Comparative Assessment of Pharmacokinetics and Acute Lung Inflammation of Nicotine Dry Powder Aerosols Generated by PreciseInhale®

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Previous studies by our group investigated the pharmacokinetic (PK) profile of a spray-dried nicotine dry powder (Batch A) delivered via the PreciseInhale® dry powder aerosol exposure system. In a new study, Batch B was produced for evaluation against Batch A. Both batches comprised 2% nicotine, and other excipients. Specifically, this work aimed to compare the aerosol characteristics and nicotine PK profiles of both batches and investigate if these batches, when inhaled, would cause acute lung inflammation in rats. Both batches were delivered intratracheally at a dose of 0.1 mg nicotine/kg body weight by using the PreciseInhale® dry powder aerosol exposure system. Plasma samples for nicotine/cotinine PK analyses were collected by repeated blood sampling via a tail-vein catheter, while single bronchoalveolar lavage fluid (BALF) samples were collected at different time points post-exposure for BALF differential cell counting using flow cytometry and inflammatory protein measurements using Luminex®.

Briefly, both batches showed consistent aerosol yields, had similar mass median aerodynamic diameters and geometric standard deviations (approximately 4 µm and 1.8, respectively), and were delivered within short exposure durations (approximately 3 min per animal to achieve the target dose). It was further observed that both batches showed similar nicotine and cotinine PK profiles and did not cause significant lung inflammation up to 24 h post-exposure. Based on these results, it can be concluded that the two batches of nicotine dry powder were comparable in terms of aerosol characteristics and nicotine PK profiles, and did not cause significant lung inflammation in rats.