

OP-04-MTS**DESIGN AND DEVELOPMENT OF AN INHALATION ASSIST DPI TO IMPROVE LUNG DEPOSITION**

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Background: A dry powder inhaler (DPI) is a small, handheld device that allows breathing in medicine through the mouth directly to the lungs to treat a wide variety of respiratory disorders. These disorders are not well controlled due to inefficient medicine delivery systems, poor treatment compliance, and inaccurate inhaler techniques. In dry powder inhalers, energy is needed for the deagglomeration of the drug and transport it into the lungs. Currently, available DPIs have a low lung drug deposition because deposition depends entirely on the patient's inspiratory effort. Improvements are being made to introduce an internal energy to improve lung deposition.

Methodology: We conducted a comprehensive review of the literature to understand the available inhalers, their mechanisms, and the improvements. We also compared the advantages and disadvantages of different inhaler types. We identified a significant research gap in this field. One significant drawback of current inhalers is their low lung drug deposition. To address this, we proposed potential improvements and developed several conceptual designs. We developed a three-dimensional (3D) model of the suggested inhaler. This model served as the basis for creating a functional prototype of the inhaler.

Deliverables: Our prototype included a pressurized air chamber and a manual pump, which can be used to create an internal energy source. An experiment was conducted that demonstrated a positive pressure when the device was actuated. This positive pressure will result in a high flow rate into the lungs.

Conclusion: Our novel device is an option that solves the limitations of DPIs and offers enhanced treatment efficacy. We developed a concept that could solve the flow-dependent dosage issue of DPI by creating internal pressure by manually pumping a pressurized air chamber before inhalation. The pressurized air chamber releases the air by pressing on the push button valve when the patient inhales. The push button valve can be replaced by a sensor that automatically opens and releases pressurized air when the patient begins to inhale. This gives adequate pressure, which is needed to gain the maximum flow rate, thereby enhancing the drug's lung deposition.

Keywords: DPI, Flow-dependent dosing, Lung deposition, Pressurized air