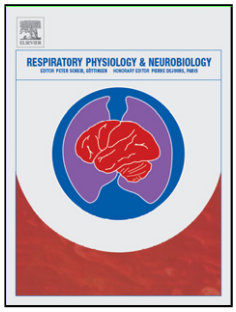

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Flow visualization through particle image velocimetry in realistic model of rhesus monkey's upper airway

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Highlights

- Flow in a realistic rhesus monkey upper airway model is the subject of this study.
- We conducted PIV to investigate the flow pattern in both oral and nasal inhalations.
- Vortex flow structures occurred in the nasal vestibule by sudden expansion of vestibule geometry.
- The flow profile is found to be well developed in the trachea region for cases involving oral inhalation at 10 and 20 L/min.
- The results contribute to understand flow pattern in the complex monkey airway model.

Abstract

Studies concerning inhalation toxicology and respiratory drug-delivery systems require biological testing involving experiments performed on animals. Particle image velocimetry (PIV) is an effective *in vitro* technique that reveals detailed inhalation flow patterns, thereby assisting analyses of inhalation exposure to various substances. A realistic model of a rhesus-monkey upper airway was developed to investigate flow patterns in its oral and nasal cavities through PIV experiments performed under steady-state constant inhalation conditions at various flow rates—4, 10, and 20 L/min. Flow rate of the fluid passing through the inlet into the trachea was measured to obtain characteristic flow mechanisms, and flow phenomena in the model were confirmed via characterized flow fields. It was observed that increase in flow rate leads to constant