Testimony of Linda C. Giudice, MD, PhD, MSc
U.S. Senate Committee on Environment and Public Works
on
"Oversight on EPA Toxic Chemical Policies"
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Dirksen Senate Office Building, Washington DC

Senator Barbara Boxer, Chairman
Senator James M. Inhofe, Ranking Member

Good Morning, Chairman Boxer, Senator Inhofe, committee members, and guests. I am Dr. Linda Giudice, Professor and Chair of the Department of Obstetrics, Gynecology, and Reproductive Sciences at the University of California, San Francisco. Thank you for the opportunity to testify at this important hearing. Today I shall focus on three things:

1. Disturbing trends about male and female reproductive health and development.
2. How chemicals in our environment can affect reproductive and developmental health and the relationship to developing adult diseases.
3. What we can do to preserve our health and that of future generations.

First, before I begin about trends I'd like to share some experiences during my career as a reproductive endocrinologist and infertility specialist. I have treated thousands of patients with infertility and other reproductive disorders – young men with very abnormal sperm or with a history of testicular cancer; young women, some of them as young as 17, already in menopause; little girls with onset of puberty at 6 or 8 yrs old; and women with estrogen-dependent disorders, like endometriosis and uterine fibroids that can result in incapacitating pain, lead to compromised fertility and increased risk of miscarriage. For the most part, we do not know the underlying causes of these disorders, but there is increasing evidence that environmental contaminants play a role. Some causes are genetic, but most are not. Couples and individuals struggle with an inability to conceive, with cancer, with debilitating pain, or having an abnormal baby - challenges that most of us would find hard to face, and which are more common than you may think.

About 5 years ago, one of my infertility patients questioned whether her exposure to environmental chemicals as a child growing up near a PCB contaminated waste site on the east coast could play a role in her inability to conceive a child. For me this was a wake up call, because we know that hormones affect human development and that some environmental chemicals act like hormones. Since then, reproductive science has exploded with data about environmental chemicals and how they affect reproduction and adult diseases due to exposures in utero.

Trends. There are disturbing trends in the United States [1].

- More young women under the age of 25, their time of peak fertility, are reporting difficulty conceiving and maintaining their pregnancies. In a national survey conducted by the National Center for Health Statistics [2], between 1982 and 2002 the percent of women reporting difficulty in conceiving and maintaining pregnancy doubled from 4.3% to 8.3%.
- Sperm counts have decreased by 50% during the past 50 years in several industrialized regions.
- Compared to 30 years ago, over 25% more women get breast cancer, over 45% more men get testicular cancer, and 76% more men get prostate cancer.
- Thirty percent more babies are born premature, and on average babies are born one week earlier now than they were 15 years ago.
- Some of the most common birth defects today are malformations of the male reproductive system.

We also have increasing scientific evidence of the impact that exposures in the womb or during early childhood to environmental contaminants can have on human health. [3]. Some effects can occur immediately, such as birth defects, pre-term birth, and low birth-weight. Some effects can occur during childhood, such as learning disabilities and childhood cancers, and some effects do not occur until adulthood, such as diabetes, cardiovascular disease, and cancers. Exposures in the womb can also affect subsequent fertility as an adult [1] .

Chemical Exposures – when, where, and how: Since World War II, chemical production in the U.S. has increased more than twenty-fold, while since 1979 the number of chemicals registered for commercial use has grown by over 30%.. There is ubiquitous exposure to environmental contaminants through air, water, food and drink, cosmetics, personal care products, pesticides and herbicides, and everyday household items.

Exposure to chemical contaminants that occurs around the time of conception, during pregnancy, or during infancy can be particularly powerful. These are critical times of development, or “periods of vulnerability,” during which unique and important developmental changes are taking place. Chemical exposures during these periods can interfere with these processes and result in negative health effects to the child or even the grandchildren.

An example of this is exposure to Bisphenol A, also known as BPA. Recent government data show that almost every person in the U.S. is exposed to BPA. BPA is found in many places including polycarbonate plastic and can linings. Studies have found that exposure during early life, during critical windows of development, can result in permanent alterations to a number of reproductive systems in the body, increasing the risk of future reproductive health problems. In a series of important studies by Dr. Pat Hunt at Washington State University, pregnant mice were exposed to BPA, which resulted in exposure to the developing fetus. This exposure to BPA damaged female

fetus's new eggs, known as oocytes. The daughter's eggs were more likely to have chromosomal abnormalities, which increased the likelihood of a granddaughter with genetic defects. Chromosomal abnormalities are the leading cause of miscarriage, congenital defects and mental retardation in humans. Dr. Hunt's studies revealed that prenatal exposure to BPA resulted in damage passed from the mother to the daughter, to the granddaughter, passing down two generations.

Another example is exposure to phthalates. People are exposed to phthalates from numerous sources, including personal care and vinyl products. Phthalates can interfere with production of testosterone, and exposure to phthalates during pregnancy can result in decreased levels of testosterone in the fetus. The male fetus must have a certain level of testosterone in order for the development of the male reproductive tract, and exposure to phthalates in animals has been linked to reproductive effects in male babies, like undescended testicles and deformities of the penis. Data of Dr. Shanna Swan of the University of Rochester show pregnant women with higher phthalates were more likely to have little boys with decreased genital dimensions, which indicate effects on the male reproductive system.

Exposure to these chemicals, phthalates and Bisphenol A, which have the ability to interfere with the proper functioning of the endocrine system, are just two examples that are raising concern among health care providers and scientists. Others, including pesticides, solvents, and heavy metals, also have been shown to have similar effects.

To address these very real concerns about the impact of environmental contaminants on reproductive health, UCSF has launched the Program on Reproductive Health and the Environment (PRHE). PRHE is dedicated to advancing scientific inquiry, professional training, citizen education, and health policies that reduce the impacts of environmental contaminants on reproductive and developmental health.

What to do. We need to ensure that couples can conceive if they wish, have a healthy pregnancy, a health child, and ultimately a healthy grandchild. However, to do this we need the Federal government to fulfill its mission. For many chemicals, we have sufficient scientific information to act. This requires assembling the existing scientific knowledge, reviewing it in an impartial and unbiased manner, following scientific principles free of ideology, so that we can begin to move forward and allow the decisions to be made to prevent exposures that can result in harm.

But there are many chemicals where we have no scientific data. The absence of scientific data does not mean the chemical is safe, it only means that that we have a lack of data. For these chemicals we need actions that require providing sufficient information so the government can move forward to prevent harmful exposures. By acting now, we can improve our health and that of our children and our grandchildren, and the health of generations to come

Thank you

References

1. Woodruff, T.J., A. Carlson, J.M. Schwartz, and L.C. Giudice, *Proceedings of the Summit on Environmental Challenges to Reproductive Health and Fertility: executive summary.* Fertil Steril, 2008. **89**(2 Suppl): p. e1-e20.
2. Chandra, A., G. Martinez, W. Mosher, J. Abma, and J. Jones, *Fertility, family planning, and reproductive health of U.S. women: Data from the 2002 National Survey of Family Growth*, N.C.f.H. Statistics, Editor. 2005, Vital Health Stat.
3. Janssen, S., V. Fujimoto, and L.C. Giudice, *Endocrine Disruption and Reproductive Outcomes in Women*, in *Endocrine-Disrupting Chemicals: From Basic Research to Clinical Practice*, A. Gore, Editor. 2007, Humana Press: Totawa, NJ. p. 203-223.

Other Materials for the Record

PRHE Fact Sheet

Executive Summary: Proceedings of the Summit on Environmental Challenges to Reproductive Health and Fertility.