

Semen concentration and quality fell in French men between 1989 and 2005

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New research shows that the concentration of sperm in men's semen has been in steady decline between 1989 and 2005 in France. In addition, there has been a decrease in the number of normally formed sperm. The study is published online today (Wednesday) in Europe's leading reproductive medicine journal *Human Reproduction*.

The study is important because, with over 26,600 men involved, it is probably the largest studied sample in the world and although the results cannot be extrapolated to other countries, it does support other studies from elsewhere that show similar drops in semen [concentration](#) and quality in recent years.

The researchers used the French assisted reproduction technology (ART) database Fivnat, which collected data from 126 main ART centres in France. They examined [semen samples](#) provided by men who were the partners of women undergoing [fertility treatment](#) because their [Fallopian tubes](#) were blocked or missing – in other words, the couples' [infertility](#) was due to these problems rather than to any problems with the men's [sperm](#).

They found that over the 17-year period there was a significant and continuous 32.2% decrease in semen concentration (millions of spermatozoa per millilitre of semen), at a rate of about 1.9% per year. The researchers calculated that in men of the average age of 35, semen concentrations declined from an average of 73.6 million/ml in 1989 to 49.9 million/ml in 2005.

In addition, there was a significant 33.4% decrease in the percentage of normally formed sperm over the same period. Changes in the way sperm shape (morphology) was measured during this time may partly explain this decrease and make it difficult to give an estimate for the general population. However, the researchers say that these changes do not account for the total decrease in the quality of sperm morphology observed over the study period.

In their paper, the researchers write: "To our knowledge, it is the first study concluding a severe and general decrease in sperm concentration and morphology at the scale of a whole country over a substantial period. This constitutes a serious public health warning. The link with the environment particularly needs to be determined."

One of the authors, Dr Joëlle Le Moal, an environmental health epidemiologist at the Institut de Veille Sanitaire, Saint Maurice, France, said: "The decline in semen concentration shown in our study means that the average values we have for 2005 fall within the 'fertile' range for men according the definition of the World Health Organisation. However, this is just an average, and there were men in the study who fell beneath the WHO values. The 2005 values are lower than the 55 million/ml threshold, below which sperm concentration is expected to influence the time it takes to conceive."

The researchers also looked at how well the sperm moved (motility) and found that the proportion of motile sperm increased slightly from 49.5% to 53.6% between 1989 and 2005.

Although they made adjustments for variables that could affect the results, such as the men's ages, the season, the centre where they gave their sperm samples, and the technique (standard in vitro fertilisation or intra-cytoplasmic sperm injection), they were unable to control for socioeconomic factors, including smoking and weight, which can affect

semen quality and concentration. However, the authors say that, even though ART is equally accessible to the whole population, it tends to be the better educated who undergo it in France and they are less likely to smoke and to be overweight. "Therefore, the real values for sperm parameters in the general population could be slightly lower than those that we present and the decreases could possibly be stronger," they write.

The authors say that there needs to be more research into the possible causes for the decline in semen concentration and percentages of normally formed sperm, but other studies have pointed to the role played by environmental factors such as endocrine disruptors (chemicals that disturb the body's normal hormonal balance). Furthermore, such factors could induce epigenetic changes (changes in the way genes and cells behave) that might be passed down the generations, and which could contribute to a longer process of decline in men's fertility.

Dr Le Moal said: "Impairments in the quality of human gametes (male sperm and female eggs) can be considered as critical biomarkers of effects for environmental stresses, including endocrine disruptors. Firstly, this is because gametes are the very first cells from which human beings are built up during their lifetimes. According to the theories about the developmental origins of health and diseases, early (foetal, postnatal, but possibly also preconceptional) exposures may have an impact on adult health; the testicular dysgenesis syndrome hypothesis could be regarded as an example.

"Secondly, it has been shown in humans and animals that intergenerational effects may occur after foetal exposures, particularly via epigenetic changes. If such exposures and effects occur in successive generations, accumulated outcomes are plausible. So the observed trends could be the result of several generations' changes."

For this reason, the authors say they are concerned that there could be

effects on the next generation's health.

"Our public health warning may help health authorities to reinforce their actions on endocrine disruptors, hopefully at the European level, and to sustain research as well as monitoring systems," said Dr Le Moal. "We plan to implement a national monitoring system with the French competent authority (the Biomedicine Agency), which now runs the national registry of ART. Our example could help other countries to implement their own systems. International monitoring systems could be a good idea to understand what is happening on human reproductive outcomes around the world, and evaluate public health actions in future," she concluded.

More information: "Decline in semen concentration and morphology in a sample of 26 609 men close to general population between 1989 and 2005 in France", by M. Rolland, J. Le Moal, V. Wagner, D. Royère, and J. De Mouzon. Human Reproduction journal.

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