Chemical Relaxers and Hair-Straightening Products: Potential Targets for Hormone-Related Cancer Prevention and Control

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Chemical Relaxers and Hair Straightening Products: Potential Targets for Hormone-Related Cancer Prevention and Control

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Emerging data show that use of permanent hair dyes and chemical relaxers and straightening products might contribute to increased risk of hormone-related cancers\textsuperscript{1-5} and potentially breast tumors with features indicative of more aggressive phenotypes.\textsuperscript{6} Given the wide use of these products globally, they are an important source of exposure to potentially harmful chemicals, including endocrine disrupting chemicals (EDCs) — to which we are ubiquitously exposed\textsuperscript{7} — and mutagenic and/or genotoxic compounds. The unequal burden of exposure across populations plausibly contributes to cancer inequities as the groups with the greatest exposure also experience poorer cancer outcomes.\textsuperscript{8} For example, Black women use more hair and menstrual/intimate products, while Latina and Hispanic women use more makeup and cosmetics, compared to other race and ethnicity groups,\textsuperscript{9,10} thereby increasing their exposures to hormonally active chemicals. Likewise, Black women are disproportionately diagnosed with aggressive breast tumors (e.g., triple-negative, inflammatory), aggressive ovarian tumors (e.g., high-grade serous carcinoma), and aggressive types of uterine and endometrial cancers (e.g., non-endometrioid carcinoma), and to have lower 5-year survival rates and higher mortality rates for these cancers relative to White women.\textsuperscript{11}

Few studies have examined associations of chemical relaxer and hair straightening product use with cancer risk, with most studies focusing on the association with breast cancer. While an early analysis from the Black Women’s Health Study indicated no association between use of relaxers and breast cancer incidence,\textsuperscript{12} recent data suggests that heavy use relative to non-use or light use may increase risk.\textsuperscript{13} Similarly, while findings from the Women’s Circle of Health Study (WCHS) indicated no association for ever vs. never use of relaxers and breast cancer overall or for Black women, increased risk was observed among White women who reported regular use.\textsuperscript{1} A subsequent analysis from the WCHS suggested that using relaxers for more than 10 years, use before age 12, and history of having relaxers applied both in professional settings (i.e., salon application) and non-professional settings (i.e., do-it-yourself, at home application) were associated with increased risk of higher grade and larger sized breast tumors.\textsuperscript{6} Findings from the Ghana Breast Health Study support the association between relaxer use and increased risk of breast cancer, with greater risk among former than current users.\textsuperscript{2} Analyses from the Sister Study suggest use of relaxers is associated with increased risk of both breast cancer\textsuperscript{3,4} and ovarian cancer.\textsuperscript{5}

In this issue of \textit{JNCI}, Chang and colleagues\textsuperscript{14} examined associations of recent personal use of five types of hair dye products (permanent, semi-permanent, and temporary dyes, and bleach and highlights) and two types of products used to alter the hair’s natural texture (chemical relaxers/straighteners or pressing products and permanent texturizers/body wave products) with risk of endometrial cancer, uterine sarcoma, or other types of uterine cancer in the Sister Study. In this prospective cohort of mostly White women without breast cancer who had at least one sister diagnosed with the disease,\textsuperscript{14} participants completed a questionnaire at baseline that included an assessment of hair product use and frequency of use within the prior 12 months. After an average follow-up of 10.9 years, 378 incident cases of uterine cancer were identified. These included 262 clinically confirmed cases, of which, 242 (94.7\%) were classified as endometrial cancer (based on International Classification of Disease (ICD)-10 codes) and further defined by histology as either Type I (more hormone-sensitive, better prognosis) or Type II (more aggressive, poorer prognosis) endometrial cancer. Using multivariable-adjusted Cox proportional hazards models with age as the time scale, the investigators observed an 80\% higher risk of uterine cancer among users of hair straightening products, with the risk more than double among frequent users (those reporting use more than 4 times in the prior year).\textsuperscript{14} These findings were consistent for Type I endometrial cancers; however, associations for Type II cases were unreliable due to small sample sizes.
Although the authors acknowledge that adverse effects associated with the use of chemical relaxers is likely more appreciable in Black women due to a higher prevalence of use, initiation at younger ages, and more toxic formulations, the current analysis included an insufficient sample of Black participants – 29 (7.7%) of incident uterine cancers and 2,523 (7.4%) of eligible cohort members – to determine associations in this group. Nonetheless, these data represent the first epidemiologic evidence of an association between use of these products and increased risk of uterine cancer. The investigators confirmed the robustness of their findings through a series of sensitivity analyses, including restricting the analysis to cases among postmenopausal women, cases that were clinically confirmed uterine cancer, and cases classified as endometrial cancer. Interestingly, while the risk of uterine cancer associated with ever and frequent use of chemical relaxers did not differ by race or ethnicity or by body mass index (BMI), risk estimates differed by physical activity status. The estimates associated with both ever use and more frequent use were higher among participants in the lower tertile of physical activity (less than 32.7 MET-hours/week) compared to those reporting activity above that level. Further investigation to determine the underlying mechanisms are warranted, especially given the lack of heterogeneity by BMI. Another point to consider, which was not explored in the current analysis, is whether heterogeneity exists by measures of central adiposity (e.g., waist circumference, hip circumference, waist-to-hip ratio), which may have an impact on uterine cancer risk beyond overall body fatness estimated using BMI.

