

Daily Chemicals That Are Severely Disrupting Your Hormones

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STORY AT-A-GLANCE

- › A rapid decline in men's sperm concentration and count is occurring worldwide
- › While the rate of sperm decline was just over 1% a year beginning in the 1970s, by 2000 the rate of decline more than doubled to 2.64% a year
- › One class of chemicals appears to be particularly detrimental to sperm – endocrine disruptors, such as phthalates and bisphenols
- › Much of the damage occurs in early pregnancy during crucial developmental windows; the damage can be passed on to future generations
- › Beyond phthalates and bisphenols, pesticides have also been shown to lower sperm count, even down to zero in adult men
- › For those interested in protecting their own fertility – and that of future generations – as much as possible, avoiding hormone-disrupting chemicals is essential

Shanna Swan, Ph.D., a reproductive epidemiologist with the Icahn School of Medicine, Mount Sinai, New York, has been studying declining sperm counts for decades. In 2017, she and colleagues published a study that went viral because it predicted an impending fertility crisis.

Men experienced a 50% to 60% decline in sperm counts from 1973 to 2011, the 2017 study found, amounting to a decline of over 1% per year over the last 50 years.^{1,2}

The team then expanded the study, adding seven years of data and an expanded geographical range. The new study, published in Human Reproduction Update in November 2022,³ includes data from six continents and 53 countries, including years 2011 to 2018⁴ – but the results reveal an equally disturbing trend.

Expanded, Updated Study Raises Red Flag Over Sperm Counts

The original 2017 study included men from North America, Europe, Australia and New Zealand but was criticized because it didn't include global data. "At that time, there were too few studies with data from South/Central America-Asia-Africa (SAA) to reliably estimate trends among men from these continents," the research team explained.⁵

In the time that elapsed since their first study, however, more research was published, enough to show a clear significant decline in sperm concentration and count in men in Asia, Africa and South America. This means the decline is worldwide.

The rate of decline also changed when more recent data was added in. While the decline was just over 1% a year beginning in the 1970s, by 2000 the rate of decline more than doubled to 2.64% a year.⁶ "That is very fast and very unusual, given that this was only in the last 18 years, from 2000 to 2018," Swan said. "Extremely rapid decline."⁷

Are Chemicals Behind the Rapid Decline?

The pertinent question is what's triggering this rapid decline in sperm counts and concentration. Genetics comes to mind, but Swan has ruled this out because the steep decline took place over just two generations – much too rapid of a change to be caused by genetics.

"That leaves us with environment," she says, breaking it down into two categories – lifestyle and chemicals.⁸ Lifestyle factors such as smoking, drinking alcohol, stress, diet and exercise all affect sperm. So, too, do chemicals in the environment via our air, drinking water, household dust, food and more.

While there are many factors contributing to this reproductive calamity, Swan believes one class of chemicals to be particularly detrimental to sperm decline – endocrine disruptors.

Sperm are germ cells produced by the reproductive system. “The production of germ cells is governed by hormones,” Swan explains.⁹ And sex hormones are altered by these chemicals, including phthalates, which lower testosterone levels, and bisphenols, including not only BPA but also BPF, BPS and other variants that have been used to replace BPA. Where are these toxic chemicals found? All over the place:¹⁰

Plastics	Canned food liners	Epoxy adhesives
Cash register receipts	Toys	Caulks and adhesives
Vinyl flooring	Flexible PVC pipes	Food packaging
Teething toys	Personal care products	Sports equipment

Beyond phthalates and bisphenols, pesticides have also been shown to lower sperm count, even down to zero in adult men, according to Swan.¹¹ A man’s sperm count can recover from pesticide exposure in about three months, provided he stops being exposed. But if a pregnant woman is exposed to pesticides, her unborn son can be affected – and his sperm count will not recover.¹² Grandchildren are also affected, as the changes are passed through generations.

Anogenital Distance Hints at Chemical Exposures in Utero

Research by Swan and colleagues found that women’s exposure to phthalates during pregnancy is also linked to male babies’ anogenital distance (AGD) – the distance from the anus to the base of the penis – with higher exposure associated with shortened AGD.¹³ Later in life, shorter AGD is linked with a smaller penis¹⁴ and poorer semen

quality, such that Swan believes AGD at birth is predictive of adult reproductive function.¹⁵

The more testosterone exposure in utero, the greater the AGD distance. If there's not enough testosterone exposure, or if it comes at the wrong time, Swan says, then that genetic male will have an AGD that's smaller than it should be:¹⁶

"There are consequences. And it turns out that if a young man has a shorter than expected AGD for his body size, then he'll have a lower sperm count and he'll be more likely to be infertile. So this is undoubtedly part of the picture of declining sperm count."

