In-Vitro Study of Inhaled Iloprost Delivery Using a Modified Deepro Mesh Nebulizer with Breath-Actuated Function

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INTRODUCTION: Pulmonary hypertension is a life-threatening disease characterized for the narrowing, blockage and destruction of blood vessels in the lungs. Inhaled iloprost has long been used to treat patients suffering from this condition. In order to ensure an effective treatment, breath-actuated mesh nebulizers are considered as one of the most efficient delivering devices.

OBJECTIVE: A non-commercial modified Deepro mesh nebulizer with newly developed breath-actuated function was used to nebulize iloprost and demonstrate its in-vitro delivery effectiveness, which adds an alternative for delivering this formulation.

METHODS: Iloprost (Ventavis®, Bayer) inhalation solution, 20 μg/2 mL, was tested. Particle size distribution parameters were analysed using a laser diffraction system (Spraytec, Malvern), obtaining volume median diameter (DV50), fine particle fraction (FPF), and geometric standard deviation (GSD). Delivered dose was collected using a breathing simulator (BRS2100, Copley Scientific) and analysed with HPLC. The nebulization time was also computed according to the breathing simulation.

RESULTS: Filled volumes were adjusted to deliver doses of 2.5 and 5.0 μg at the mouthpiece. The mean values of triplicates for DV50, FPF, and GSD were 4.2 μm, 60%, and 1.74, respectively. The nebulization time to deliver 2.5 μg was 4.5 mins, while 5 μg was delivered in 5 mins.

CONCLUSION: The modified Deepro, equipped with a new pressure sensor for breath actuation, successfully nebulized iloprost within reasonable time to improve patient adherence. Particle size distribution characteristics were aligned with the requirements for proper lung deposition. This new technology could also be used to effectively deliver other types of formulations.