The preponderance of evidence supporting a positive association of personal care product (PCP) use, especially relaxers (and hair dyes), with breast cancer specifically and hormonally driven cancers generally, suggests that it is time to intervene – despite limitations in cancer epidemiology research (e.g., small sample sizes, racial and ethnic heterogeneity, long latency period). The National Cancer Institute has invested in the rigorous review of existing evidence-based cancer control programs (EBCCPs) to reduce cancer burden and has an online repository of these programs. However, no EBCCPs explicitly targeting toxic chemical environmental exposures are listed. As such, the time to build up this evidence base is now. One example of such a program, The Hermosa Study, showed that reduced personal exposure to phthalates, parabens, and triclosan chemicals among adolescents is possible through behavioral changes in PCP use. For chemical hair straighteners specifically, mounting evidence support the prevalence of toxins, carcinogenic effects, chronic and early life exposure, and inequity in exposure, warranting the prioritization of interventions as a means for cancer prevention and control. However our history, (i.e., the Food, Drug, and Cosmetic Act which has done little to enforce regulations on cosmetics, including PCPs since its enactment in 1938) and the present day (i.e., Supreme Court decision in West Virginia v. Environmental Protection Agency which ruled to restrict the Environmental Protection Agency’s ability to regulate greenhouse gasses, setting a precedent for other governmental agencies that are mandated to protect our nation’s health) make it clear we have a long way to go in terms of policy interventions to reduce harmful environmental exposures in our communities. Nonetheless, an emergence of funding opportunities focused on reducing environmental impacts (e.g., https://www.epa.gov/research-grants/safer-chemicals-research-grants, https://grants.nih.gov/grants/guide/notice-files/NOT-HL-20-788.html) – including opportunities specifically targeting EDCs (i.e., https://www.challenge.gov/ [HHS Endocrine-Disrupting Chemicals Innovator Award Competition]), new federal policy initiatives (e.g., Safer Beauty Bill package, https://www.bcpp.org/resource/safer-beauty-bill-package-press-briefing/), and grassroots advocacy (e.g., https://www.thecrownact.com/, https://www.safecosmetics.org/) to reduce exposures from toxic chemicals in PCPs are steps in the right direction.

In the United States (US), Black women experience greater uterine cancer mortality than White, Asian, or Hispanic women, irrespective of histologic subtype or stage at diagnosis, and significant annual increases have been observed among both Black and Hispanic women. There
is a pressing need to identify and mitigate deleterious risk factors for uterine cancer thereby reducing morbidity and mortality for thousands of women. We applaud Chang and colleagues\textsuperscript{14} for adding to the growing body of evidence that PCPs, specifically hair straightening products, are associated with hormone-related cancers in women. As PCP use may be associated with drivers of uterine cancer risk\textsuperscript{21} that differ by race (i.e., early age at menarche, increased body fatness, history of uterine fibroids), this literature points toward an opportunity to develop interventions to reduce women's cancer risk. Interventions focused on PCP use are likely needed across multiple levels to address racialized standards of beauty; a persistent lack of transparency about chemical constituents and formulations in PCPs; culturally acceptable, less toxic alternatives that meet users’ cosmetic needs; and other targets.\textsuperscript{22} We acknowledge that more research is needed, even as the epidemiologic evidence base has been limited by pervasive challenges. However, we invoke the precautionary principle to call for action even as uncertainties remain.\textsuperscript{23,24} Many women who use chemical relaxers and hair straighteners begin doing so during adolescence and young adulthood and use of these products is not limited to the US. This reality, coupled with global increases in uterine cancer incidence,\textsuperscript{25} suggests that policy change and evidence-based interventions to reduce exposure to potentially hazardous hair products and other PCPs could be impactful for cancer prevention and control and provide a multitude of benefits for population health.

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No data were generated in the preparation of this editorial.
REFERENCES


