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Abstract: Recent developments in the prediction of local aerosol deposition in human lungs are driven by the fast development of computational simulations. Although such simulations provide results in unbeatable resolution, significant differences among distinct methods of calculation emphasize the need for highly precise experimental data in order to specify boundary conditions and for validation purposes. This paper reviews and critically evaluates available methods for the measurement of single and disperse two-phase flows for the study of respiratory airflow and deposition of inhaled particles, performed both *in vivo* and in replicas of airways. Limitations and possibilities associated with the experimental methods are discussed and aspects of the computational calculations that can be validated are indicated. The review classifies the methods into following categories: 1) point-wise and planar methods for velocimetry in the airways, 2) classic methods for the measurement of the regional distribution of inhaled particles, 3) standard medical imaging methods applicable to the measurement of the regional aerosol distribution and 4) emerging and nonconventional methods. All methods are described, applications in human airways studies are illustrated, and recommendations for the most useful applications of each method are given.

Keywords: computational fluid particle dynamics, human airways, lungs, experimental methods, medical imaging, aerosol deposition, velocimetry techniques, flow measurement techniques, gas–liquid two-phase flow, CFD validation