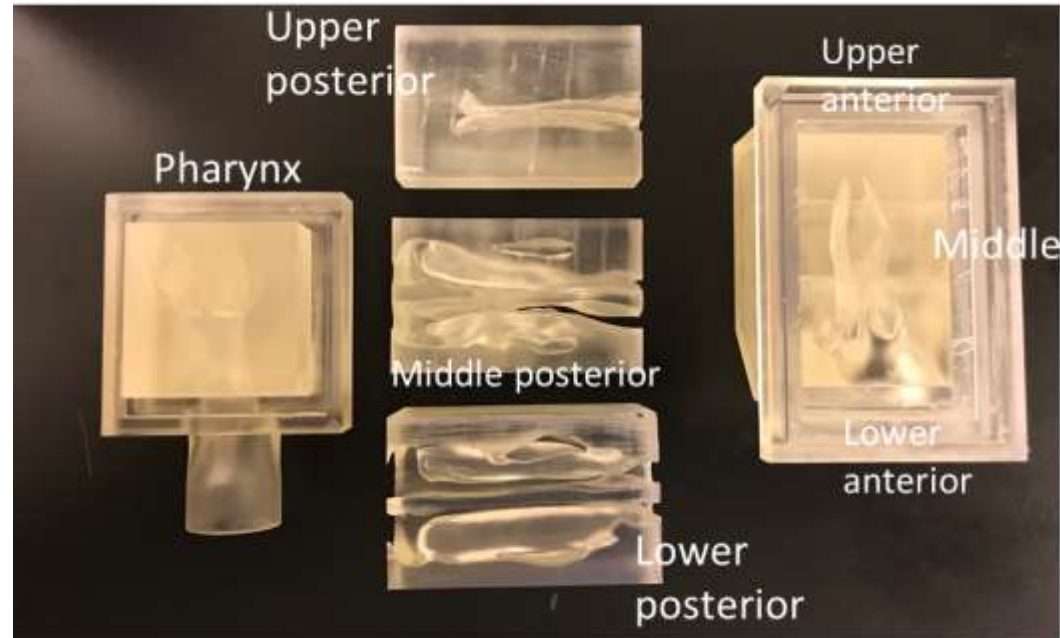
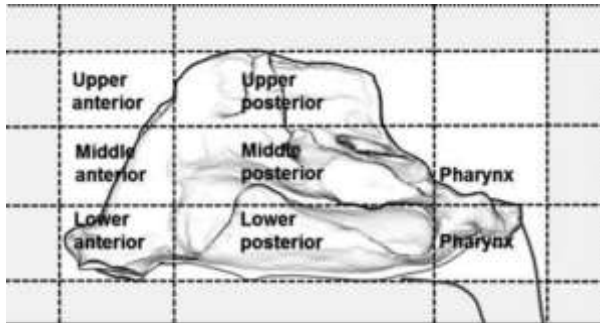


