Visualizing and Improving the Operation of an Inhaled Medication Chamber Tube

Metered Dose Inhalers (MDIs) are designed to deliver medication to a patient's lungs fast and effectively. However, when used alone, MDI's deliver less than half of the medication to the lungs because the flow rate of the aerosol is too fast for the curve-shaped trachea. MDIs are often used with chamber tubes to slow down this flow of the medication and help better administer the medication. However, the designs of the current chamber tubes are far from perfect and do not provide the maximum amount of medication to patients. This is due to the significant amount of medication that adheres to the inner walls of the tube, never making it to the patient. In the first year of this project, several commercial chamber tubes were analyzed to find exactly how much medication was being adhered to the inner walls. Using this data collected in the first year of this project, a list of positive characteristics of a chamber tube was made. In addition to these characteristics, that all pertain to size and shape, an idea to apply an electrostatic charge to the inner walls, to repel the aerosol flowing through, was formulated. All of these characteristics were then tested separately and the best size, shape, and material was found. After this basic design was made, the newly designed tube was then coated with a positively charged material to repel the positively charged aerosol. This final tube was then tested the same as the commercial tubes to find percent of medication lost within the tube. This percent was found to be an astonishingly low, 0.50% medication adhered within the tube. When comparing this to the commercial tubes tested last year (highest percentage at 50%), this newly designed tube is far more effective in getting the maximum amount of medication to the patient.

Awards Won: