

Air pollution found to affect marker of female fertility in real-life study

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Ovarian reserve, a term widely adopted to reflect the number of resting follicles in the ovary and thus a marker of potential female fertility, has been found in a large-scale study to be adversely affected by high levels of air pollution.

Results from the Ovarian Reserve and Exposure to Environmental Pollutants (ORExPo study), a 'real-world data' study using hormone measurements taken from more than 1300 Italian women, are presented today at the Annual Meeting of ESHRE by first investigator Professor Antonio La Marca from the University of Modena and Reggio Emilia, Italy.

Behind the study lay emerging evidence that many environmental chemicals, as well as natural and artificial components of everyday diet, have the potential to disturb the physiological role of hormones, interfering with their biosynthesis, signaling or metabolism. The hormone in this case, anti- Müllerian hormone or AMH, is secreted by cells in the ovary and is now widely recognised as a reliable circulating marker of ovarian reserve.

'The influence of age and smoking on AMH serum levels is now largely accepted,' explains Professor La Marca, 'but a clear effect of environmental factors has not been demonstrated so far.'

The ORExPo study was in effect an analysis of all AMH measurements taken from women living in the Modena area between 2007 and 2017

and assembled in a large database. These measurements were extended to a computing data warehouse in which AMH levels were linked to patients' age and residential address. The analysis was completed with environmental data and a 'geo-localisation' estimate based on each patient's residence. The assessment of environmental exposure considered daily particulate matter (PM) and values of nitrogen dioxide (NO₂), a polluting gas which gets into the air from burning fuel.

Results from the 1463 AMH measurements collected from 1318 women firstly showed—as expected—that serum AMH levels after the age of 25 were inversely and significantly related to the women's age. However, it was also found that AMH levels were inversely and significantly related to [environmental pollutants](#) defined as PM₁₀, PM_{2.5} and NO₂. This association was age-independent.

These results were determined by dividing the full dataset into quartiles reflecting PM₁₀, PM_{2.5} and NO₂ concentrations. The analysis found significantly lower levels of AMH in the fourth quartile than in the lowest quartiles, which, said Professor La Marca, 'again confirms that independently of age the higher the level of particulate matter and NO₂, the lower the serum concentration of AMH'. The lowest concentration of AMH—reflecting 'severe ovarian reserve reduction' - was measured in subjects who were exposed to levels of PM₁₀, PM_{2.5} and NO₂ above 29.5, 22 and 26 mcg/m³ respectively. Nevertheless, these were values well below the upper limits recommended by the EU and local authorities (ie, 40, 25 and 40 mcg /m³ respectively).

Severe ovarian reserve reduction, as reflected in a serum AMH concentration below 1 ng/ml, was significantly more frequent in the fourth quartile than in the first three quartiles for PM₁₀ (62% vs 38%), for PM_{2.5}, and for NO₂. 'This means by our calculations,' said Professor La Marca, 'exposure to high levels of PM₁₀, PM_{2.5} and NO₂ increases the risk of having a severely reduced ovarian reserve by a factor between

2 and 3.'

While noting that this study again confirms that age is the most important determinant of AMH concentration in women, Professor La Marca emphasised that other factors such as smoking, body weight and long-term hormonal contraception are already recognised as having an impact on AMH. Similarly, he said, environmental pollutants may also have a significant effect in determining circulating levels of AMH. 'Living in an area associated with high levels of air pollutants in our study increased the risk of severely reduced [ovarian reserve](#) by a factor of 2 or 3,' he said.

More information: Abstract O-204, Tuesday 25 June 2019: Ovarian Reserve and Exposure to Environmental Pollutants (ORExPo study)

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