Exposure to Ozone May Affect Human Reproduction

Scientists who have examined the relationships between exposure to specific air pollutants and semen quality report significant declines in semen quality associated with exposure to ozone air pollution.

It has been known since long time that air pollution can affect human health. The most reported effects of exposure to air pollutants include increased risks of cardiovascular and respiratory diseases. However, recent studies have highlighted the possibility that exposure to air pollution could have adverse effects on male reproductive system, mainly on sperm counts and quality.

In order to address the hypothesis that exposure to fluctuating air pollutants affects sperm parameters, a team of American scientists have analysed semen samples in relationship to temporal exposure to main air pollutants: ozone, nitrogen dioxide, carbon monoxide, and particulate matter with an aerodynamic diameter inferior to 10mg/m3 (PM10).

The study included semen analysis data (semen volume, sperm concentration, and sperm mobility) derived from 48 men who regularly donated to a Los Angeles sperm bank between 1996 and 1998. The air quality data were collected for ten-kilometer grid areas during the same two-year period and donors were assigned a grid location based on their zip code at the time of their first donation. Ozone, nitrogen dioxide, and carbon monoxide were measured daily and PM10 was measured once every six days. Consequently, the researchers examined the relationship between each semen sample (more than 5,000 in total) and the air quality at 0-9, 10-14, and 70-90 days prior to its collection.

The results show significant decline in sperm quality with exposure to ozone air pollution. In particular, scientists have found negative correlations between ambient ozone levels and sperm concentrations at all biological time periods studied, suggesting that spermatozoa are susceptible to this pollutant throughout their whole period of formation and development (spermatogenesis). This correlation remained significant even after the adjustment for the potential confounders (i.e. donor’s age, ambient temperature and season).

Ozone was the only pollutant linked to decrease in sperm concentrations, implicating ozone as a reproductive toxicant. No similar associations were found for the other air pollutants considered.

Although the mechanisms behind the reproductive toxicity of ozone remain unknown, the authors argue that ozone exposure may trigger an inflammatory reaction in male genital tract or the formation of circulating toxic species which could disrupt testicular function and cause decline in sperm concentration.

Overall, the results of this study support the hypothesis that ozone pollution adversely affects human reproductive system. They also highlight the need for more detailed scientific studies on this subject.


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