Pulmonary Deposition of Radio-labeled Aerosol Using the Aerogen® Ultra Versus a Conventional Jet Nebulizer In Healthy Volunteers


Background

The Aerogen Ultra is a novel drug delivery system that combines vibrating mesh technology with a valved holding chamber. It was designed to optimize delivery of aerosolized medicines to the lungs in spontaneously breathing patients.

Objective

The aim of this study was to compare lung deposition of radio-labeled aerosol delivered using the Aerogen Ultra versus a constant-output jet nebulizer in healthy subjects.

Materials and Methods

Design: Randomized, single-blind crossover study

Healthy non-smoking male volunteers aged ≥18 years with normal lung function

N=6

Aerosol delivery and deposition analysis

• Subjects inhaled radio tagged aerosol until the onset of sputtering (jet nebulizer) or no visible evidence of nebulization (Aerogen Ultra)
• Pulmonary aerosol deposition was evaluated using SPECT-CT and planar imaging

*Driving flow rate of 8 L/min compressed air.
99mTc-DTPA, technetium-99m diethylenetriaminepentaacetic acid; SPECT-CT, single-photon emission computed tomography combined with low-resolution computed tomography.
Pulmonary Deposition of Radio-labeled Aerosol Using the Aerogen® Ultra Versus a Conventional Jet Nebulizer In Healthy Volunteers


Radio-labeled aerosol deposited in the lungs (% of nominal dose)

<table>
<thead>
<tr>
<th>Imaging modality</th>
<th>Aerogen Ultra</th>
<th>Jet nebulizer</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECT-CT analysis</td>
<td>34.1%</td>
<td>5.2%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Planar analysis</td>
<td>32.6%</td>
<td>4.9%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Representative SPECT-CT images of pulmonary aerosol deposition

Aerogen Ultra and Jet nebulizer

- Aerosol delivery to the lungs is more than six times higher with the Aerogen Ultra versus a conventional jet nebulizer

SD, standard deviation; SPECT-CT, single-photon emission computed tomography combined with low-resolution computed tomography.