J R Coll Physicians Edinb 2007; **37:**120–121

Air pollution, heart attacks, stroke and you

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TITLE Long-term exposure to air pollution and incidence of cardiovascular events in women.

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JOURNAL *N Engl J Med* 2007; **356:**447–58.

KEYWORDS Air pollution, fine particles, stroke

DECLARATION OF INTERESTS No conflict of interests declared.

***Published online** June 2007*

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SUMMARY

The Women's Health Initiative is a prospective study of the cardiovascular health of 65,893 postmenopausal women across the US. This paper relates exposure to particulate air pollution prospectively to duration before death or first episode of illness. Exposure was measured from the closest monitor in the relevant city in terms of fine particles (less than 2·5 μm aerodynamic diameter) at the mid-point of the follow-up period (2000). Great care was taken to control for potential social and medical confounders and to test for the sensitivity of the results to different inclusions in and exclusions from the cohort. Verification of outcome diagnosis was by detailed scrutiny of medial records.

In all, 1,816 women suffered or died from a cardiovascular episode over the median 6-year follow-up period. Exposures to particles differed little from those occurring in UK cities. Each increase of 10 μgm^{-3} was associated on average with a 25% (CI 9–41%) increase in risk of an event and a 76% (24–147%) increase of death from cardiovascular disease. The increase in risk of stroke was similar, at 35% (8–68%). The detailed results in an online appendix show that they were not altered significantly by the exclusion or inclusion of different groups in the cohort or by addition in the model of other possible lifestyle confounders.

In an accompanying editorial, Dockery and Stone commented on the important advances made by this prospective study.[1] It had included a range of air pollutants and only found association with fine particles; it had verified the diagnosis; it had controlled for multiple cardiovascular risk factors and it had studied within-city as well as between-city effects. They pointed to the weakness that it only comprised women and predominantly non-smokers and questioned whether females may be more susceptible.

OPINION

It is now 12 years since my colleagues and I suggested an explanation for the association of air pollution with cardiac deaths.[2] At first this hypothesis was met with some scepticism among cardiologists who were more interested in traditional personal risk factors such as diet, lifestyle and medical conditions. In 2004, I wrote in this journal about the possible association of air pollution with stroke,[3] and again was met some scepticism.[4] Since then the evidence has hardened. Few now doubt the cardiac associations, both short-term precipitation of events and the longer term increases in risk, and this paper present the strongest evidence to date. It also provides important new support for the association with stroke and is the first that clearly associates it with fine particles. The UK Committee on the Medical Effects of Air Pollutants commissioned a large meta-analysis of the associations of pollution with cardiovascular events by Professor R Anderson and colleagues at St George's Medical School.[5] For stroke, only data on relatively coarse particles (less than 10 μm diameter) was available, and the combined estimate was a 30% (10–60%) increase per 10 μgm^{-3}. These associations with fine particles have implications in the developing world of nanotechnology.[6]

In the accompanying editorial, Dockery and Stone[1] point out that the risks are substantial in population terms but relatively small in personal terms. The UK has a good record in reducing particulate pollution since the awful days of the 1950s. We all need to make our contributions to reducing pollution further, as effects occur at quite low levels and cardiovascular disease and stroke are among the most common conditions confronting all of us. Think when you drive and buy your next car. But consider CO_2 as well (and that's another story, perhaps for later).

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THE MOST FAMOUS CASE OF ASTHMA IN SCOTTISH HISTORY

Girolamo Cardano (1501–1576)
Ars curandi parva, Basle, 1564

In 1551, Girolamo Cardano was professor of medicine at Pavia and one of the most famous scholars in Europe. His published works had included important contributions to mathematics as well as an encyclopaedia of natural science which contained many remarkable observations for its day.

In Scotland, John Hamilton was Archbishop of St Andrews, Keeper of the Privy Seal and Treasurer of Scotland. His brother James, Earl of Arran, was regent and tutor to the young Mary, Queen of Scots. During the troubled minority of Mary, the Hamiltons were, in effect, ruling Scotland. The Archbishop, however, was suffering from a debilitating illness and his illness had become an issue of national concern. Unable to provide any effective treatment, his physician, William Cassanate, wrote in desperation to the greatest medical man in Europe, Girolamo Cardano, and urged him to come to Scotland to treat the Archbishop. It was a well-timed request, for Cardano had just resigned as professor at Pavia and was free to take up the opportunity to travel. Cassanate met the great man in Lyons and accompanied him back to Scotland.

For six weeks the Italian did nothing but observe the Archbishop and the attempts of his physicians to help him. Hamilton steadily became worse. Cardano then intervened, diagnosed asthma, and prescribed an intricate set of measures. This mainly consisted of a new diet, regular exercise, and plenty of rest and sleep. Most important of all, however, was the instruction that he should not sleep on a pillow or a bed made of feathers. The importance of this connection was not clearly understood by the medical profession for another three centuries. Hamilton improved rapidly and Cardano returned to Italy.

Two years later, a Scotsman arrived in Milan with a letter to Cardano from the Archbishop.

'I thank you ... for my health, that is in great part restored, for the almost complete subjugation of my disease, for strength regained; in fine, I may say, for life recovered. All those good things, and this body of mine itself, I hold as received from you ... the accustomed attacks now scarcely occur ... and then not as they used to be, but are felt very slightly.'

Girolamo Cardano gave two separate accounts of his successful treatment of Archbishop Hamilton's asthma. These are included in a collection entitled *Ars curandi parva*. On the title page of the College copy are inscribed the words –

'Ex bibliotheca Joan: hammiltoun
[i.e. John Hamilton].'

The Italian's medical treatment of John Hamilton proved to be more successful than the horoscope he wrote for the Archbishop. Cardano predicted he would enjoy a long and happy life. In 1571 Archbishop Hamilton was executed for treason.

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