

# Science for Environment Policy

## Ash inhalation increases risk of lung infection

**Inhaling volcanic ash** could weaken the body's natural defences against infection, a recent study concludes. A team of researchers collected samples of ash from the 2010 Eyjafjallajökull volcano eruption in Iceland and, in laboratory tests, found that they reduced the ability of immune cells in lungs to fight off bacterial infections.

**Volcanic air pollution** has often been linked to respiratory [health](#). For example, hospital visits for respiratory infections increased six-fold after the 1980 Mount St Helen's eruption in the USA. Thus, when the Eyjafjallajökull volcano erupted in Iceland, in March and April 2010, health concerns were naturally raised.

The six-mile high eruption from Eyjafjallajökull produced a large cloud of ash that spread over Europe, which led to worries about the inhalation of tiny, sharp ash particles carrying acids and toxic compounds, such as fluorine and arsenic.<sup>1</sup> This study builds on past research, which has suggested that ash may increase respiratory health problems, by exploring its effects at a cellular level in the body.

The researchers collected samples of ash from three different sites, found between 38 and 64 kilometres from the Eyjafjallajökull eruption. They tested the effects of ash on cells from the air sacs (alveoli) in the lungs of rats and on cells lining human air passages, as well as on human and rat immune cells. They also observed the ash's effects on *Pseudomonas aeruginosa* bacteria, which are known to cause serious infections in hospitals.

The rat and human cells were exposed to ash particles for two hours, at concentrations close to those calculated for exposure levels during the Eyjafjallajökull eruption. The ash was found to affect immune cells in the air sacs called 'macrophages'. One important role of macrophages is to identify and kill disease agents, such as bacteria, by ingesting or 'eating' them. In the tests, the researchers watched the cells taking up the ash and found it interfered with their ability to carry out their digestion processes. Macrophages consumed similar numbers of bacteria whether or not they were exposed to ash, but those exposed to ash did not kill as many.

Ash also increased the growth of *P. aeruginosa* bacteria. The researchers conclude that while the effects of ash on lung cells are minimal, exposure to ash could influence respiratory health by damaging the body's immune response to disease and allowing harmful bacteria to multiply.

In the weeks following the Eyjafjallajökull eruptions in 2010, the World Health Organization advised that health risks from the ash cloud over Europe were minimal, but that people with respiratory problems, including asthma, should not take strenuous exercise<sup>2</sup>.



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10.1289/ehp.1206004. This study is free to view at:

<http://ehp.niehs.nih.gov/pdf-files/2013/Mar/ehp.1206004.pdf>

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1. Gislason, S. R. *et al.* (2011) Characterization of Eyjafjallajökull volcanic ash particles and a protocol for rapid risk assessment. *Proceedings of the National Academy of Sciences*. Doi:10.1073/pnas.1015053108.

2. [www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/news/news/2010/05/no-change-in-current-who-advice-on-potential-health-risks-of-volcanic-ash-cloud](http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/news/news/2010/05/no-change-in-current-who-advice-on-potential-health-risks-of-volcanic-ash-cloud)