

"Gender benders" cause sperm burn out

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The first direct evidence that "gender bender" chemicals affect the fertilising ability of sperm has been revealed - but it is unclear whether this would boost or harm fertility.

Researchers told the European Society for Human Reproduction and Embryology conference in Vienna that chemicals that mimic the effects of the female sex hormone oestrogen can prime sperm into becoming prematurely active, burning out before they have a chance to meet an egg.

"It's certainly very exciting work," says Chris Barratt at the University of Birmingham. "Sperm and the fertilisation process may be much more sensitive to artificial oestrogens than we thought."

Chemicals that mimic action of oestrogen abound in food and the environment. Many occur naturally in plants such as soy and hops, and are eliminated from the body within a few hours. Others take the form of synthetic chemicals such as pesticides and plasticisers, and build up in body tissues.

Research had already suggested a link between environmental oestrogens, testicular problems and low sperm counts, but this is the first time anyone has looked at their effect on sperm function, according to Lynn Fraser at King's College London, who led the new study.

Turn on

Oestrogen in semen and in the vagina is vital for fertilisation because it literally turns sperm on. The hormone stimulates a sperm to swim, and triggers physical changes that prime it for meeting with an egg - a process called capacitation.

Once a primed sperm docks with the egg, the cap on its head ruptures and releases a cocktail of enzymes that help it burrow inside and fertilise the egg. Normally, proteins in semen restrain this process, making sure it does not occur too soon.

If it does, the sperm will be unable to enter the egg. "Once they have undergone this reaction, they cannot fertilise, no matter how much they wiggle," explains Fraser.

Fraser and her team tested the effect of oestrogen and three oestrogen mimics - genistein, found in soya, 8-prenylaringen, found in hops, and nonylphenol, found in paints, herbicides and pesticides.

They mixed the chemicals with mouse sperm and found all the compounds triggered capacitation and enzyme release. But the oestrogen mimics were far more powerful, triggering capacitation at concentrations a thousand times lower than oestrogen itself.

What's more, when the team tested the compounds on sperm that had already capacitated, they found that the oestrogen mimics triggered the premature release of the enzymes, whereas oestrogen did not.

Doubled fertilisation

However, when researchers mixed sperm with eggs and then treated them with the compounds, the number of eggs fertilised was doubled. This could be a benefit for IVF techniques, said Fraser.

"At first sight, these results might suggest that oestrogens, particularly those found in the environment, could help fertility. However, the responses we have seen could have negative effects over time," said Fraser.

Asked if oestrogen mimics could harm fertility in real life, Fraser said: "The potential answer to that question would be yes." Premature capacitation and enzyme release of sperm might not be a serious problem for normal fertile men, but it could be for men with lower sperm counts.

On the other hand, if the proteins that normally keep sperm under control still do their job, then the extra oestrogen-like activity could actually make sperm more fertile by increasing the numbers primed for fertilisation.

Barratt agrees that the jury is out until more research is done. But he adds that human sperm is known to be more sensitive than mouse sperm to progesterone, a hormone in the same class as oestrogen, meaning that oestrogen mimics could in theory have an even greater effect on humans.

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