Introduction

Chemical agents have been used for decades to enhance safety, contribute to healthy, modern lifestyles, and increase the human lifespan. However, these exogenous compounds have been scrutinized for their unintended health effects. Data from the National Health and Nutrition Examination Survey (NHANES), collected by the Centers for Disease Control and Prevention, have shown widespread exposure to Bisphenol A (BPA) (i.e., ingredient used in some plastics), Bisphenol-A-3 (BP-3) (i.e., major ingredient in sunscreen), and triclosan (TCS) (e.g., an antimicrobial) within the US general population (Tyrell et al.; 2013; Zamolik et al., 2015). Because of the existing concerns surrounding the evidenced and associated health effects of these known endocrine disruptors and the limited information surrounding exposure health implications on the human prostate gland, this study evaluated the topic of concern in US males above the age of 40, by use of the publicly available NHANES data.

OBJECTIVES

Evaluate the associated effects of BP-3, BPA, and TCS on the reproductive indicators of prostate health in American men ages 40 and above.

Methods

NHANES data 2005-2010 & 2011-2012 (total testosterone only) was collected for the purposes of this study. The analytical method conducted for all variables of interest is provided in the table on the right. To conduct these analyses, SAS 9.4 Survey procedures were employed to properly analyze the complex weights of these probability survey sample data. Exposures to BPA, BP-3, and TCS were measured in terms of urinary output and associated with serum markers of prostate health. Exposures were recoded as categorical quartiles (Q1–highest exposure). These variables include total prostate specific antigen (PSA), creatinine, and total testosterone.

Results

The results provided here are those that were significantly associated with the serum outcome of interest. The nationwide distribution is provided at the top of this section, providing geometric means (standard error [SE]) for the variables of interest. Table 1 shows total PSA levels distributed in this study sample. Overall, total PSA increased with age. When compared between racial and ethnic backgrounds, the highest was in African American men and lowest in those who classified as "Other." Additionally, total PSA saw decreasing levels with higher levels of education. Finally, with regard to marital status, widowed men saw significantly higher levels, indicating poorer health. This was a pattern seen for the other serum variables of interest, as well (i.e., marker levels projecting towards that of poorer health: most total PSA and creatinine, in addition to the lower levels of TT (not shown here)).

Table 2 and 3 provides the regressions for BPA and BP-3 with TT and BPA with creatinine, respectively. BPA and BP-3 positively associated with TT. Only BP-3 was globally associated with TT, specifically with exposures noted ≥44.876 ng/mL of urinary BP-3. Table 3 shows a non-global association between BPA and creatinine. The result provides a significantly positive percent change as compared to the first quartile.

Conclusions

To date, this is the first known study to investigate the associations of environmental phenols within the context of older men’s health, particularly regarding the prostate gland. Exposure to BP-3 was the only agent to produce global significant effects on one of the variables of interest, TT. In this cross-sectional study, a significant direct association between BP-3 and serum TT was presented in men ≥40 years of age that were participants of the 2011-2012 NHANES cycle. These findings provide that BP-3 may have androgenic effects on older men. However, given the cross-sectional nature of this study, further studies will be needed to validate these findings.

"The old construct was that 'prostate cancer was fire and testosterone was gasoline,'" said Dr. Köhler. 'But a better analogy is that prostate cancer is a tree and testosterone is water,' he said. 'You need a certain amount of testosterone for prostate cancer to develop, but if you keep piling on more and more testosterone [water], the tree doesn’t develop into a sequoia.' This is known as the 'saturation model,'" he explained.


Reference


Contact Information

Monica K. Zdanukiewicz, Milken Institute of Public Health, The George Washington University, zdanukiewicz@gwmail.gwu.edu, (586) 854-4066.