

# **Association of Urinary Bisphenol A Concentration With Medical Disorders and Laboratory Abnormalities in Adults**

**Journal of the American Medical Association**

**Vol. 300 No. 11, September 17, 2008, pp. 1303-1310**

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## **FROM ABSTRACT**

Bisphenol A (BPA) is widely used in epoxy resins lining food and beverage containers. Evidence of effects in animals has generated concern over low-level chronic exposures in humans.

### **Objective**

To examine associations between urinary BPA concentrations and adult health status.

### **Design, Setting, and Participants**

Cross-sectional analysis of BPA concentrations and health status in the general adult population of the United States, using data from the National Health and Nutrition Examination Survey 2003-2004. Participants were 1455 adults aged 18 through 74 years with measured urinary BPA and urine creatinine concentrations.

### **Results**

Higher urinary BPA concentrations were associated with cardiovascular diagnoses in age-, sex-, and fully adjusted models [39% increased risk].

Higher BPA concentrations were also associated with diabetes [39% increased risk].

Higher BPA concentrations were associated with clinically abnormal concentrations of the liver enzymes.

### **Conclusion**

Higher BPA exposure, reflected in higher urinary concentrations of BPA, may be associated with avoidable morbidity in the community-dwelling adult population.

## **THESE AUTHORS ALSO NOTE:**

"Bisphenol A (BPA) is one of the world's highest production-volume chemicals, with more than 2 million metric tons produced worldwide in 2003 and annual increase in demand of 6% to 10% annually."

Bisphenol A is used extensively in epoxy resins lining food and beverage containers and in plastics of many consumer products.

“Widespread and continuous exposure to BPA, primarily through food but also through drinking water, dental sealants, dermal exposure, and inhalation of household dusts, is evident from the presence of detectable levels of BPA in more than 90% of the US population.”

Studies have noted that BPA has well-documented estrogenic activity, causes liver damage, disrupts pancreatic function, disrupts thyroid hormones, and has obesity-promoting effects.

## RESULTS

“Weighted mean BPA concentrations adjusted for age and sex appeared higher in those who reported diagnoses of cardiovascular diseases (including coronary heart disease, heart attack, and angina) and diabetes.”

Participants in the highest BPA concentration quartile had an increased risk for cardiovascular disease by 189% compared with those in the lowest quartile.

Those in the highest BPA concentration quartile had an increased risk for diabetes by 143% compared with those in the lowest quartile.

## COMMENT FROM AUTHORS

“In this study we aimed to assess whether increased urinary BPA concentrations were associated with adverse health effects in the general US adult population. This analysis made use of the first large-scale and high-quality population-representative data set to become available. After adjusting for potential confounders, we found that higher BPA concentrations were associated with diagnoses of cardiovascular disease and diabetes. We also found associations between higher BPA concentrations and clinically abnormal concentrations of the 3 liver enzymes examined, namely GGT, alkaline phosphatase, and lactate dehydrogenase.”

The general US population is likely to exceed the 50-µg/kg per day dose, which is currently recommended by the US Environmental Protection Agency, and that “exposure is most likely through continuous, multiroute exposure, principally diet, but also through transdermal exposure and inhalation of airborne dust.”

A 2003 study suggests that “canned beverages constitute a major dietary source” for BPA.

Human health effects are most likely associated with long-term, low-dose exposure to BPA.

Bisphenol A has shown to have the following effects:

- 1) Binding to the estrogen and estrogen-related receptors.
- 2) Induced oxidative stress in liver cells.
- 3) Disrupted pancreatic beta cell function, "which produces insulin resistance in mice exposed to oral BPA doses well below the lowest observed adverse effect level currently considered by the Environmental Protection Agency."

"Exposure to some environmental pollutants may initiate or exacerbate the development of obesity and associated health problems."

## CONCLUSIONS

"Using data representative of the adult US population, we found that higher urinary concentrations of BPA were associated with an increased prevalence of cardiovascular disease, diabetes, and liver-enzyme abnormalities."

## KEY POINTS FROM DAN MURPHY

- 1) "Bisphenol A (BPA) is one of the world's highest production-volume chemicals, with more than 2 million metric tons produced worldwide in 2003 and annual increase in demand of 6% to 10% annually."
- 2) Bisphenol A is used extensively in epoxy resins lining food and beverage containers and in plastics in many consumer products.
- 3) "Widespread and continuous exposure to BPA, primarily through food but also through drinking water, dental sealants, dermal exposure, and inhalation of household dusts, is evident from the presence of detectable levels of BPA in more than 90% of the US population."
- 4) Studies have noted that BPA has well-documented estrogenic activity, causes liver damage, disrupts pancreatic function, disrupts thyroid hormones, and has obesity-promoting effects.
- 5) "Weighted mean BPA concentrations adjusted for age and sex appeared higher in those who reported diagnoses of cardiovascular diseases (including coronary heart disease, heart attack, and angina) and diabetes."
- 6) Participants in the highest BPA concentration quartile had an increased risk for cardiovascular disease by 189% compared with those in the lowest quartile.
- 7) Those in the highest BPA concentration quartile had an increased risk for diabetes by 143% compared with those in the lowest quartile.

- 8) These authors found that higher BPA concentrations were associated with diagnoses of cardiovascular disease, diabetes, and clinically abnormal concentrations of the 3 liver enzymes (GGT, alkaline phosphatase, and lactate dehydrogenase).
- 9) Human BPA exposure is through "continuous, multiroute exposure, principally diet, but also through transdermal exposure and inhalation of airborne dust."
- 10) Canned beverages constitute a major dietary source for BPA.
- 11) Human health effects are most likely associated with long-term, low-dose exposure to BPA.
- 12) "Using data representative of the adult US population, we found that higher urinary concentrations of BPA were associated with an increased prevalence of cardiovascular disease, diabetes, and liver-enzyme abnormalities."