

Haze, health and disease

With the increasing pace of industrialization and urbanization in Asia, there has been a marked increase in the severity of urban air pollution, making many Asian cities, particularly those in China, amongst the most polluted in the world (1). Levels of fine particulate matter (PM_{2.5}) are frequently in the levels of hundreds of micrograms per cubic meter in cities like Beijing, where there are now so few days where the air quality can be considered as being safe for health. Severe episodes of air pollution have enveloped large parts of China, a phenomenon that has been dubbed as episodes of haze or 'Chinese haze'. As we write this article in November 2014, the Northern part of China has just had its most recent episode of haze when levels of PM_{2.5} in Beijing had climbed to the levels of 450 to 600 µg/m³, up to 25 times above the recommended World Health Organisation (WHO) safe levels.

The magnitude of the health effects of such unprecedented levels of air pollution is likely to be important but many questions remain unanswered. During the week-long episode of "killer smog" in December 1952 in London, UK, it has been well established that the smoke mainly emitted from coal combustion was responsible for approximately 4,000 premature deaths (2). As yet, there have been no scientifically-based reports linking extra mortality with a particular episode of haze in China. The recent Beijing marathon took place on October 19th 2014, a hazy day when levels of PM_{2.5} were recorded at 344 µg/m³. Despite this, there were no apparent problems experienced by the thousands of participants, except that there were many who pulled out before or during the marathon run. The chronic effect of such high levels of pollutants, particularly on respiratory health, including lung cancer, may not be easily quantifiable but efforts need to be put in place to do so.

In this series of articles in the *Journal of Thoracic Diseases (JTD)* that describes the potential respiratory risk hazards of environmental pollution, the focus will be on studies of pollution in the Western world in relation to respiratory health. One needs to realise that the levels of pollution in the Western world are usually modest compared to those seen in China. Nevertheless, these are the best pieces of epidemiological data available so far with regards to effects on respiratory health focusing on outdoor air pollution especially in relation to air pollution in China.

The series of review articles start with an evaluation of the differences in the constituents and levels of air pollution between China and the West by Drs. Zhang and Samet. This series will not deal with indoor air pollution, where there are also important differences between China and the West; we may deal with this aspect in another series. Allergic disease, particularly asthma, has been linked in the West to environmental pollution both in terms of its prevalence and as an inducer of exacerbations. Drs. Zhang, Qiu, Chung and Huang report on data available in the Far East on its effect on asthma and also review mechanisms underlying the effect of pollution on asthma. The question is whether environmental air pollution is contributory to the increasing asthma prevalence. The relationship of haze effects on another respiratory condition usually associated with cigarette smoking but increasingly perceived as a condition that could be secondary to environmental pollution is reviewed by Drs. Hu, Zhong and Ran. The question is whether there is a positive interaction between active smoking, the prevalence of which is high in China, and exposure to pollution in terms of initiating this disease and inducing exacerbations.

Susceptibility to the effects of environmental pollution may be increased at the extremes of the age span. Dr. Viegi and colleagues (Simoni, Baldacci, Maio, Cerrai, Sarno and Viegi) describe the adverse effects in the elderly while Dr. Gilliland and colleagues (Chen, Salam, Eckel, Breton and Gilliland) focus on children. Air pollutants have now been classified as a leading environmental cause of lung cancer by the WHO International Agency for Research on Cancer (IARC) in the same category as cigarette smoke and ultraviolet radiation. Drs. Demetriou and Veneis review the evidence for this. Finally, Drs. Laumbach, Meng and Kipen provide a review on whether there are any useful measures and advice that can be given to both the healthy and chronically ill patients, particularly with regards to minimising the health effects of air pollution. We thank all the contributors to this issue for taking time to write these reviews.

While the ultimate solution to reducing the health risks of air pollution is to eliminate sources of air pollution, this will take time. These episodes of haze are likely due to a combination of exhaust emissions from motor vehicles, coal burning, dust storms and construction dust, but the contribution of secondary sources from interaction of components of the pollutants to produce high concentration of sulphates, ammonium and nitrates together with high levels of organic matter is now recognised (3). In addition to reducing primary particulate emissions, mitigating the emissions of secondary aerosol precursors from fossil fuel combustion and biomass burning is going to be important for controlling China's PM_{2.5} levels and for reducing the environmental, economic and health impacts resulting from particulate pollution. The recorded levels of pollution in China are at an unprecedented level. In the face of this, the Chinese government has produced an action plan

aimed at reducing PM_{2.5} by 25% by 2017. Levels of pollution can certainly be controlled as was demonstrated during the 2008 Beijing Olympics, with a reduction in particulate matter and other pollutants that led to detectable improvement in circulating biomarkers (4). In November 2014, levels of pollution were improved for the Asia-Pacific Economic Cooperation meeting held in Beijing by reducing use of cars and closing factories, but these measures can only be taken on a temporary basis since there are important economic implications of shutting down industrial production.

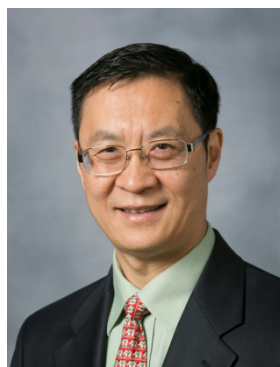
It is important to assess and quantify the potential harms of environmental pollution and take any potential measures to combat its ill-effects. We expect that over the coming ten years there will be many more studies that will be assessing the health impact of the pollution in China. This series of articles should help public health scientists and health workers to have a greater understanding of the challenges of air pollution which not only affect respiratory health but also many other aspects of healthy living which are not covered here. For health workers, it is important to have a rational series of advice or measures that could be given to the general public that could help mitigate the health effects of environmental pollution.

References

1. Chung KF, Zhang J, Zhong N. Outdoor air pollution and respiratory health in Asia. *Respirology* 2011;16:1023-6.
2. Stone R. Air pollution. Counting the cost of London's killer smog. *Science* 2002;298:2106-7.
3. Huang RJ, Zhang Y, Bozzetti C, et al. High secondary aerosol contribution to particulate pollution during haze events in China. *Nature* 2014;514:218-22.
4. Rich DQ, Kippen HM, Huang W, et al. Association between changes in air pollution levels during the Beijing Olympics and biomarkers of inflammation and thrombosis in healthy young adults. *JAMA* 2012;307:2068-78.



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