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Common BPA-like chemical, BPS, disrupts heart rhythms in females

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Bisphenol S (BPS), a common substitute for bisphenol A (BPA) in consumer products, may have similar toxic effects on the heart as previously reported for BPA, a new study finds. The results were presented Monday at the joint meeting of the International Society of Endocrinology and the Endocrine Society: ICE/ENDO 2014 in Chicago.

In the years since research evidence first showed many potentially damaging health effects of the industrial chemical BPA, some manufacturers have switched to its chemical cousin, BPS, to make hard plastics and other products that they call BPA free, said the study's lead investigator, Hong-Sheng Wang, PhD, from the University of Cincinnati.

Although some BPA-free products contain no bisphenols, Wang said, "BPS is one of the substitutes used in BPA-free products. There is implied safety in BPA-free products. The thing is, the BPA analogs—and BPS is one of them—have not been tested for safety in humans."

BPA is an endocrine (hormone) disrupter that can interfere with the actions of native estrogen and other hormones, but it is not clear whether BPS also is disrupts hormones.

In what Wang called "one of the first assessments of BPS' effect in mammalian primary cells or organs," he and his co-workers tested an environmentally relevant dose of BPS in the hearts of approximately 50 rats. The 1-nanomolar dose was in the range of BPS found in human

urine samples in a study by other authors.

In the current study, the investigators perfused, or flowed, BPS through the arteries of each animal's pumping heart, after stimulating the heart with the hormone catecholamine to mimic stress. For a control group, 30 rat hearts received only catecholamine and no BPS.

Exposure to BPS rapidly increased the heart rate of female rats and under the stress condition led to arrhythmias—heart rhythm abnormalities—far greater than in the control rats that did not receive BPS, Wang reported. Electocardiograms demonstrated that BPS caused extra heartbeats and a racing heartbeat, also known as ventricular tachycardia. In male rats, BPS reportedly did not have this rapid impact on the heart.

To determine the cause of the cardiac effects in female rats, the researchers studied cardiac muscle cells from some of the rats. Using studies at the cellular and protein levels, they found that BPS caused abnormal calcium handling, or cycling, which is a key cause of arrhythmias, according to Wang. This action is very similar to the underlying mechanism of BPA's toxic effects on the heart, which Wang and his colleagues showed in a previous study.

The investigators were able to abolish the BPS-induced heart rhythm abnormalities by blocking a type of estrogen receptor (beta) in the female rats. This result shows that "the BPA analog BPS is not necessarily free of endocrine-disrupting activity," Wang said.

"Our findings call into question the safety of BPA-free products containing BPS," he said. "BPS and other BPA analogs need to be evaluated before further use by humans."

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