

Particles of metal in brain link air pollution to Alzheimer's

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The inhalation of a poisonous compound produced by cars could be putting people at risk Photo PETER MACDIARMID/GETTY IMAGES

Air pollution may be putting people at greater risk of Alzheimer's disease as tiny magnetic particles of iron ore build up in the brain, a study suggests.

Scientists found large quantities of magnetite, a poisonous compound produced when cars brake and burn fuel, that appear to have entered the brain through the nose. The microscopic crumbs of metal may also be absorbed from open fires or printer ink.

Once it enters the brain, magnetite appears to act as a rallying point for the clusters of poisonous protein that are thought to

cause Alzheimer's, a debilitating mental disorder affecting more than 850,000 people in the UK.

Researchers looked at brain slices taken from 29 dead people in Mexico City and eight in Manchester. The bodies were aged from three to 92.

It has been known for more than two decades that the brain naturally accumulates small cubic or octohedral crystals of magnetite but this study found a very different form.

The new particles were spherical and smooth, as though they had been shaped by high temperatures, and so fine — at about 20 millionths of a millimetre in diameter — that they could easily slip through the body's defences.

Barbara Maher, of the Centre for Environmental Magnetism and Palaeomagnetism at the University of Lancaster, said her team suspected that the magnetite found its way into the brain through the olfactory nerve, which carries information about smells.

Once there it speeds up the production of reactive oxygen, which can lead cells to die or kick off a cycle of inflammation, Professor Maher and her colleagues wrote in the journal *PNAS*.

“When you look at those samples, you find literally millions of these extra magnetites,” she said. “They look compellingly similar to those magnetites that we know are floating around in the atmosphere in air pollution.

“Excess metals in the brain are thought to be dangerous. Magnetite is a mixture of ferric iron and ferrous [less

chemically stable] iron, and it's the ferrous form that's quite toxic."

Professor Maher said that the ease with which the ore became magnetised meant that as people moved through electrical or magnetic fields the particles could shift around, possibly damaging surrounding cells.

The scientists are looking for evidence that long exposure to these fine grains of metal is linked to a higher risk of Alzheimer's. One study in Taiwan found that living amid micro particle pollution appeared to more than double the risk of developing the disease.

Independent experts said that the study was pioneering but relatively small in scale and far from proof that magnetite in the air was a powerful cause of dementia. The article did not look at the brains of people who lived in the countryside, which might have made a useful comparison.

Professor Peter Dobson, principal fellow at the Warwick Manufacturing Group, said: "There is growing evidence that magnetite nanoparticles in the brain might be associated with Alzheimer's. What is still not certain is if these are the cause or possible effect of Alzheimer's. There also seems to be a shortage of data from the brains of people not suffering from Alzheimer's."

David Reynolds, chief scientific officer at Alzheimer's Research UK, said that it was not clear how air pollution might change the brain's biochemistry. "It's interesting to see research investigating the presence of this mineral in the brain but it's too early to conclude that it may have a causal role," he said.

