

## **Inhaled Particles: From the Nose to the Brain?**

### **Background**

Particle toxicology has come a long way from revealing the prominent role for coal and silica-induced diseases in the early 20<sup>th</sup> century.

Investigations have gone from asbestos fibers to man-made mineral fibers, ambient particulate matter, and engineered nanoparticles. The focus too has grown from the traditional target organ, the respiratory system, to extra-pulmonary organs such as the heart, vascular system, and the brain. The connection between the nose and the brain and the transport, in particular, of nanosized particles to the olfactory bulb, was described early on to explain how poliovirus infection progressed. Research that is more recent suggests that man-made nanosized particles can access the same pathway.

### **Research**

Ongoing research addresses several of the knowledge gaps, including efforts to better understand (1) if and how nanosized poorly soluble particles get into the brain, (2) the properties of the particles that accumulate in the brain (e.g. size, solubility, reactivity), (3) how the particles get cleared from brain tissue, and (4) how particles might induce adverse effects such as neurodegenerative disease.

### **Gaps in Knowledge**

While particle translocation into the brain occurs under certain conditions, the specific mechanism linking particle exposures to physiological response in the central nervous system remain to be investigated.