

## Reduce fetal exposure to BPA and phthalates, experts say

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With **Health Canada** recently banning plastic baby bottles made from bisphenol A and proposing to ban certain toys, questions arise about whether similar actions should be taken to safeguard pregnant women

Citing possible risks to young children, Health Canada recently banned plastic baby bottles made from bisphenol A and is proposing to ban toys containing six types of phthalates, best known as the rubber duck chemical.

Singling out babies and toddlers for special protection against harmful chemicals is a good idea because infants, with their rapidly growing bodies and unique exposure patterns, can be more vulnerable to dangerous chemicals than are most adults.

But a question has arisen about Health Canada's actions: If young children shouldn't come into contact with the two chemicals, what about pregnant women and their fetuses, which are even more susceptible to harmful compounds, especially those with hormonal impacts, like these man-made substances?

Bisphenol A is an estrogen mimic, meaning exposure gives an extra hit of the female hormone, while phthalates interfere with testosterone production, reducing levels of the crucial male hormone.

During fetal development, in particular, humans are extremely sensitive to sex hormones. Everything from genital development to brain organization is choreographed by specific levels of these hormones circulating in the womb at precise points in the pregnancy. If levels are skewed by synthetic chemicals, there is the risk of irreversible, life-long changes occurring.

“Pregnant women and the fetus are in fact the greatest target group for all of these chemicals,” says Frederick vom Saal, a professor at the University of Missouri and one of the leading researchers in the U.S. investigating bisphenol A, or BPA as it is also known.

Health Canada needs “to now take the next logical step” and consider wider restrictions on the chemicals to reduce exposures in pregnant women, contends Dr. vom Saal. The agency shouldn't assume “that by just targeting protections for newborns they've done enough.”

Although Health Canada took action against the two chemicals to protect children, the most provocative research on both compounds has been done on pregnant rodents and on their pups during early neonatal life, the period that corresponds to the last part of gestation in humans. Because conducting experiments on pregnant women would be unethical, these animal laboratory tests are designed to flag possible harmful effects on people.

Such experiments have found dramatic results, including enlarged prostates, skewed mammary ducts that in women would translate into increased breast cancer risk, and the feminization of male genitals.

Safeguards for pregnant women are needed, agrees another top researcher in the field, Shanna Swan, director of the Center for Reproductive Epidemiology at the University of Rochester's school of medicine, and an authority on phthalates. While children are sensitive to the chemicals, they're "not as sensitive as the fetus. There is no question about that," says Dr. Swan.

Dr. Swan has published a study finding that women who have higher levels of phthalates during pregnancy give birth to boys with a slightly shorter distance from the start of their genitals to the anus, mirroring a discovery made in male rodents exposed to the chemical. In rodents, the shrinkage is viewed as feminizing the male genital tract, but the effect occurred at far higher doses than what is found in people exposed to the chemicals.

Nonetheless, because there is animal evidence of harm during gestation, Dr. Swan says "we should assume until proven otherwise that it's reproductively toxic to humans."

Health Canada said it is monitoring research on the chemicals, but it believes the weight of evidence does not yet warrant measures to reduce exposures by pregnant women.

"Health Canada will take appropriate action if a risk to human health is identified," it said in an e-mailed response to questions.

But the federal agency has begun several studies on pregnant women and their babies to see whether the animal research is onto something, and has ordered up research to see if the genitals of newborns have been affected by their mothers' exposure to the two chemicals.

Last month, for instance, it posted a notice indicating that it has asked a McMaster University researcher to study pregnant women to find out whether BPA affects the anogenital distance in their babies. It has a similar study on phthalates to try to duplicate Dr. Swan's findings.

In human babies, as in rodent pups, males typically have a larger distance from the anus to the genitals than females, and it is likely that anything reducing the sex difference would be hormonal in nature.

