Can air pollution affect unborn children in the womb?

In recent years concern has been mounting over the possible health implications of unborn foetuses’ exposure to air pollutants in the womb. Compared with adults, the unborn foetus and infant are especially vulnerable to environmental stresses. Spanish researchers are conducting an ongoing epidemiological study to investigate the effects that pollutants have on the health of pregnant women and their unborn children.

Poor air quality is a health hazard, and policy makers rely on epidemiological studies to establish the link between exposure to airborne dust particles and ill health. A wide range of sources including diesel vehicles, industrial processes and household boilers emit fine particles, PM$_{2.5}$, which contribute to the premature deaths of 350,000 people across the EU each year. Along with the coarser PM$_{10}$, these particles are among the most dangerous pollutants for human health. To reduce exposure, air quality standards for PM$_{10}$ came into force in January 2005. Legislation limiting PM$_{2.5}$ concentrations is introduced with the new EU air quality directive, with effect from 2010.

However, recent research suggests that it is important to identify the chemical, physical and biological properties of particulate matter (PM), as the adverse health effects of pollution are not only defined by the size and concentration of particles.

As part of the ongoing study, the researchers selected four monitoring sites across Valencia, Spain, to represent urban, metropolitan, suburban and rural areas. Air samples were taken between 2004 and 2005, at three different times during the participants’ pregnancies. The data gathered will be used in the ongoing study to assess the impact of environmental pollutants during pregnancy and early in life. Air pollutants are thought to affect foetal growth, but there is a need for more conclusive evidence.

The chemical composition and concentrations of two size fractions of particles, PM$_{2.5}$ and PM$_{10}$, were identified from organic, man-made and mineral sources. For man-made particulate matter, there was a clear gradient from urban to regional areas, suggesting that roughly half the air pollutants in cities have a local origin. For particulate matter of mineral origin, there was no such gradient. However, in winter these levels of PM$_{2.5}$ were higher in the cities and the researchers suggest this is caused by re-suspension of dust created by traffic. Central monitoring of air quality, however, may not adequately represent exposure to local pollutants, as emission concentrations vary greatly with distance from the source.

Foetuses and infants are particularly susceptible to the toxic effect of compounds that cause cancer, such as polycyclic aromatic hydrocarbons (PAHs). The study showed that the levels of fifteen PAHs, found in particulate matter, were similar to, or slightly higher than, levels reported from other Spanish sites but lower than in the rest of Europe.

1 See [http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm](http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm) for details of the air quality Directive 1999/30/EC.
3 The INMA (Infancia y Medio Ambiente–’Environemnt and Childhood’) project follows nearly 4000 pregnant mothers and their newborns across a network of research groups in Spain. [www.infanciaymedioambiente.org](http://www.infanciaymedioambiente.org)


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Theme(s): Air quality, Environment and Health