

New data reveals even low levels of air pollution triggers gene expression

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New data from a landmark study by Monash University researchers raises concerns that even short-term exposure to low level air pollution can affect gene expression, leaving us at risk of diseases such as cancer, cardiovascular and respiratory diseases.

It has long been known that exposure to air pollution, including the widespread smoke events of the last Summer in Australia, can lead to short term health problems such as respiratory distress. It is also known that, longer term, exposure to air pollutants leads to oxidative stress and issues like an increased risk of cardiovascular disease. Now the American Lung Association has warned that there is a risk of increased infections if and when a region's pollution spikes—as happened when the Summer bushfires occurred in Australia.

The study, published in the *PLOS Medicine*, provides the first evidence that exposure to even very low levels of air pollution can change gene expression that are the hallmark of diseases such as cancer.

Led by Associate Professor Yuming Guo from the Monash School of Public Health and Preventive Medicine, and colleagues at Nagasaki University in Japan and Cambridge University in the UK, the study involved blood samples from 266 pairs of twins (192 identical and 74 non identical) as well as 165 parents in Brisbane over periods from 2005 to 2010. The volunteers are part of the Brisbane System Genetics Study.

The periods when the blood samples were taken were matched to data from seven air quality monitoring stations around Brisbane at that time, to measure the levels of exposure to PM2.5 (the main particulate matter in smoke) and sulfur dioxide (the main gaseous pollutant).

The researchers studied expression in six [genes](#) associated with [oxidative stress](#) and inflammation, which have long been considered important features of disease processes initiated by pollutants and found that even the low levels of air pollution experienced in Brisbane led to change of gene expression associated with morbidity and mortality in the longer term.

The latest study is further evidence that exposure to air pollutants, even at low levels, has long term health consequences, which has real life implications for the current the COVID-19 pandemic according to Associate Professor Guo. "This is the first evidence as to how exactly exposure to low levels of air pollution actually alters our [gene expression](#) which in turn impacts our health," he said.

"Combined with the global consequences of COVID-19 and its impact on respiratory health there is even a greater need to be conscious of limiting our exposure to air [pollution](#)."

More information: Wenhua Yu et al, The association between long-term exposure to low-level PM2.5 and mortality in the state of

Queensland, Australia: A modelling study with the difference-in-differences approach, *PLoS Medicine* (2020). DOI: [10.1371/journal.pmed.1003141](https://doi.org/10.1371/journal.pmed.1003141)

Provided by Monash University

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