

BPA exposure affects heart health of males and females differently in mouse models

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Credit: Martha Sexton/public domain

Heart function and blood pressure in mice exposed to bisphenol A (BPA) from birth through young adulthood are affected differently in males and females, with females at greater risk of damage from stress, a study from a University of Cincinnati (UC) researcher has found.

The findings will be published online Jan. 16, 2015, in the journal *Endocrinology*.

A research team led by Scott Belcher, PhD, professor of pharmacology and cell biophysics, Robin Gear, principal research assistant, and Eric Kendig, PhD, former UC postdoctoral fellow, found that in young BPA exposed female mice, the heart is more sensitive to stress-induced ischemic damage in a way not observed in untreated female mice.

In BPA-exposed female mice, isoproterenol, a drug that leads to hypertrophy (tissue enlargement) by mimicking some effects of a heart attack, caused increased heart muscle damage along with accumulation of collagen - an indicator of fibrosis or scarring - in the heart, says Belcher, the study's principal investigator. In male mice BPA alone increased fibrosis, however researchers did not observe an additional increase in fibrosis, ischemic damage, or hypertrophy in response to isoproterenol treatments.

BPA, an environmental pollutant with estrogen-like activity, is used to make polycarbonate plastic and epoxy resins and is a common contaminant of many packaged foods and beverages. Numerous studies have linked BPA to neurological defects, diabetes and breast and prostate cancer.

"The results of this study find heart and blood pressure effects in male and female mice, with females seemingly at greater risk for harm," says Belcher. "We used an isoproterenol model that in some ways mimics damage that can occur during a heart attack. For female mice exposed to BPA there was a severe increase in the sensitivity to cardiotoxic damage. This effect was especially striking because females are typically protected."

"The overall aim of the study was to determine whether there were

effects of BPA on cardiac function," says Belcher. "We chose a very specific and broad range of BPA exposures that span levels below those considered safe in humans up through a high dose that nears the no observed adverse effect level, an approach aimed at make the findings useful for assessing public health risk."

In this study mice were exposed to different doses of BPA in their food and BPA exposures ranged from four to 5,000 micrograms per kilogram of body weight per day. "Our highest exposure was just below the no observed adverse effect level while the lowest exposure group was below what is considered a safe level and approaches the levels of human exposure," explains Belcher.

"What we did in our studies was to expose mice to BPA in a way similar to how humans are exposed," says Belcher. "Humans are continuously exposed to BPA throughout life. The exposure in mice was in the diet and from conception all the way through adulthood."

Changes in the control of heart rate and blood pressure were detected in both male and female BPA-exposed mice according to the study. Decreased systolic [blood pressure](#) was detected in male mice exposed to BPA throughout their lifespan, while a lowering of pressure was noted only in [female mice](#) exposed to the very highest amounts of BPA.

Belcher cautions that the study uses animal models and that there are differences between mice and humans. That said, the findings from experimental models are informative and instructive about human heart health, and serve as well-established experimental models for the effects of endocrine disrupting chemicals, explains Belcher.

"The reality is everything from what we have seen from this study and a number of previous studies suggests that BPA likely worsens [heart](#) health in women, who have unique risks compared to men," says Belcher.

Provided by University of Cincinnati Academic Health Center

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