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Numerical investigation of aerosolized drug delivery in the human lungs under mechanical ventilator conditions TIMOTHY VANRHEIN, ARINDAM BANERJEE, Missouri S&T — Particle deposition for aerosolized drug delivery in the human airways is heavily dependent upon flow conditions. Numerical modeling techniques have proven valuable for determining particle deposition characteristics under steady flow conditions. For the case of patients under mechanical ventilation, however, flow conditions change drastically and there is an increased importance to understand particle deposition characteristics. This study focuses on mechanically ventilated conditions in the upper trachea-bronchial (TB) region of the human airways. Solution of the continuous phase flow is done under ventilator waveform conditions with a suitable turbulence model in conjunction with a realistic model of upper TB airways. A discrete phase Euler-Lagrange approach is applied to solve for particle deposition characteristics with a focus on the effect of the ventilator inlet waveform. The purpose of this study is to accurately model flow conditions in the upper TB airways under mechanically ventilated conditions with a focus on real-time patient specific targeted aerosolized drug delivery.

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