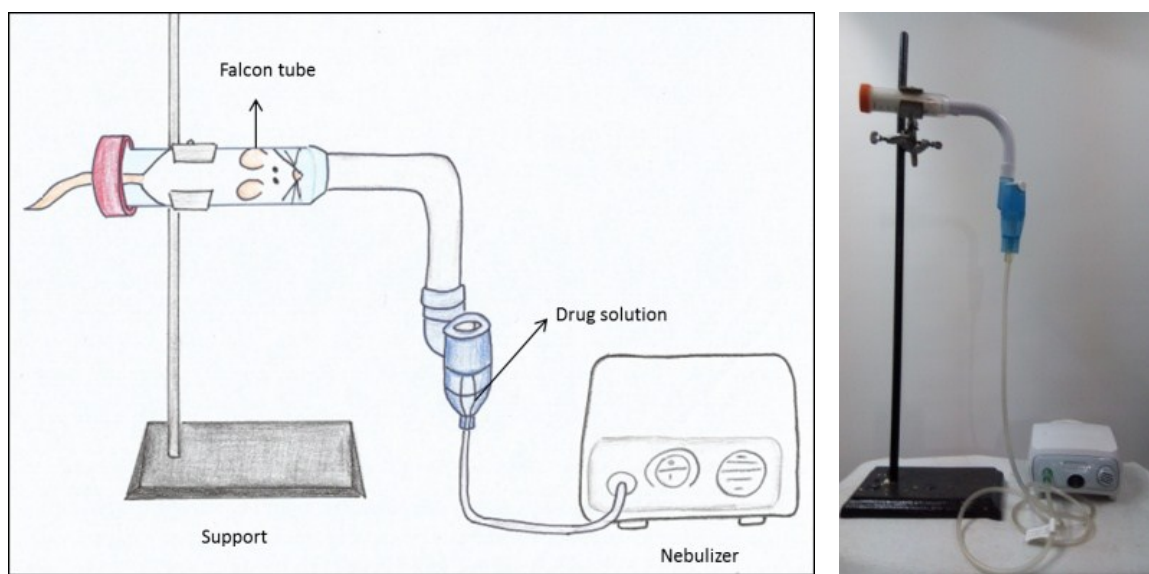
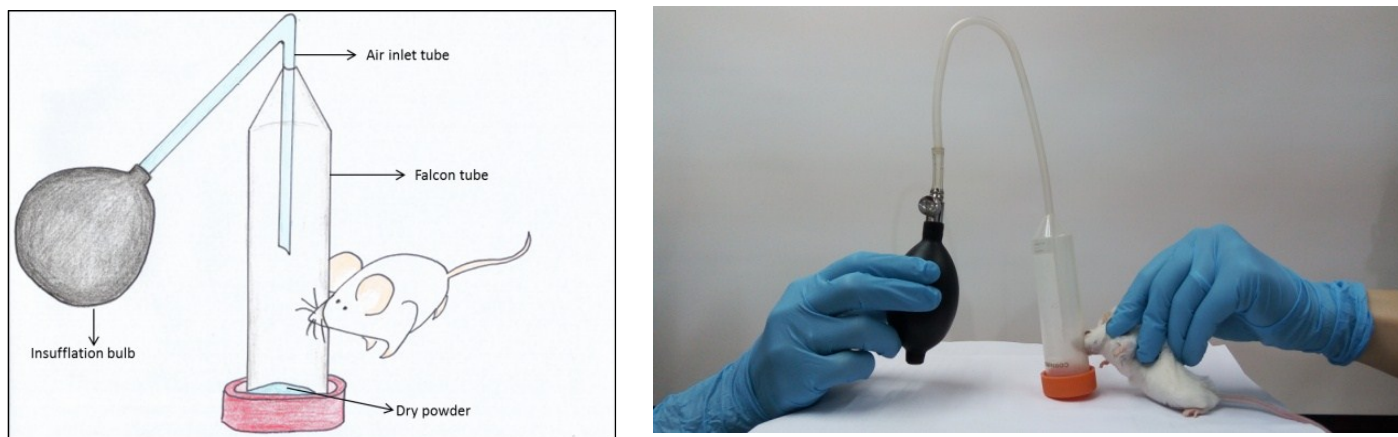