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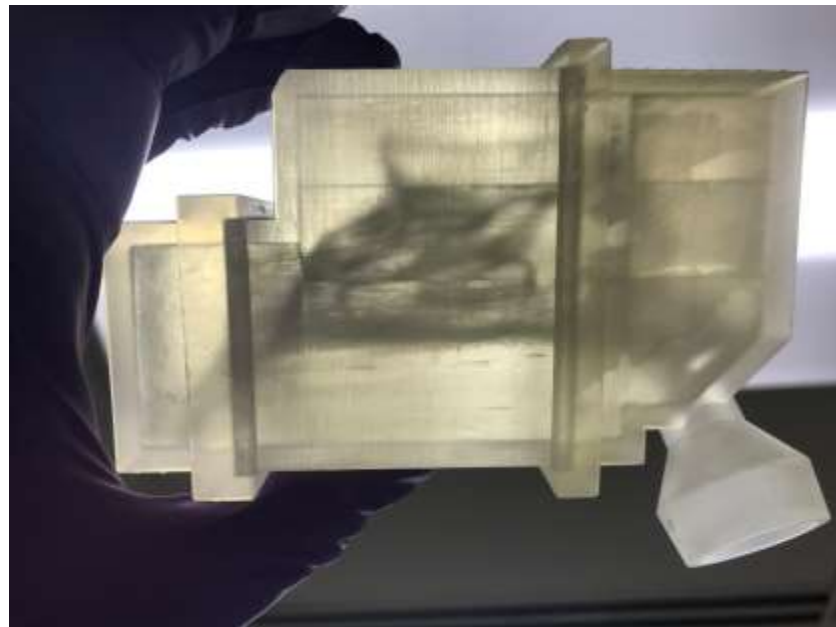
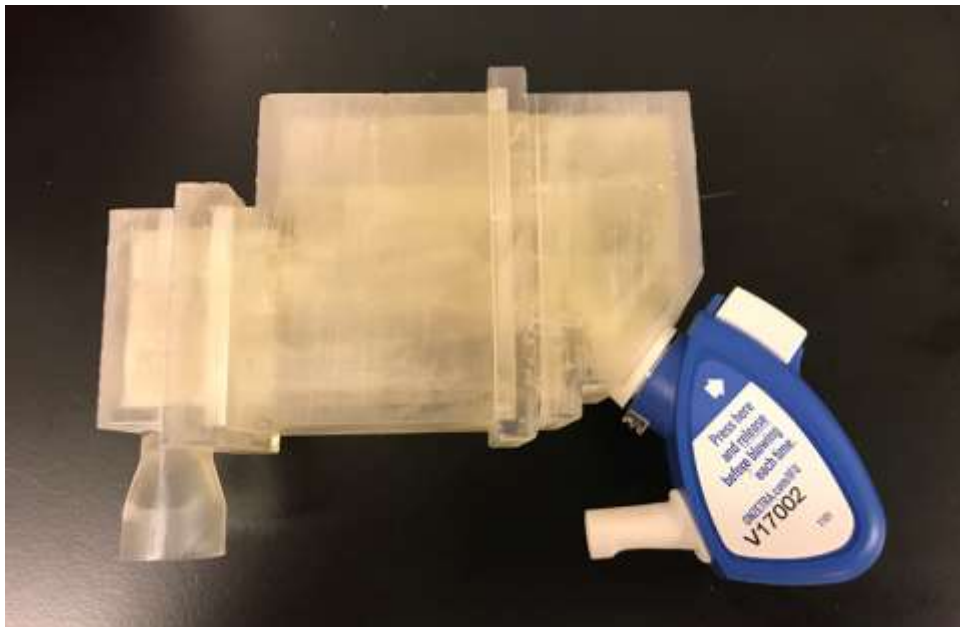
# In Vitro Nasal Model

