Are the nanoparticles friends or foes when inhaled?

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Recent applications in nanomedicine focus on nanoparticles as they are promising tools for site-specific delivery of drugs and diagnostic agents, through the possibility to functionalize their surface with target-specific ligands. Recently, we showed that among the different administration routes, pulmonary delivery is feasible not only for the local treatment of airway diseases but also for the systemic administration. Our results suggest that pulmonary administration could be exploited for delivery of nanoparticles designed for brain therapy. On the other hand a big claim rised up about the emerging evidence suggesting that living near major roads might adversely affect cognition. Indeed despite the mounting global effect of neurodegenerative diseases, their cause remains largely unknown. Concern is growing that exposures associated with air pollution and mainly to the inhaled ambient fine particles might contribute to neurodegenerative pathology. We will try to outline a road map in order to disclose the inner mechanisms by which nanoparticles interact with the cerebral microvascular endothelial cells thus triggering effects induced at the endothelial level further linking with systemic inflammation and the development of the neurodegenerative diseases.