During critical phases of development in early pregnancy, if phthalates occupy the testosterone receptors in the fetus, it signals its body to not produce enough testosterone on its own.

At that point, the AGD stops growing and the boy will be under-masculinized, Swan says. "That also affects the germ cells that will go on to become sperm when he's a young man. And so they are impaired by this as well. So when he goes on to ... try and have a child, he won't do as well. His sperm count will be lower and he won't be able to do the job."¹⁷

While much of the damage occurs in early pregnancy during crucial developmental windows, when the fetus is first forming and cells are rapidly dividing, exposure then continues, accumulating throughout life. Worse still, the damage that occurs can be passed on to future generations, and it's not only boys that are affected.

"A female fetus, in utero," Swan explained, "is growing the eggs that she will use to have her own children. These chemicals can make their way to those germ cells, too."¹⁸ A PLOS Genetics study also demonstrated generational effects of hormone-disrupting chemicals, with effects worsening with each subsequent generation until, by the third generations, some of the animals could not produce any sperm.¹⁹

Assisted Reproductive Technology Use Up More Than Threefold

Swan's book, "Count Down," goes into detail about how the modern world not only is threatening sperm counts but also altering reproductive development in males and females,²⁰ and in so doing "imperiling the future of the human race."²¹

In terms of reproductive consequences, this means it's going to be harder to conceive a child, a trend that's already becoming apparent. Since 1996, U.S. births that occurred via assisted reproductive technology are up more than threefold.²² This may also have consequences, Swan says, as research suggests boys born through couples that have gone through assisted reproductive techniques have lower sperm counts themselves.

Meanwhile, men with lower sperm counts tend to die younger than men with higher counts. "Sperm count tells us not just about ability to conceive, but it also tells us something about longevity, which is pretty important."²³ Overall, when the fertility rate goes down it means fewer children are being born.

While some believe that's a good thing, Swan says, the data suggest the world's population will continue to increase until about 2040 or 2050. At that point, it's predicted that it will drop "and it will never come back." This means there will be fewer young people around to support older people. "This is a social problem that's growing" and already being felt in Japan, China and other Asian countries.

Swan warned in 2021 that if the curve of declining sperm counts from the 2017 study continues, by 2045 the median sperm count will be zero. "It is speculative to extrapolate, but there is also no evidence that it is tapering off. This means that most couples may have to use assisted reproduction," she said.²⁴ Further, now we know declining sperm counts have not tapered off but actually accelerated.

What to Do if You're Looking to Start a Family

Swan's findings have implications for the whole of humanity. But in the immediacy, she shared advice for people interested in starting a family in the near future:²⁵

"They should think about what they're allowing into their bodies, even right now, in terms of the kind of food, the kind of drinks, the kind of air, the kind of

products they use in their house, the cosmetics they use. Mostly just be aware that it all matters ... And then, I would say, men should bank a semen sample. Why not? It's not difficult. It's not particularly expensive. Now you can do it at home with a mail-in sample ...

If you want to conceive a child in the next 10 years, why not have a sample that's probably OK. By the same measure, I would say that every man should have his sperm tested. If it's not great quality, he can think about what to do to improve that in terms of his lifestyle, exposures and so on."

I believe electromagnetic fields (EMFs) are another significant factor for the observed decrease in male sperm count. Writing in *Clinical and Experimental Reproductive Medicine*, researchers noted that many in vivo and in vitro studies have revealed the EMF exposure can alter reproductive function, including sperm motility, with effects varying according to the frequency, duration of exposure and strength of EMFs.²⁶

For those interested in protecting their own fertility – and that of future generations – as much as possible, reducing your EMF exposure and avoiding hormone-disrupting chemicals are essential. Swan also recommends some simple solutions like eating unprocessed foods that you cook yourself as much as possible to reduce your exposure to plastic food packaging, and using only simple, unscented personal care and household products.²⁷

One silver lining is that phthalates leave your body quickly, in a matter of hours, after exposure. They're nonpersistent chemicals – unlike other toxins like dioxin, PCBs or lead, so if people stop taking them in, the damage done to fertility would stop – at least from this class of chemicals.²⁸

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