- 3D printed model pieces on resin printer



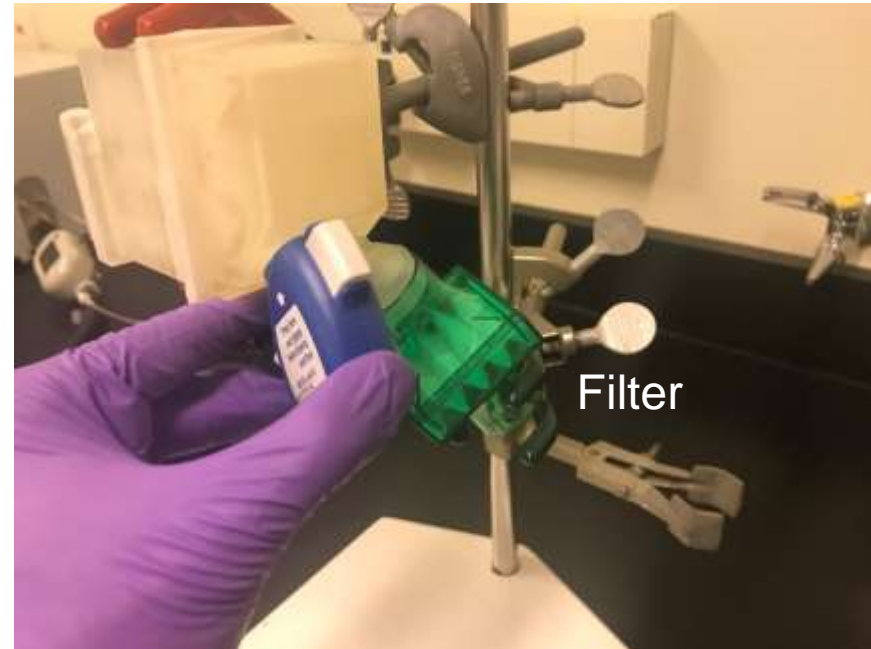
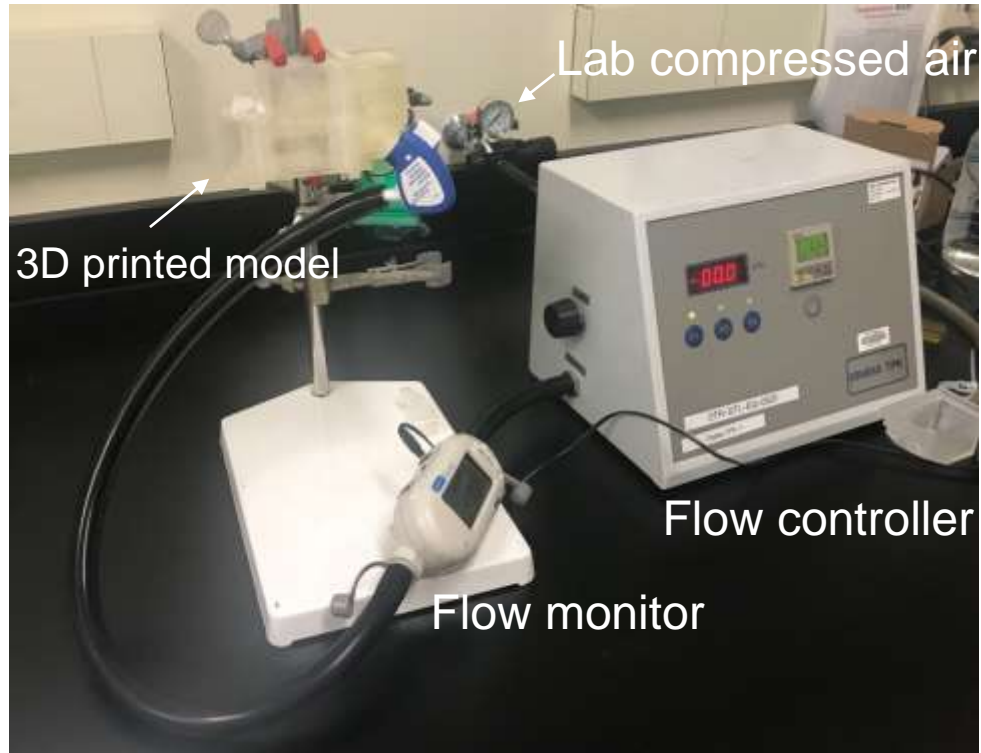
# In Vitro Nasal Model