The chemical industry said it welcomes the research and predicted its products will get a clean bill of health. "We are confident that the levels of bisphenol A that will be found will be extremely low and we think it's unlikely that any health effects will be observed," said Steven Hentges, spokesman for the American Chemistry Council.

The council also represents phthalate makers and has argued that the research showing effects on the genitals of boys is flawed.

It's been relatively easy for Health Canada to introduce measures restricting infant exposure to phthalates and BPA by ordering them out of just a few products such as plastic baby bottles and

toys. If it decides pregnant women need protection, it faces a much harder task because products containing the substances are ubiquitous.

“The ability of governments to actually tackle adult exposures is going to be extremely challenging,” Dr. vom Saal predicted.

Pregnant women wanting to reduce their exposure while the government researches the issue may have difficulty because many plastic products don't disclose what they're made from, although some polycarbonates containing BPA carry the plastic industry's symbol of a triangle encasing the number seven, while polyvinyl chloride, which often contain phthalates, sometimes carries a triangle encasing the number three.

As well, there isn't a full understanding of how humans are being exposed to the chemicals, but residues in food from packaging and processing equipment are suspected. Some researchers believe other sources might be important, such as breathing dust containing the chemicals or absorbing them through the skin, as people would do for compounds in cosmetics.

The uterus doesn't offer protection against the compounds, which have been detected in the placenta, amniotic fluid and umbilical cord blood, indicating that maternal exposure leads to fetal exposure.

The amounts of exposure in people are low, but according to some experts, they are still worrisome. Blood concentrations of bisphenol A are typically a couple of parts per billion, while phthalates measured in urine can be thousands of parts per billion. One part per billion is a tiny amount, the equivalent of one second of elapsed time over nearly 32 years.

But Dr. vom Saal cautioned that these concentrations are far higher than the natural amounts of estrogen in people, which are in the parts per trillion, and testosterone, in the parts per billion. He says that because people's hormone systems are already operating at their natural levels, any alterations caused by phthalates and BPA should be a source of concern.

### **Health Canada studying effect of chemicals on infant genitals**

Health Canada has quietly been studying a delicate topic: Whether or not the genitals of Canadian babies are being altered by their moms' exposure to bisphenol A or phthalates during pregnancy.

The research will measure the distance between the start of a baby's genitals and its anus, a space that on average is larger in boys than in girls. If the space is getting smaller, it means boys are being born less manly, and likely to have smaller penises and testicles.

The phthalate study is under way and will take up to five years to complete, while the bisphenol A research is just starting.

Phthalates, which are able to reduce levels of the male hormone, testosterone, are found in everything from polyvinyl chloride shower curtains to floor tiles, where they're used to make

plastics less brittle. They're also added to cosmetics and perfumes to make the fragrance last longer.

Bisphenol A, an estrogen mimic, is the main ingredient in polycarbonate plastic products, including office water-cooler jugs, lenses for eyeglasses and the protective coatings on compact discs. It's also in the epoxy liners found on the inside of most food and beverage cans, and in some carbonless paper register receipts.

All BPA is made by humans and isn't found in nature, although there are some microbial sources of phthalates.

Scientists have known for years that dosing pregnant rodents with phthalates feminizes their male offspring, giving them female-like areolas and nipples, and smaller genital tracts. The amounts used to prompt the effects are far above what people are exposed to, but recently, researchers in the U.S. believe that they have detected slightly smaller genitals in boys born to mothers with higher-than-average phthalate exposure during pregnancy.

Bisphenol A has raised health concerns too, with tests in experimental animals leading to such conditions as early puberty, genital malformations and increased prostate growth, often at low doses given during fetal development.

The federal government is also testing several thousand Canadians for their BPA and phthalate levels, but the results are not yet available. Bio-monitoring in the U.S. has found that nearly everyone carries detectible amounts of the two chemicals. One survey conducted between 2003 and 2004 found about 93 per cent of Americans have bisphenol A in their bodies, and researchers looking for phthalates have found a similar percentage.