

MPPD validation report

Written by: Yinkui Yu

Date: 01/12/2024

With MPPD v3.04

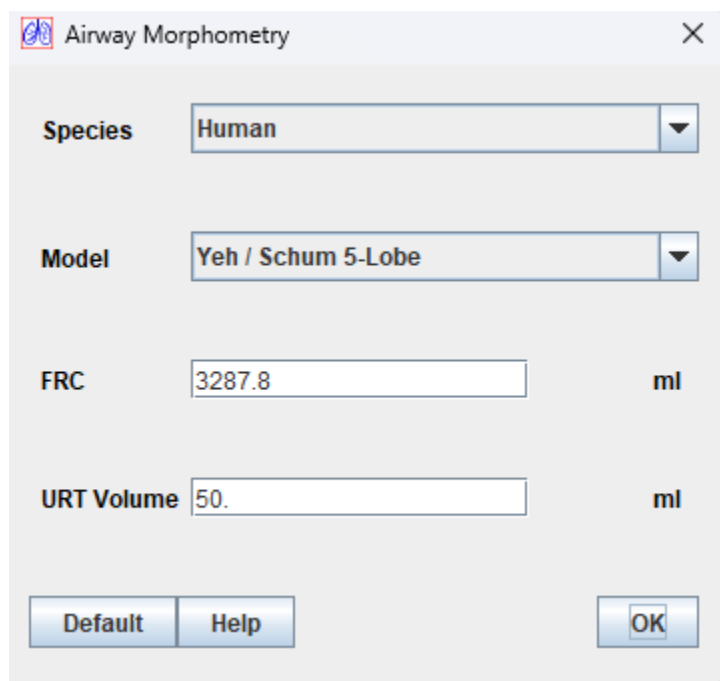
This report contains the calculation results from the MPPD v3.04. Two different nebulizers, low VMD and STD VMD, are tested. Two different breathing profiles, shallow breathe and deep breathe, are tested. The detailed information are shown in Table 1 below:

| Settings | Nebulizer | Breathing profile | VMD [μm] | GSD | Aerosol concentration [mg/m ³] | Tidal [mL] | Breaths/min |
|----------|-----------|-------------------|----------|------|--------------------------------------------|------------|-------------|
| 1 | Low VMD | Shallow | 6.77 | 2.22 | 47.8 | 600 | 12 |
| 2 | STD VMD | Shallow | 6.93 | 2.05 | 168.6 | 600 | 12 |
| 3 | Low VDM | Deep | 6.77 | 2.22 | 47.8 | 1000 | 9 |

Note: Based on Yeh(1980), $FRC = 0.6 * TLC = 5479.6 * 0.6 = 3287.8$ [mL]

URT volume is set to be 50 mL (MPPD default value) from Overton and Graham (1989) and Hart, et al. (1963).

Airway Morphometry:



The screenshot shows a software window titled "Airway Morphometry" with a close button (X) in the top right corner. Inside the window, there are four settings:

- Species:** A dropdown menu with "Human" selected.
- Model:** A dropdown menu with "Yeh / Schum 5-Lobe" selected.
- FRC:** A text input field containing "3287.8" with the unit "ml" to its right.
- URT Volume:** A text input field containing "50." with the unit "ml" to its right.

At the bottom of the window, there are three buttons: "Default", "Help", and "OK".

Aerosol properties:

STD VMD:

Particle Properties

Density: 1.0 g/cm³

Aspect Ratio: 1.0 =1 for spherical

Diameter: 6.93 µm

Single
Multiple
Multimodal

☐ CMD ☐ MMD ☒ MMAD

☐ Inhalability Adjustment

GSD (diam.): 2.04

GSD (length): 1.0

Correlation: 0.0

☐ Equiv. Diam. Model

Diff. Diameter: 1.0 µm

Sed. Diameter: 1.0 µm

Imp. Diameter: 1.0 µm

Int. Diameter: 1.0 µm

Help OK

Low VMD:

