

# Cystic Fibrosis Research News

**Title:**

Prostaglandin E2 and phagocytosis of inhaled particulate matter by airway macrophages in cystic fibrosis

**Authors:**

Norrice M Liu <sup>1</sup>, Lisa Miyashita <sup>1</sup>, Marek Sanak <sup>2</sup>, Benjamin Barratt <sup>3</sup>, Jonathan Grigg <sup>1</sup>

**Affiliations:**

<sup>1</sup> Centre for Genomics and Child Health, Blizard Institute, Queen Mary University of London, London, UK

<sup>2</sup> Department of Internal Medicine, Jagiellonian University Medical College, Krakow, Poland

<sup>3</sup> MRC Centre for Environment and Health, School of Population Health and Environmental Sciences, King's College London, UK

**What was your research question?**

Airway macrophages are cells in the lower airway that remove inhaled sooty air pollution particles from fossil-fuel combustion. The amount of black particles in airway macrophages therefore reflects their ability to remove inhaled particles. Since adverse effects of exposure to particulate matter pollution are reported in cystic fibrosis (CF), we sought to assess whether removal of particles by airway macrophages is impaired in CF.

**Why is this important?**

Impaired removal of inhaled particles by airway macrophages would mean that inhaled sooty particles can damage other airway cells and activate bacteria. A possible explanation why removal of sooty particles could be impaired in CF is that a substance known to interfere with a macrophage's ability to remove inhaled particles and bacteria, prostaglandin-E2 (PGE<sub>2</sub>), is increased in the CF airway.

**What did you do?**

After informed consent, children with CF and children with no lung disease living in London (United Kingdom) provided sputum and urine samples. We measured levels of PGE<sub>2</sub> in the sputum and a biomarker of PGE<sub>2</sub> in the urine. Children's exposure to air pollution was measured using portable monitors. Airway macrophages were also extracted from the sputum and the amount of sooty particles in airway macrophages measured. To test the effect of PGE<sub>2</sub> on the ability of macrophages to ingest particles, we cultured airway macrophages from both CF and non-CF sputum in the laboratory with diesel exhaust particles.



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For one half of the cultures we also added PGE<sub>2</sub>, measured the amount of black particles in the macrophages, and compared this to the macrophages cultures that didn't receive PGE<sub>2</sub>.

## **What did you find?**

Children with CF had higher levels of PGE<sub>2</sub> in their sputum and higher levels of the marker of PGE<sub>2</sub> (tetranor PGEM) in their urine compared to the children without CF. Both groups of children were exposed to similar levels of particle air pollution, but the area of black particles in airway macrophages from children with CF was markedly reduced. When cultured in the laboratory, removal of diesel exhaust particles by both CF and healthy airway macrophages was markedly reduced by adding PGE<sub>2</sub>.

## **What does this mean and reasons for caution?**

These findings strongly suggest that increased levels of PGE<sub>2</sub> in the airway of children with CF impairs the removal of inhaled sooty particles. However, future studies are still needed to work out whether impaired removal of particulate matter pollution by airway macrophages increases susceptibility to airway infection.

## **What's next?**

Since levels of airway PGE<sub>2</sub> is reduced by the over-the-counter medicine ibuprofen, future studies should look at the effect of ibuprofen on both airway macrophage carbon and airway infection in children with CF.

## **Original manuscript citation in PubMed**

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