Background and Methods
Pulmonary deposited carbon nanotubes (CNTs) are cleared very slowly from the lung, but there is limited information on how CNTs interact with the lung tissue over time. To address this, three different multiwalled CNTs were intratracheally instilled into female C57BL/6 mice: one short (850 nm) and tangled, and two longer (4 μm and 5.7 μm) and thicker. We assessed the cellular interaction with these CNTs using transmission electron microscopy (TEM) 1, 3 and 28 days after instillation.

Results
TEM analysis revealed that the three CNTs followed the same overall progression pattern over time. Initially, CNTs were taken up either by a diffusion mechanism or via endocytosis. Then CNTs were agglomerated in vesicles in macrophages. Lastly, at 28 days post-exposure, evidence suggesting CNT escape from vesicle enclosures were found. The longer and thicker CNTs more often perturbed and escaped vesicular enclosures in macrophages compared to the smaller CNTs. Bronchoalveolar lavage (BAL) showed that the CNT exposure induced both an eosinophil influx and also eosinophilic crystalline pneumonia.

Conclusion
Two very different types of multiwalled CNTs had very similar pattern of cellular interactions in lung tissue, with the longer and thicker CNTs resulting in more severe effects in terms of eosinophil influx and incidence of eosinophilic crystalline pneumonia (ECP).