Studies have found that populations who live in areas with polluted air, containing high levels of combustion-derived nanoparticles (fine particulate matter), are more likely to suffer from respiratory and cardiovascular diseases. This has raised concerns that nanoparticles are to blame and that engineered nanoparticles of a similar size could behave in the same way.

It is important, therefore, to understand how nanoparticles interact with the body, including what happens to nanoparticles in the lungs, and whether they enter the bloodstream or various cells of the body. This information could help us understand how nanoparticles pose a health risk. A new study considers all forms of nanoparticles (defined here as smaller than 100 nanometres in diameter), both engineered and combustion-derived.

The research suggests that when nanoparticles are inhaled, they can enter the deepest part of the lungs and come into contact with the 140 square metres of folded surface present in the lungs. There is then the potential for the nanoparticles to translocate, or move through the cells lining the lungs, and cross into the fine blood vessels of the lungs. From here they could circulate throughout the body.

Previous studies have demonstrated that a small fraction of nanoparticles can translocate from the lungs to the bloodstream and be transported to other parts of the body. This was seen, for example, in studies on the effect of titanium dioxide nanoparticles on rats. Whilst it is reasonable to suggest that translocation does happen, the extent of this and its importance for human health is not fully understood.

There are a number of ways by which nanoparticles can enter cells lining the lung cavities. Further studies are needed to understand these entry methods in relation to the composition and surface properties of the nanoparticles and to functioning of cells in the lungs.

The researchers have suggested that the following areas of investigation are required to understand exactly how nanoparticles interact with the body and whether they could cause any health problems:

- Do nanoparticles need to translocate to the circulation of blood to cause adverse cardiovascular health problems?
- What happens if nanoparticles accumulate in the body?
- What happens to nanoparticles that translocate in the body?
- What are the different mechanisms by which nanoparticles enter the different cells of the body and what factors affect cell uptake of nanoparticles?

Studies addressing these questions could advance the understanding of how exposure to nanoparticles affects human health.


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