



American Healthcare Professionals and Friends for Medicine in Israel

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Dr. Hagai Levine, a one-time APF Fellow, is worried about the future of the human race.

And, judging by his latest research on the sharp decline in sperm counts internationally, you should be too.

“Eventually we may have a problem with reproduction in general, and it may be the extinction of the human species. Because reproduction may be the most important function of any species,” says epidemiologist Levine, head of the Environmental Health Track at the Hebrew University-Hadassah Braun School of Public Health and Community Medicine. “And something is very wrong with men.”

What few realize, according to the American Society for Reproductive Medicine, is that the male partner is either the sole or contributing cause in about 40 percent of cases of infertility.

Not only is the economic and societal burden of male infertility high and increasing, reduced sperm count predicts all-cause mortality and morbidity. It is also associated with conditions such as undescended testicles and testicular cancer, says Levine.

“If we will not change the ways that we are living and the environment and the chemicals that we are exposed to, I am very worried about what will happen in the future.”

Levine is the lead investigator of a ground-breaking study detailing that sperm counts have declined 59.3 percent, more than half, in the last 40 years among men from North America, Europe, Australia and New Zealand. Researchers were unable to draw significant conclusions regarding non-Western countries because of the lack of available data.

Study findings also reveal that, between 1973 and 2011, the concentration of sperm in the ejaculate of men in Western countries has fallen by an average of 1.4 percent a year, leading to an overall drop of just over 52 percent. The study controlled for such factors as age and how long men had gone without ejaculation.

“The results are quite shocking,” he says.

While infertility treatments such as IVF can offer solutions to potential ramifications of the decline on one level, little has been done to address the other side of the issue. In essence, research, popular culture, government agencies, even business have been focused on the female side of infertility. It is predicted that, by 2020, the women’s fertility industry will be valued at \$21 billion globally.

“This is a classic under-the-radar, huge public health problem that has really been neglected,” says Levine.

While declines in sperm count have been reported for 25 years, the question has remained controversial because of limitations in past studies. Levine’s meticulous work seems to have put that question to rest.

The study was published in *Human Reproduction Update*, the leading journal in the fields of reproductive biology and obstetrics and gynecology. It is a meta-analysis, an analysis of studies, not individuals, allowing researchers to see the “larger picture,” and is considered “the highest level of evidence in the ranking of evidence,” according to Levine.

Levine, an APF 2014-2015 Research Fellow in Public Health at Mt. Sinai Hospital in New York, worked closely with Mt. Sinai’s Dr. Shanna H. Swan, Professor in the Department of Environmental

Medicine and Public Health, whom he had first met at a workshop in 2009 (after which he decided to focus on reproductive health) and with whom he later worked during his fellowship.

“It was a great experience working with Shanna and it would have been impossible to have done this without her.”

Levine and Swan recruited a team of eight researchers from various disciplines: Medicine, Public Health, Epidemiology, Statistics, Basic Science and Medical Informatics. They were from: Denmark, Israel, The United States, Brazil and Spain. They screened 7,500 studies and read fully 2,500 to select 185 that met the necessary criteria. Research involving almost 43,000 men was examined. The whole project ran from 2014 through 2017, although Levine had been planning it for some time before.

Since Levine started the study during his fellowship year, early on he had lots of time to devote to research, extracting data and beginning the analysis. When he returned to Israel it was more complicated.

“I had my life as a physician, researcher and teacher. Also, there were my public obligations as The Secretary of the Israeli Association of Public Health Physicians and my private responsibilities as a husband and father.

“But I kept giving the study top priority.”

Levine did all the statistics, the meta-analysis. Even though he’d done statistical work before, this was different. “I needed special tools for this. I had to study a lot to find and use these tools. I worked nights and weekends. We also consulted a world-class expert on meta-analysis.

“I couldn’t, however, have done it without the support of my wife Orit, a pharmacist. She fully understands my research and can always provide a good opinion on the topics at hand.”

Levine says all the effort was worth it to sound an alarm and a clarion call. “There’s something wrong

with the way we live now. We need to find out the causes of the decline and address them.”

Factors potentially affecting sperm count decline in Israel and elsewhere include:

- Exposure to chemicals, including agricultural and commercial -- “In Israel we have a quick ‘farm to plate’ time, which is good, but also leads to a higher exposure to pesticides.” Also, endocrine disruptors, chemicals such as BPA and phthalates, can interfere with the endocrine (or hormone) systems at certain doses. These disruptions can cause cancerous tumors, birth defects and other developmental disorders. Endocrine disruptors are found in products including: cosmetics, shaving cream and household cleaning chemicals. “We need better regulations in all these areas.”
- Obesity – “There is dreadful data in Israel on the consumption of soda drinks and sugar, in some places it’s even higher than in the U.S. This is harmful to sperm, not to mention overall health. The interests of commercial companies are driving the policies at the expense of the population’s health.” Lack of physical activity also contributes to obesity.
- Smoking – “Smoking in Israel has shockingly increased during the last year. And so we are seeing the consequences of first and secondhand smoke increasing. “Israel is way behind other countries in working to curtail smoking. We have not made use of the available tools such as taxation and graphic public health warnings.”
- Binge drinking
- Drug use

“Men can protect themselves and their partners. Take care of yourself. Don’t expose pregnant women to chemicals,” Levine warns. “And let your decision-makers know that you care about your health and want protections.”

He wants to reiterate the message that his study should serve as “the canary in the coal mine,” revealing not just a serious reproductive health problem, but a serious overall public health problem across the entire male lifespan.

What's next for Levine?

"As a researcher I am going to conduct further studies on the specific causes of poor sperm count and other presentations of testicular dysgenesis syndrome (a male reproduction-related condition) such as testicular cancer.

"As an advocate, I am going to speak loudly, in my position, for policies that consider impact of the environment on health."

Levine and Swan's study has been covered by such diverse media outlets as: online's the Guardian; magazines: Scientific American, Reader's Digest and Newsweek and broadcast organizations CNN and the BBC.

Support came primarily from the researchers themselves, APF, The Israel Medical Association and Israel's Environment and Health Fund. "Their support was crucial for this study, impacting global health and science."

American Physicians Fellowship for Medicine in Israel

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