Particle Properties

Density: 1.0 g/cm³

Aspect Ratio: 1.0 =1 for spherical

Diameter: 6.77 µm

Single
Multiple
Multimodal

☐ CMD ☐ MMD ☒ MMAD

☐ Inhalability Adjustment

GSD (diam.): 2.22

GSD (length): 1.0

Correlation: 0.0

☐ Equiv. Diam. Model

Diff. Diameter: 1.0 µm

Sed. Diameter: 1.0 µm

Imp. Diameter: 1.0 µm

Int. Diameter: 1.0 µm

Help OK

Exposure scenario:

Shallow breath (low VMD):

Exposure Scenario

Acceleration of Gravity: 981.0 cm/s²

Body Orientation: Upright

Body Orientation: α: 0.0 °

Body Orientation: β: 0.0 °

Body Orientation: γ: 0.0 °

Aerosol Concentration: 47.8 mg/m³

Breathing Frequency: 12 per minute

Tidal Volume: 600 ml

Inspiratory Fraction: 0.5

Pause Fraction: 0.0

Breathing Scenario: Oral

Default Help OK

Deep breath (low VMD):

Exposure Scenario

Acceleration of Gravity: 981.0 cm/s²

Body Orientation: Upright

Body Orientation: α: 0.0 °

Body Orientation: β: 0.0 °

Body Orientation: γ: 0.0 °

Aerosol Concentration: 47.8 mg/m³

Breathing Frequency: 9 per minute

Tidal Volume: 1000 ml


Inspiratory Fraction: 0.5

Pause Fraction: 0.0

Breathing Scenario: Oral

Default Help OK

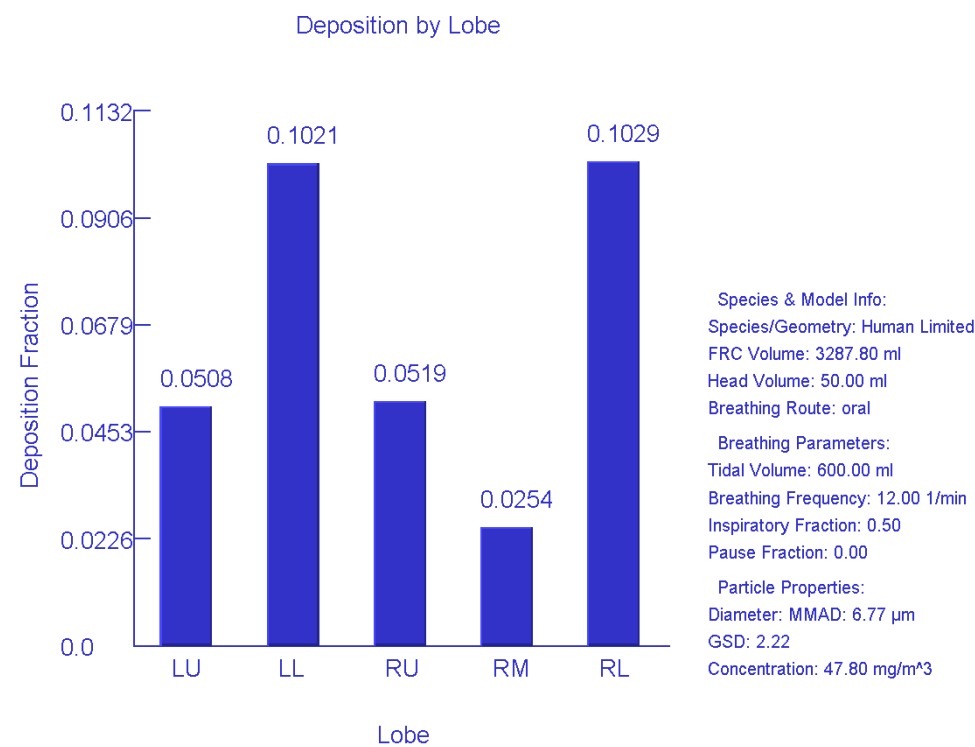
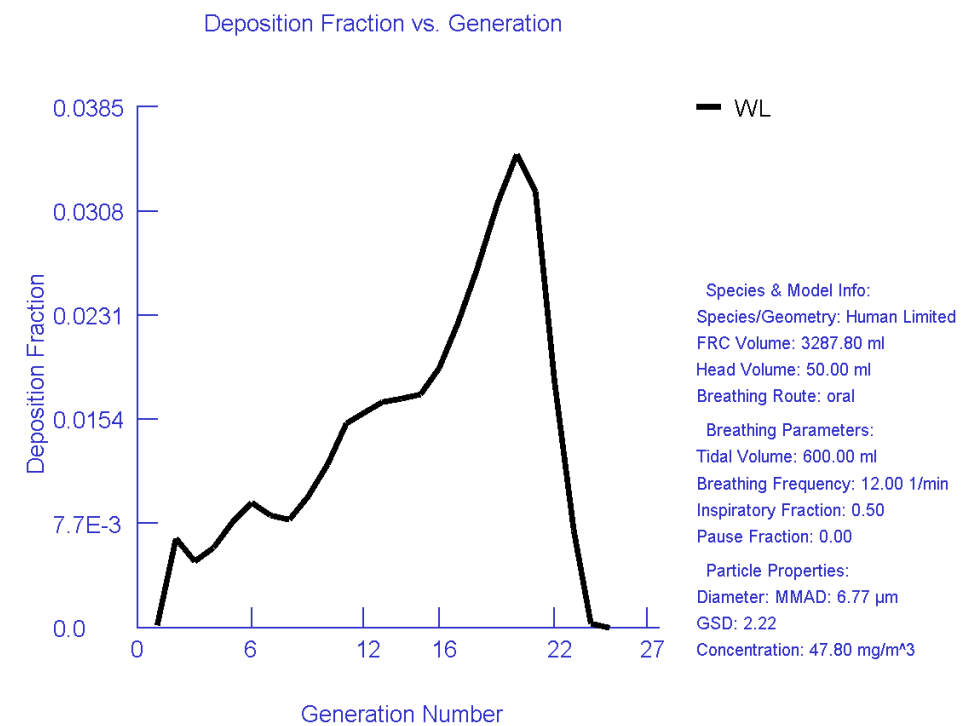
Shallow breath (STD VMD):