## Supplementary material

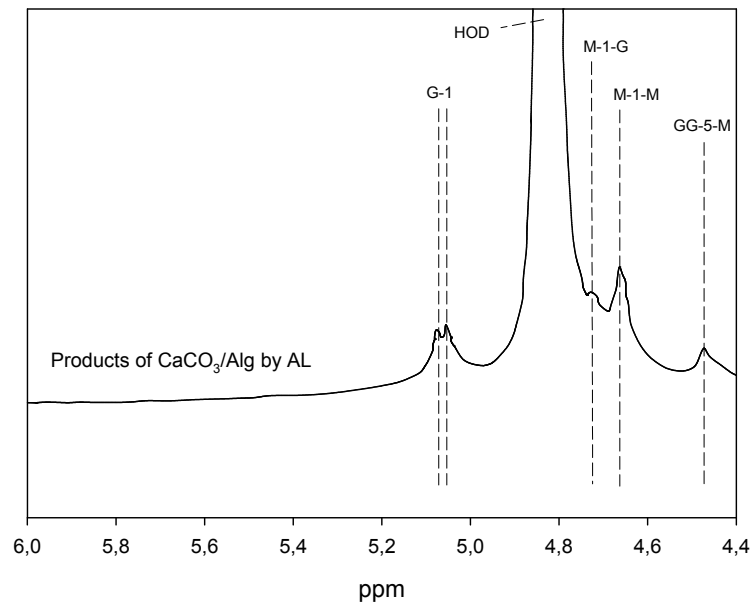
**Figure S1.** Whole-body inhalation exposure chamber for nebulization of microparticles in solution.



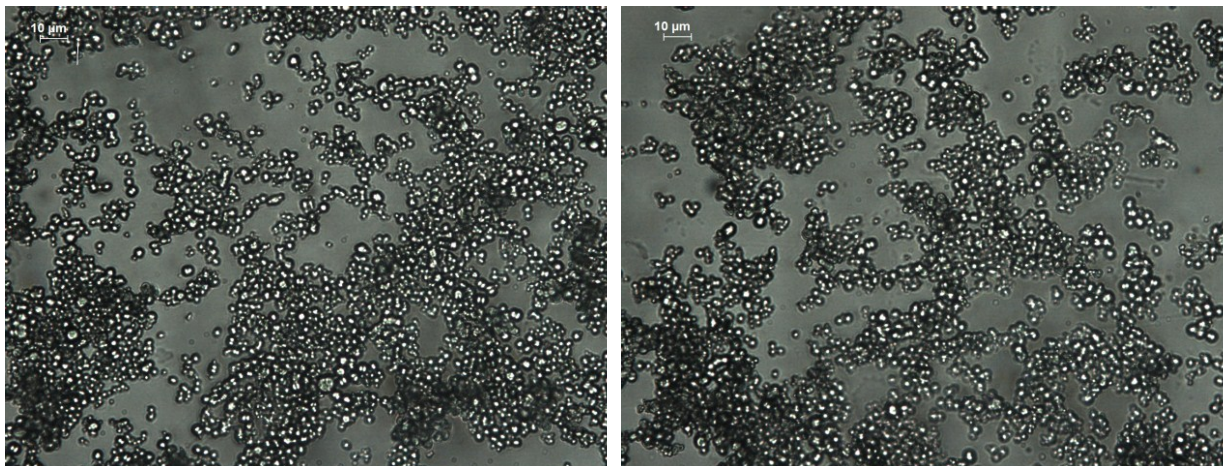
**Figure S2.** Hand-held apparatus for “nose-only” exposure of mice to inhalable microparticles as a dry powder inhalation targeting lung



**Figure S3.**  $^1\text{H-NMR}$  study of the degradation products of  $\text{CaCO}_3/\text{Alg}$  microparticles after AL treatment. The signal is originated from the underlined residue and the numbers denote proton causing the signal. M or G without underline indicates neighbor residue.



**Figure S4** Optical microscopy of  $\text{CaCO}_3/\text{Alg}$  microparticles: non-treated (left) and AL treated microparticles (right) at 400X magnifications.



**Figure S5.** Measure of Z potential (striped bars) and mobility of microparticles (empty bars) CaCO<sub>3</sub>/Alg+AL: empty and loaded with LV/DNase.

