Research shows 'BPA-free' bottles live up to manufacturers' claims

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The alarm caused by bisphenol A (BPA) presence in reusable plastic bottles resulted in a recent industry change, producing products made with supposed BPA-free materials.

Prompted by requests and concern from consumers, University of Cincinnati (UC) researchers wanted to see if these alternatives--including products made with stainless steel and coated aluminum--were truly giving the consumer an option free of BPA.

In a study reported in the July 8, 2011 advance online edition of the journal Chemosphere, Scott Belcher, PhD, associate professor in the pharmacology and cell biophysics department, and colleagues found that stainless steel- and/or co-polyester lined-aluminum bottles did not release BPA; however, aluminum bottles lined with epoxy-based resins still resulted in BPA contamination of liquids.

"BPA is an ever-present, high-volume industrial chemical that is an estrogen and an environmental endocrine disrupting chemical," explains Belcher, adding that it has been shown in experimental models to negatively impact the heart and reproductive system and enhance the growth of certain tumors.

"It is used extensively in the production of consumer goods, polycarbonate plastics, in epoxy resins that are used to coat metallic food and beverage cans and in other products," he continues. "There is great concern regarding the possible harmful effects from exposures that

result from BPA leaching into foods and beverages from packaging or storage containers.

"The objective of this study was to independently assess whether BPA contamination of water was occurring from different types of reusable drinking bottles marketed as alternatives to BPA-containing polycarbonate plastics."

Belcher says that all reusable bottles used in the study were obtained from retail sources and were constructed from polycarbonate, co-polyester, stainless steel, aluminum with co-polyester lining or aluminum with epoxy resin lining.

The bottles, divided into test groups based on their material or lining, and collection vials were washed and rinsed using a standardized protocol to ensure that they were free of non-experimental contaminants. The interior of each bottle was scrubbed with a soft nylon bristle brush for approximately 30 seconds with a cleaner.

Belcher says bottles were then rinsed six times with BPA-free water, two of those times with high-performance liquid chromatography (HPLT)-grade water used to identify, quantify and purify the individual components of the water, and then air dried.

"Briefly, 100 milliliters of HPLC-grade water was added to each bottle on the first day and was kept in the bottle for five days at room temperature," he says.

Three replicate experiments were performed for each bottle. The water was then rotated using a cell culture roller bottle system to ensure even contact of the water and the bottles' surface.

The effect of hot water on BPA leaching from the epoxy resin-lined

bottles was measured by the addition of 100 milliliters of HPLC-grade water heated to 100 degrees on the first day.

Following the transfer of boiling water, the bottles were kept at room temperature with rotation for 24 hours during which water samples cooled to room temperature.

"Results once again showed that, at room temperature, detectable concentrations of BPA migrated from polycarbonate bottles. This confirmed our lab's previous study," says Belcher. "However, under the same conditions, BPA migration from aluminum bottles lined with epoxy-based resins was variable depending on the manufacturer. The discount store branded bottles tested released much more BPA."

He says boiling water significantly increased BPA migration from the epoxy-lined bottles. No detectable contamination was observed in water stored in bottles made from co-polyester plastic, uncoated stainless steel or aluminum lined with EcoCare™.

"The results from this study show that when used according to manufacturers' recommendations, reusable water bottles constructed from 'BPA-free' alternative materials are suitable for consumption of beverages without the fear of BPA contamination," Belcher says. "BPA does, however, migrate into water stored in polycarbonate plastic and metal bottles coated with epoxy-resins, especially when heated to high temperatures.

"Consumers should not think that just because a bottle isn't polycarbonate plastic that it is safe from the dangers of BPA, but while there are no standards for claims of 'BPA-free,' it appears that 'BPA-free' labels used to market co-polyester-based water bottle alternatives actually reflect a lack of BPA contamination in liquids stored in those containers," he continues.

"While consumers have been skeptical of manufacturers' claims, these studies confirm that these specific products do offer a BPA-free alternative to polycarbonate or epoxy lined bottles and that companies have responded to their consumers' desires for BPA-free products."

Provided by University of Cincinnati