Parabens Promote Pro-Tumorigenic Effects in Luminal Breast Cancer Cell Lines with Diverse Genetic Ancestry

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In the United States, Black women are 39% more likely to die from breast cancer compared to White women (AACR Cancer Disparities Progress Report 2020). Furthermore, Black women are at a higher risk of developing breast cancer under the age of 40 than any other racial or ethnic group. While the underlying cause of these disparities is multifactorial, exposure to endocrine disrupting chemicals (EDCs) in hair and personal care products has been associated with increased risk of breast cancer. Parabens are known EDCs that are commonly used as preservatives in hair and other personal care products. The Environmental Working Group scores methylparaben (MP), propylparaben (PP), and butylparaben (BP) moderate (MP) to high (BP and PP) on a hazardous scale of chemicals found in personal care products. Furthermore, these parabens are restricted in personal care products with set maximum concentration standards in Japan, the European Union, and Southeast Asia. Studies have shown that parabens impact breast cancer cell proliferation, death, migration/invasion, and metabolism, as well as gene expression in vitro. However, these studies were conducted using cell lines of European ancestry; to date, no studies have utilized breast cancer cell lines of West African ancestry to examine effects of parabens. We hypothesize that, like what has been shown for breast cancer cell lines with European ancestry, parabens will promote pro-tumorigenic effects in breast cancer cell lines with West African ancestry. To test this hypothesis, we treated MCF-7 (European ancestry) and HCC1500 (West African ancestry) luminal breast cancer cell lines with biologically relevant doses of either MP, PP, or BP. We also co-treated with the estrogen receptor (ER) antagonist ICI 182,780 to determine whether observed effects are mediated by ER. We found BP increases HCC1500 cell viability, but not MCF-7 cell viability. This effect was not blocked by co-treatment with ICI 182,780. We also observed that BP and PP, but not MP, increased expression of estrogen-regulated genes in both MCF-7 and HCC1500. The increase in gene expression was reduced with co-treatment of ICI 182,780 in both cell lines, suggesting that these effects are ER-mediated. Preliminary studies suggest that parabens promote migration of both cell lines, with a potentially greater effect on HCC1500 cells. Taken together, these data demonstrate that parabens, particularly BP and PP, promote pro-tumorigenic effects in diverse luminal breast cancer cell lines. These findings have future translational relevance as we are part of a community-led initiative called Bench to Community. Bench to Community brings together basic researchers in endocrinology and social-behavioral scientists, community stakeholders including breast cancer survivors to develop interventions to reduce adverse exposures to EDCs in hair and other personal care products in Black women.

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