 Exposure Scenario ✕

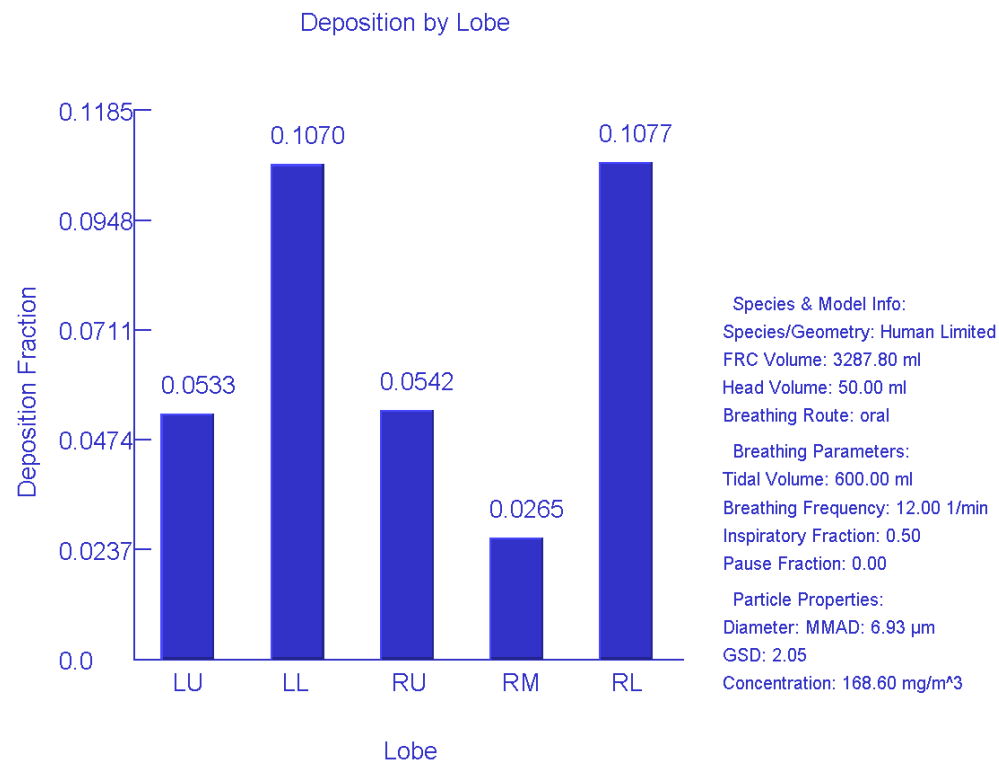
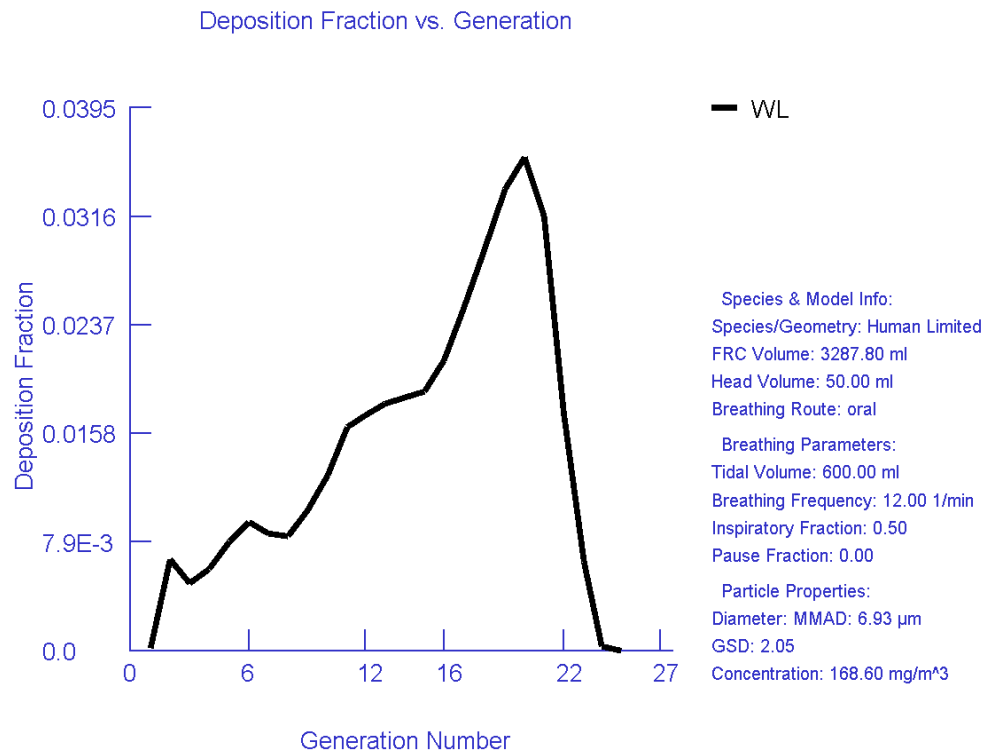
| | | |
|----------------------------|--------------------------------------|-------------------|
| Acceleration of Gravity | <input type="text" value="981.0"/> | cm/s ² |
| Body Orientation | <input type="text" value="Upright"/> | ▼ |
| Body Orientation: α | <input type="text" value="0.0"/> | ° |
| Body Orientation: β | <input type="text" value="0.0"/> | ° |
| Body Orientation: γ | <input type="text" value="0.0"/> | ° |
| Aerosol Concentration | <input type="text" value="168.6"/> | mg/m ³ |
| Breathing Frequency | <input type="text" value="12"/> | per minute |
| Tidal Volume | <input type="text" value="600"/> | ml |
| Inspiratory Fraction | <input type="text" value="0.5"/> | |
| Pause Fraction | <input type="text" value="0.0"/> | |
| Breathing Scenario | <input type="text" value="Oral"/> | ▼ |

Results:

Setting 1:



Setting 2:



Setting 3:

