Carbon black nanoparticles can cause cell death

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Researchers from the University of Iowa Roy J. and Lucille A. Carver College of Medicine have found that inhaled carbon black nanoparticles create a double source of inflammation in the lungs.

Their findings were published online in the April 27 edition of the Journal of Biological Chemistry. Martha Monick, Ph.D., UI professor of internal medicine, was lead author of the paper, "Induction of Inflammasome Dependent Pyroptosis by Carbon Black Nanoparticles," which outlined the results.

Monick said researchers expected to find one level of inflammation when cells were exposed to carbon black nanoparticles. They were surprised, however, to find that nanoparticles activated a special inflammatory process and killed cells in a way that further increased inflammation. She said the research showed that the intake of carbon black nanoparticles from sources such as diesel fuel or printer ink caused an initial inflammatory response in lung cells. The surprising results came when the team discovered that these nanoparticles killed macrophages – immune cells in the lungs responsible for cleaning up and attacking infections – in a way that also increases inflammation.

"Apoptosis is one way cells die in which all the contents stay in the cell, the cell just keeps shrinking onto itself and the surrounding tissue is protected," Monick said. "We thought that was what was happening with the carbon nanoparticles; we were wrong. A different process called pyroptosis was occurring, causing the cells to burst and spill their

contents."

That, she said, can cause a secondary inflammatory response.

Monick cautioned that the doses of carbon black nanoparticles used in the study were much more concentrated than the amounts to which a person might typically be exposed.

"This doesn't mean that walking through a cloud of diesel exhaust will hurt your lungs," she said. "It does show that we may have an environmental exposure that could contribute to inflammation in the lung."

Provided by University of Iowa