

## Podcast script: Menopause and the Environment

[Theme music]

**Ashley Ahearn (AA):** You're listening to Environmental Health Chat – a show from the National Institute of Environmental Health Sciences that explores the connections between our health and our world.

I'm Ashley Ahearn.

The environment we live in can have so many different effects on our health, but one that we don't discuss perhaps as much as we should, as a society, is menopause. How might our environmental exposures affect the end of a woman's reproductive phase in life?

Women tend to hit menopause around the age of 50, though that can vary widely. Menopause marks the end of a woman's ability to reproduce – when she stops menstruating. But the lead up to menopause – or perimenopause – can start in your mid-40s. That's when you might have hot flashes, trouble sleeping, and mood swings.

**Jodi Flaws (JF):** To be honest, the older I've gotten, the more interested I've become in menopause and reproductive aging. But I think that it's an area where there hasn't been a lot of focus or a lot of research. And so, I just became really interested in it, and wanting to do more studies in that area.

**AA:** Dr. Jodi Flaws' research focuses on how environmental factors may affect reproductive aging in women. She's a professor in the Department of Comparative Biosciences at the University of Illinois, Urbana-Champaign.

**JF:** So as the female's body ages, one of the things that happens is that the ovary loses ovarian follicles. Those are gradually depleted over time either through a small percentage through ovulation, but the majority because the follicles in the ovary are programmed to die. And so, what happens is you've got very few ovarian follicles over time, meaning you don't have the structures containing the eggs. So, you're not ovulating as much, and fertility goes way down. Those follicles also make sex steroid hormones. So, as they're declining, the sex steroid hormone levels decline.

**AA:** As you might imagine, a chemical exposure that kills or harms ovarian follicles or interacts with parts of the endocrine system that produce sex hormones, like the pituitary and hypothalamus glands, could mess up the natural process of reproductive aging.

**JF:** And the result of that is that you may experience things like infertility and loss of hormones at a much earlier age than the normal age. And that can lead to early onset of infertility as well as early onset of chronic diseases, other chronic diseases that result from having low estrogen levels.

**AA:** Women who go through menopause earlier are more likely to develop osteoporosis, cardiovascular disease, depression, and even to die at a younger age.

**JF:** And there's many reasons for this, but in simplest terms, estrogen is really, really important for cardiovascular health, bone health, brain health. And when estrogen levels become low, and you have this lack of estrogen earlier in life compared to later, that just increases your risk of having conditions that are driven by low estrogen. And because you have things like cardiovascular disease, that's going to increase your risk of death earlier than if you don't have cardiovascular disease.

**AA:** Dr. Flaws is particularly interested in how one family of chemicals might affect reproductive aging.

Phthalates are one of the most commonly used chemicals in our daily lives today. They're found in plasticizers and solvents and show up in plastic food and beverage containers, children's toys, building materials, fragrances, shampoos, nail polish and so many other products.

More than 75% of the U.S. population has phthalates in their urine at detectable levels. That's according to data from the National Health and Nutrition Examination Survey or NHANES from the Centers for Disease Control and Prevention. The national data set also shows higher levels of phthalates in women than in men and non-Hispanic Black women had some of the highest levels.

**JF:** And we do know that those higher phthalate exposures are leading to things such as higher risk of cancer in those populations. So, I wouldn't be surprised to see that there were higher risks of early menopause, or lots of menopausal symptoms in those women as well.

**AA:** Dr. Flaws has been involved with the Midlife Women's Health Study, which is funded by the National Institutes of Health. It follows a cohort of roughly 780 women who were enrolled between the ages of 45 and 54 and correlates their phthalate levels with hot flashes and changes in their hormonal profiles.

**JF:** And what we found was that the phthalate exposure was increasing the risk of having frequent hot flashes and that it was also leading to abnormal hormone profiles in these women. Women who self-described as African American or Black or Hispanic, had higher risk of hot flashes and some of the sleep disorders and mood disorders compared to women who self-described as White. There are also racial/ethnic differences in risk of cardiovascular disease, osteoporosis, and depression. They don't always follow though with one group having a higher risk compared to other groups.

**AA:** Across all racial groups, they found that exposure to certain phthalates commonly found in plastics altered the levels of sex steroid hormones in the women and could lower androgen and estrogen.

To better understand what might be going on here, Dr. Flaws has been using mice. It's important to note that animal studies aren't an exact representation of what might be happening in humans, but Dr. Flaws says that when it comes to studying the ovary, mice are a pretty good parallel because they have very similar structures, genes, and hormones as humans.

