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Environmental exposures may damage DNA in as few as three days

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Exposure to particulate matter has been recognized as a contributing factor to lung cancer development for some time, but a new study indicates inhalation of certain particulates can actually cause some genes to become reprogrammed, affecting both the development and the outcome of cancers and other diseases.

The research will be presented on Sunday, May 17, at the 105th International Conference of the American Thoracic Society in San Diego.

"Recently, changes in gene programming due to a chemical transformation called methylation have been found in the blood and tissues of lung cancer patients," said investigator Andrea Baccarelli, M.D., Ph.D., assistant professor of applied biotechnology at the University of Milan. "We aimed at investigating whether exposure to particulate matter induced changes in DNA methylation in blood from healthy subjects who were exposed to high levels of particulate matter in a foundry facility."

Researchers enrolled 63 healthy subjects who worked in a foundry near Milan, Italy. Blood DNA samples were collected on the morning of the first day of the work week, and again after three days of work. Comparing these samples revealed that significant changes had occurred in four genes associated with tumor suppression.

"The changes were detectable after only three days of exposure to

particulate matter, indicating that environmental factors need little time to cause gene reprogramming which is potentially associated with disease outcomes," Dr. Baccarelli said.

"As several of the effects of particulate matter in foundries are similar to those found after exposure to ambient air pollution, our results open new hypotheses about how air pollutants modify human health," he added. "The changes in DNA methylation we observed are reversible and some of them are currently being used as targets of cancer drugs."

Dr. Baccarelli said the study results indicate that early interventions might be designed which would reverse gene programming to normal levels, reducing the health risks of exposure.

"We need to evaluate how the changes in gene reprogramming we observed are related to cancer risk," he said. "Down the road, it will be particularly important not only to show that these changes are associated with increased risk of cancer or other environmentally-induced diseases, but that, if we were able to prevent or revert them, these risks could be eliminated."

Source: American Thoracic Society (news : web)

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