

Exposure to perfluorinated chemicals may reduce women's fertility

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Researchers have found the first evidence that perfluorinated chemicals (PFCs) - chemicals that are widely used in everyday items such as food packaging, pesticides, clothing, upholstery, carpets and personal care products - may be associated with infertility in women.

The study published online in Europe's leading reproductive medicine journal *Human Reproduction* today (Thursday 29 January) found that women who had higher levels of perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) in their blood took longer to become pregnant than women with lower levels.

The researchers from the USA used data from the Danish National Birth Cohort to assess whether levels of PFOS and PFOA in pregnant women's plasma were associated with a longer time to pregnancy. A total of 1,240 women were included in their analyses.

Blood samples were taken at the time of the women's first antenatal visit (between 4-14 weeks into the pregnancy) so that concentrations of PFOS and PFOA could be measured. The researchers also interviewed the women at around the 12th week of pregnancy to find out whether the pregnancy was planned or not and how long it took them to become pregnant. Infertility was defined as a time to pregnancy of longer than 12 months or infertility treatment to establish the current pregnancy, and the results were adjusted for potential confounding factors such as age, lifestyle and socio-economic status.

The levels of PFOS in the women's plasma ranged from 6.4 nanograms per millilitre (ng/ml) to 106.7 ng/ml, and from less than 1 ng/ml to 41.5 ng/ml for PFOA.

The researchers divided the women's levels of PFOS/PFOA into four quartiles, and found that, compared with women with the lowest levels of exposure, the likelihood of infertility increased by 70-134% for women in the higher three quartiles of PFOS exposure and by 60-154% for women in the higher three quartiles of PFOA exposure.

Dr Chunyuan Fei, from the University of California in Los Angeles (UCLA), the study's first author, said: "PFOS and PFOA were considered to be biologically inactive, but recently animal studies have shown that these chemicals may have a variety of toxic effects on the liver, immune system and developmental and reproductive organs. Very few human studies have been done, but one of our earlier studies showed that PFOA, although not PFOS, may impair the growth of babies in the womb, and another two epidemiological studies linked PFOA and PFOS to impaired foetal growth."

Professor Jørn Olsen, Chair of Department of Epidemiology at UCLA, is the principle investigator of the study. He said: "As far as we know, this is the first study to assess the associations between PFOA and PFOS levels in plasma with time to pregnancy in humans. We are waiting for further studies to replicate our findings in order to discover whether PFCs should be added to the list of risk factors for infertility."

PFCs, the class of chemicals to which PFOS and PFOA belong, are found not only in household goods but are also used in manufacturing processes, for instance for industrial surfactants and emulsifiers. They persist in the environment and in the body for decades.

The researchers believe that although they measured the PFOS/PFOA

levels after pregnancy was established, these levels probably did not change significantly from the time before pregnancy. Men's sperm quality could also be affected by PFCs and might, therefore, contribute to the associations between PFC levels and time to pregnancy, since couples would tend to be sharing the same lifestyles and have similar exposures. However, the researchers did not have data on PFC levels in fathers. "Studies on sperm quality and PFOA/PFOS are certainly warranted," said Prof Olsen.

The researchers say the biological mechanisms by which exposure to PFOS and PFOA might reduce fertility are unknown, but PFCs may interfere with hormones that are involved in reproduction.

"Our data showed that higher proportions of women reported irregular menstrual periods in the upper three quartiles of PFOA and PFOS compared with the lowest, and so this could indicate a possible pathway," said Dr Fei.

Reference: Maternal levels of perfluorinated chemicals and subfecundity. *Human Reproduction*. Published online under advance access. doi:10.1093/humrep/den490.

Source: Oxford University

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