With funding from the NIEHS, Dr. Flaws exposed mice to similar levels of commonly used phthalates that you might see in humans, both at chronic, long-term doses and bigger, short-term doses, like you might get if you sprayed a bunch of perfume on yourself, for example. Then she and her colleagues examined fertility in the mice, they measured hormones, and they looked at the ovaries to see if the exposure might be killing off egg follicles.

**JF:** And we do see, depending on the phthalate and the length of exposure and the dose, we do see that phthalates are causing in mice many of the same indicators of early reproductive aging that we would expect to see in women undergoing early menopause. So, for example, they lose their fertility quicker – that's due to loss of ovarian follicles. They have abnormal levels of hormones, including declining estrogen levels, and a lot of gene changes that are consistent with there being aging in the ovary.

**AA:** So, if phthalates are all around us – and likely in our blood and urine already – what’s to be done? Dr. Flaws says she tries to limit her exposure by staying away from nail polish and other personal care products and soaps that are heavily fragranced and colored. She doesn’t eat out of plastic food or beverage containers, and she avoids fast food. She also mentioned that phthalates can collect in dust, so she tries to keep her house clean. Dr. Flaws also noted how difficult it is to avoid phthalates and that the burden shouldn't fall to the individual to protect their health. She says consumers need safe, affordable alternatives to phthalate-containing products.

Physicians and clinicians play an important role in educating the public about their exposures, and the risks that may come from phthalates.

**JF:** I think a lot of times clinicians don't think about environmental chemical exposures. Many do, but some do not. And so I think really understanding how the environment and the human body really interact and how these environmental exposures might be leading to some of the adverse health outcomes that physicians are seeing and then being able to counsel people on how to reduce their exposure to some of the things and try to improve health by reducing exposure to chemicals, as opposed to just taking another drug to treat a symptom.

**AA (on tape):** And in that vein, hormone replacement therapy – I haven't followed it closely – but there seems to be quite the back and forth in terms of the literature and then how people in the general public are feeling about it. What are your thoughts about hormone replacement therapy?

**JF:** So, I will say that I went through menopause, and I took hormone replacement therapy because I felt pretty good about it and I know that it is one of the best ways to treat menopausal symptoms, and I was having really menopausal symptoms. So, with my physician and I discussing it, I felt like the benefits to me outweighed the risk. And I did not have a history of things such as cardiovascular disease, or depression, or cancer. And so, I was comfortable with saying, for me, the benefits outweigh the risk. And I think many studies will show that depending on a person's risk benefit ratio, and so I don't think it's a bad thing. I think it's the kind of thing though, that a person considering taking it has to really discuss with their physician their own personal risks and benefits. Because somebody that has breast cancer might be taking a different track than I took, you know, not having a risk for breast cancer.

**AA:** Dr. Flaws is passionate about bringing attention to how environmental exposures may be affecting women’s reproductive health. And she says sometimes it’s hard. These aren’t always topics that people are comfortable talking about. In some cultures, it’s taboo to talk about menstruation or menopause.

**JF:** And I think because of that people don't think about it as much as we should think about it, and research it as much as we should to really try to understand and improve these things. Because, you know, the older I got, and started going through menopause and talking to my friends about it, they were like, ‘Oh, you're having that too? So am I.’ And, and when they would go to the doctor or something, a lot of times it's just not anything that they're counseled about or talked about in a clinical fashion. I mean, many, many medical schools for example, don't really even train about menopause or talk about treating menopausal women.

**AA:** Dr. Flaws is working to change that. She leads two programs at the University of Illinois, which are funded by the NIEHS, designed to train the next generation of researchers, physicians, and leaders to

better engage in conversations about women's bodies and how the environment may be affecting them – and to inspire more research and policy that will help keep people safe.

**JF:** And I think that's really important because we need the next generation to be conducting experiments, whether they be epidemiological studies or basic science experiments, so that we could really understand the harm that chemicals are doing to our bodies and come up with creative ways to prevent or protect us from that. We also need some people trained in the field that can go into the government and become regulators and help protect the health from a population basis or go into companies where they're making safer products. We also need people going into academia so that we can continue training people in this field and continue advancing knowledge and trying to find ways to improve health of the population.

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**AA:** I'm Ashley Ahearn. Thanks for listening to Environmental Health Chat.