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Effect of varying inhalation durations in normal breathing and HFOV conditions[1] MANIKANTAM GADDAM, YU FENG, ARVIND SANTHANAKRISHNAN, Oklahoma State University — Experimental and computational studies in idealized and subject-specific airways at normal breathing conditions (Womersley number, Wo=2-4) and in high-frequency oscillatory ventilation (HFOV, Wo=4-25) have shown flow separation at bifurcations, secondary flows, and steady streaming at the end of inhalation. However, the effects of varying inhalation duration (relative to breathing time period) on the flow field remain unclear. We conducted 2D simulations on a Weibel airway model representing mouth to trachea with G2 to investigate the influence of inhalation time (IT) to breathing time (BT) in normal breathing and HFOV conditions. Oscillatory breathing patterns, with peak inhalation at Reynolds number (Re) of 1070 and peak exhalation at Re of 1100, were prescribed as inflow conditions for different Wo values. With increasing Wo for a given IT/BT ratio, residual flow region increased at the end of exhalation, affecting flow during inhalation in the next breathing cycle. With increasing IT/BT, residual flow region increased at the end of exhalation for Wo ranging from 2.4 to 7.5 in the oral region.

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