

BPA Disrupts Sperm Development, Linked to Declining Male Fertility

BY DOUGLAS MAIN 1/23/15 AT 11:50 AM

Men are generally not as fertile as they used to be, many studies suggest. While there are regional variations, sperm counts and quality have, by and large, been declining over the past 50 years or so. One 2013 study of more than 26,000 French men, for example, found that sperm concentrations have dropped by nearly 2 percent each year from 1996 to 2005. And other male reproductive problems, like testicular cancer and genital birth defects, are on the rise.

One prominent hypothesis is that this uptick in dysfunctions may be partially due to increasing exposure to endocrine-disrupting chemicals, especially substances that mimic the effects of estrogen, which is found in higher concentrations in women and plays a role in the reproductive development of both sexes.

“There is little doubt that factors in our environment have adverse effects on human testicles,” says [Niels Skakkebaek](#), a prominent Danish researcher at the University of Copenhagen. “We are, for example, witnessing rather significant increases in testicular cancer that have occurred so fast that only factors in our environment...can explain it.”

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A new study soon to be published in the journal *PLOS Genetics* suggests that bisphenol A (BPA)—an endocrine disruptor found in many plastics, can linings and receipts, and which mimics the effects of estrogen—may play a role in this decline in male fertility.

In the study, researchers exposed several different types of mice to low concentrations of BPA at birth, for a short period of time. Once the mice were sexually mature, the scientists examined the animals’ testes and measured sperm count. In exposed males, sperm count was significantly lowered in two out of three mice strains tested, says study author [Patricia Hunt](#), an expert on

BPA at Washington State University. The one strain unaffected by BPA, an inbred variety, appears to have developed an unusual resistance to the chemical that wouldn't be expected in other mammals like humans, she adds.

Researchers also transplanted the [stem cells that give rise to sperm](#) from exposed animals into other mice to see if the BPA had damaged these cells or some other component of the reproductive system. Once inserted into healthy, unexposed mice, the cells still spit out sperm at the same reduced rate. The scientists concluded that that sperm-making cells themselves had been permanently disrupted by their early-life exposure to BPA.

“A short exposure after birth can permanently affect the way the adult male makes sperm,” says Hunt. “This rocks my world,” she adds, and not in a good way.

The scientists performed further experiments showing that BPA, as well as the chemical ethinyl estradiol, commonly used in oral contraceptive pills, affect a specific and vitally important cell process called [meiosis](#)—when the [germ cells](#) found in testes and ovaries make sperm or eggs. It appears that BPA permanently alters the way germ cells carry out the delicate process of DNA copying and splicing, Hunt says.

The fact that BPA and other estrogenic chemicals appear to damage stem cells “is huge and supports the prediction, though it is only a prediction at this point, that this could be the basis for the trend of declining sperm in males,” says [Fred vom Saal](#), who studies endocrine disruptors at the University of Missouri and wasn't involved in the study.

It's also quite possible that these alterations to stem cells, as caused by estrogenic chemicals, may be passed down for generations, vom Saal adds.

It's important to emphasize the study was done in mice, and animal studies don't always translate to humans. But it adds to previous work on humans that showed, for example, a link between [higher BPA levels in men's urine and low sperm counts](#). The process of meiosis is also quite similar in mice and humans, and all mammals for that matter, vom Saal says.

“The hypothesis that BPA may play a role together with many other endocrine disruptors” in reducing male fertility “is plausible,” Skakkebaek says. He and his group [published a paper](#) recently in the journal *Environmental Health Perspectives* “suggesting that exposure of young

men to bisphenol A was associated to changes in their pituitary-testicular hormones, [which] are important for fertility.”

But as you might expect, industry representatives say there’s nothing to worry about. “In contrast to the author’s assertion, the...doses of BPA tested in the small-scale study are hundreds to thousands times higher than actual human exposure, as repeatedly documented in population-scale biomonitoring studies,” says Steven Hentges. He is with the American Chemistry Council, which represents plastic manufacturers that use BPA in their products. “Overall, this new study is of limited relevance to human health.”

Hunt, vom Saal and others pointedly disagree, saying that they administered small doses within the range humans are exposed to. And a [study published just last week](#) found the tiny concentration of [BPA found in a stream in Alberta, Canada, was enough to alter brain development in zebrafish](#).

Regulators are not impressed with these studies, apparently. In the past month, the U.S. Food and Drug Administration (FDA) said the BPA in food doesn’t pose a significant health threat. And this week the [European Food Safety Authority said](#) basically the same thing, suggesting BPA was not a significant health concern.

Scientists like endocrinologist [Andrea Gore](#), a professor of pharmacology and toxicology at the University of Texas at Austin who also represents [the Endocrine Society](#), aren’t happy about these rulings. “The Endocrine Society, the world’s oldest and largest organization of doctors who treat and scientists who research hormone health conditions, has expressed continued disappointment with the FDA’s approach to regulating BPA,” she says. “While conclusive evidence is lacking, sound scientific studies indicate a strong possibility for adverse health effects. It is the responsibility of the government to adopt measures that protect people from the risk of exposure to certain chemicals.”

This is “just one more study that illustrates exposure to environmental estrogens during development can negatively affect physiology later in life,” says [Deborah Kurrasch](#), a developmental neuroscientist at the University of Calgary in Alberta, who wasn’t involved in the study. “A substantially large body of literature now links endocrine disrupting chemicals to adverse health, and collectively these studies suggest that we should be minimizing our exposures as much as possible.”