Abstract

Drug delivery in human respiratory system is long standing study for the better treatment. Since the time consuming and expensive nature of experimental study, the mathematical modeling becomes another choice for this development.

Detailed information about airflow pattern is highly important in accurately predicting droplet particle flow. A two-dimensional study of airflow and droplet particle transport/deposition in a human upper airway covering mouth inlet to trachea are presented in this research. The model of oscillating airflow is constructed by using Navier-Stokes equations, continuity equation, and oscillating in pressure gradient condition. The numerical results are solved by finite element method in COMSOL Multiphysics® 3.5a, and then the airflow patterns at different times are simulated. In addition, the particle mobility and deposition characteristics through the airflow are investigated by using Lagrangian dispersed phase model. The model is solved by Euler's method. Moreover, the particle trajectories and the distribution of particle deposition are investigated for different values of particle density, particle injection angle and initial injection speed. Finally, the numerical results show good agreement with previous studies, which useful for promoting the treatment of pharmacological drug particle via target delivery such as the optimization design of therapy methodologies, treatment device and drug materials.