

Air pollution linked to a decrease in IVF birth rate success, new study shows

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A pioneering study, presented at the [ESHRE 40th Annual Meeting](#) in Amsterdam, has revealed that exposure to fine particulate matter (PM) prior to the retrieval of oocytes (eggs) during in vitro fertilization (IVF) can reduce the odds of achieving a live birth by almost 40%.

The study analyzed PM₁₀ exposure in the two weeks leading up to oocyte

collection, finding that the odds of a [live birth](#) decreased by 38% (OR 0.62, 95% CI 0.43–0.89, $p=0.010$) when comparing the highest quartile of exposure (18.63 to 35.42 $\mu\text{g}/\text{m}^3$) to the lowest quartile (7.08 to 12.92 $\mu\text{g}/\text{m}^3$). The study abstract was published in *Human Reproduction*.

Conducted over an eight-year period in Perth, Australia, the research analyzed 3,659 frozen embryo transfers from 1,836 patients. The median female age was 34.5 years at the time of oocyte retrieval and 36.1 years at the time of frozen embryo transfer.

The study examined air pollutant concentrations over four exposure periods prior to oocyte retrieval (24 hours, two weeks, four weeks, and three months), with models created to account for co-exposures.

Increasing $\text{PM}_{2.5}$ exposure in the three months prior to oocyte retrieval was also associated with decreased odds of live birth, falling from 0.90 (95% CI 0.70–1.15) in the second quartile to 0.66 (95% CI 0.47–0.92) in the fourth quartile.

Importantly, the negative impact of air pollution was observed despite excellent overall air quality during the study period, with PM_{10} and $\text{PM}_{2.5}$ levels exceeding WHO guidelines on just 0.4% and 4.5% of the study days, respectively.

Dr. Sebastian Leathersich, lead author of the study, explains, "This is the first study that has used frozen embryo transfer cycles to separately analyze the effects of pollutant exposure during the development of eggs and around the time of embryo transfer and early pregnancy. We could therefore evaluate whether pollution was having an effect on the eggs themselves, or on the early stages of pregnancy."

"Our results reveal a negative linear association between particulate matter exposure during the two weeks and three months prior to oocyte

collection and subsequent live birth rates from those oocytes. This association is independent of the air quality at the time of frozen embryo transfer.

"These findings suggest that pollution negatively affects the quality of the eggs, not just the early stages of pregnancy, which is a distinction that has not been previously reported."

Ambient (outdoor) air pollution is one of the greatest environmental risks to health and is estimated to cause over 4 million premature deaths per year worldwide. Exposure to [fine particulate matter](#) is associated with a range of adverse health conditions, including cardiovascular and respiratory diseases.

In 2021, 97% of the urban EU population was exposed to concentrations of PM_{2.5} above the WHO annual guideline (5 µg (microgram) /m³). Although epidemiological data show a clear correlation between pollution and poorer reproductive outcomes, the mechanisms remain unclear.

Dr. Leathersich explains, "Climate change and pollution remain the greatest threats to human health, and human reproduction is not immune to this. Even in a part of the world with exceptional air quality, where very few days exceed the internationally accepted upper limits for pollution, there is a strong negative correlation between the amount of air pollution and the live birth rate in frozen embryo transfer cycles. Minimizing pollutant exposure must be a key public health priority."

Professor Dr. Anis Feki, Chair-Elect of ESHRE, comments, "This important study highlights a significant link between air [pollution](#) and lower IVF success rates, with a notable reduction in live births associated with higher particulate matter exposure before [oocyte](#) retrieval. These findings emphasize the need for ongoing attention to environmental

factors in reproductive health."

More information: Leathersich S.J, et al, Particulate matter (PM2.5 and PM10) exposure prior to oocyte collection is associated with decreased live birth rates in subsequent frozen embryo transfers. *Human Reproduction* (2024).

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