- Glycerol/Methanol mixture was used as coating to simulate nasal fluid



# In Vitro Nasal Model

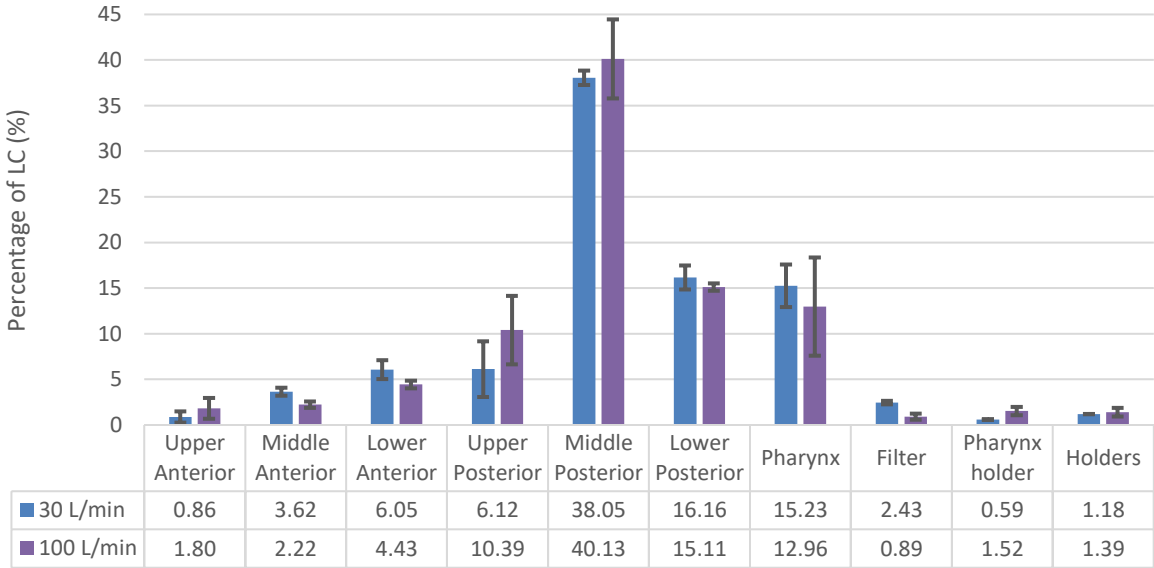
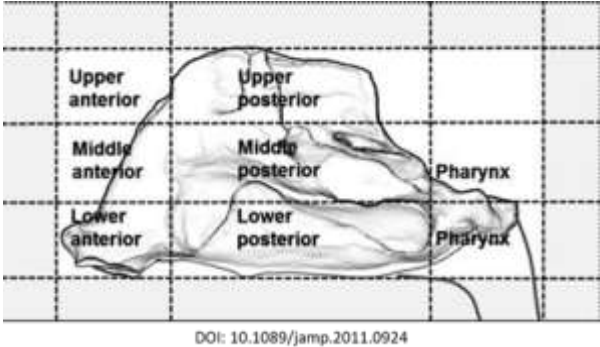
## Experimental Setup



# In Vitro Nasal Model

- Less than 5% of LC deposition in filter and outer casings

30 L/min vs 100 L/min (Low Humidity)



# Challenge Question #1

**What characterization parameter does laser diffraction measure?:**

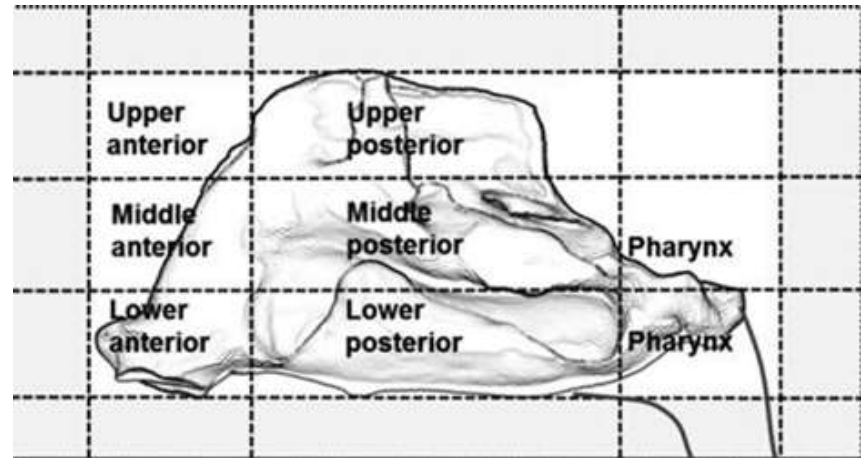
- A. Number-weighted particle size distribution
- B. Mean number of particles
- C. Volume-weighted particle size distribution
- D. Particle shape



## Challenge Question #2

**The dry powder delivery device deposits mainly in which region of the nasal cavity?**

- A. Lower posterior
- B. Middle anterior
- C. Lower anterior
- D. Middle posterior



# Summary



- The dry powder delivery device utilizes bi-directional delivery by closing the soft palate on exhale.
- Laser diffraction is a fast in vitro characterization tool that measures volume-weighted PSDs.
  - Blind to API and particle shape (assumes spherical particles)
- 3D printed nasal models can be useful for simulating drug deposition.
  - Preliminary data looks promising, but still needs validation.

# Acknowledgments



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# Questions?

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