Evidence Scan: Hair relaxers and cancer

Question

What is known about the association between hair relaxer use and negative health outcomes?

Answer

A few high-quality studies have demonstrated associations between hair relaxer use and ovarian and uterine cancers. However, research to date has produced inconsistent results due to small sample sizes, imprecise exposure data, and hair relaxer product changes over time. Even though definitive evidence is limited, there is enough high-quality evidence to suggest that concerns about links between hair relaxer use and cancer are warranted.

Background

- Black women bear a disproportionate burden of negative health outcomes, including poor cancer outcomes. Black women are also disproportionately exposed to chemical hair relaxers/straighteners (including at young ages), and cosmetic products used by black women are most likely to contain harmful hormones and chemicals.[1–4]
- Chemicals in hair relaxers are largely unregulated in the US. Europe restricts more than 1,300 chemicals in cosmetics, while the FDA restricts only nine.[5a]
- It is reasonable to hypothesize that hair relaxers would cause negative health outcomes because they are known to contain harmful chemicals including:
    - Endocrine disrupting chemicals including phthalates (used for fragrance) parabens (used for preservatives), and estrogens (used to promote hair growth).[6,7]
    - Formaldehyde (known carcinogen)[2,6]
    - Lye[6]
- Studies have shown that hair product use (relaxers/straighteners/perms, styling products, moisturizers, oils, and hair food) was associated with greater concentrations of endocrine-disrupting chemical biomarkers.[8]
- It is very difficult to study the relationship between hair relaxer use and negative health outcomes because it is difficult to capture accurate and complete exposure information.[1,9–12]
    - Researchers don't have access to detailed product information (formulations are considered proprietary and chemicals are often not listed on product labels), and products have changed over time.[13]
    - Americans are exposed to endocrine disrupting chemicals in many different ways including through cleaning products, drinking water, food, food packaging, and household items. Many other personal care products including permanent hair dye, hair creams/oils/sprays, perfumes, and cosmetics contain concerning chemicals. Research on the safety of these products has been mixed, and has the same challenges listed above.[1,6,7,9,11,14–16]

[a] The FDA has proposed a ban on straightening products containing formaldehyde, but there is no timeline for implementing this.[5] Some states are taking action to regulate the manufacture, distribution, and sale of cosmetics that contain certain toxic chemicals, including California and Washington.

Supporting evidence

This evidence snapshot is based on one systematic review,[9] one narrative review,[7] 21 primary studies,[2–4,6,8,10–25] and two other articles.[1,5] We also talked to Dr. Alexandria White, a Researcher on the Sister Study.

Hair relaxers and cancer

Most high-quality evidence to date regarding the relationship between hair relaxers (and hair products in general) and cancer comes from two prospective cohort studies[2,6,10,15,15,17,20] and a case-control study[12,22]. See Tables 1 – 3 for details about these studies and their findings. Some of the findings from these studies are contradictory, likely due to differences in products over time, difficulty capturing exposure information, and small sample sizes.

Table 1. Summary of evidence regarding the association between chemical hair relaxer use and breast cancer.

For each publication, we've included number of study participants (N) with exposure, N with the outcome [breast cancer], and N with both.

Black Women's Health Study, prospective cohort 59,000 black women 21-69 years old. Enrolled in 1995, queried about hair product use in 1997.	
Publication (exposure, outcome, both)	**Results**
Rosenberg 2007[17] (45912, 547, 400-521)	Hair relaxer use not associated with breast cancer incidence (looked at duration, frequency, age at first use, number of burns, lye vs. non-lye).
Coogan 2021[6] (45360, 2311, 2059)	Hair relaxer use not associated with breast cancer risk in general (even heavy use, HR=1.13[b] 95% CI: 0.96-1.33). HRs for certain breast cancers (estrogen receptor positive) were elevated for frequent users of lye formulations (highest HR for >=7 times per year use [HR=1.37 95% CI: 1.04-1.82])
Sister Study, prospective cohort 50,844 women 35-74 years old who had a sister with breast cancer. Enrolled 2003-2009 and queried about hair product use at enrollment.	
Publication (exposure, outcome, both)	**Results**
Eberle 2020[2] (4624, 2794, 251)	Relaxer use in the past year associated with breast cancer risk, but not statistically significant (HR = 1.18, 95% CI 0.99–1.41), higher risk was associated with frequent use (HR 1.31, 95% CI: 1.05-1.63).

[b] HR= hazard ratio. A hazard ratio compares the event probability over time between two groups (in this review, those who were exposed to hair relaxers vs. those who were not). A HR of 1 means both groups had the same number of events (e.g., cancer diagnosis) in a given period.

Sister Study, prospective cohort (cont.) 50,844 women 35-74 years old who had a sister with breast cancer. Enrolled 2003-2009 and queried about hair product use at enrollment.	
Publication (exposure, outcome, both)	**Results**
White 2021a[11] (4556, 3380, 293)	Frequent use of relaxers in adolescence (age 10-13) associated with higher risk of premenopausal breast cancer (HR=2.11, 95% CI 1.26–3.55) but not postmenopausal breast cancer (HR=0.99, 95% CI: 0.76–1.30).
Women's Circle of Health Study, case-control 4,285 women 20-75 years old. Enrolled 2001-2018 and queried about hair product use at enrollment.	
Publication (exposure, outcome, both)	**Results**
Llanos 2017[22] (2525, 2280, 1255)	History of relaxer use not associated with breast cancer for African American women (OR=0.99 95% CI: 0.79-1.26)
Rao 2022[12] (case-only) (n/a, 2998, 2011)	Duration of relaxer use (>10 years) and use of relaxers before age 12 associated with larger tumor size (1-2cm, OR=1.72, 95% CI: 1.04–2.87 and OR=1.65, 95% CI: 1.02–2.68, respectively). Regular relaxer use not statistically significantly related to tumor grade.

Table 2. Summary of evidence regarding the association between chemical hair relaxer use and ovarian cancer.

For each publication, we've included number of study participants (N) with exposure, N with the outcome [breast cancer], and N with both.

Sister Study, prospective cohort (cont.) 50,844 women 35-74 years old who had a sister with breast cancer. Enrolled 2003-2009 and queried about hair product use at enrollment.	
Publication (exposure, outcome, both)	**Results**
White 2021b[15] (3793, 241, 24)	Frequent use of relaxers or pressing products in the past year was associated with an increased risk of ovarian cancer HR = 2.19, 95% CI: 1.12-4.27).

Table 3. Summary of evidence regarding the association between chemical hair relaxer use and uterine cancer.

For each publication, we've included number of study participants (N) with exposure, N with the outcome [breast cancer], and N with both.

Black Women's Health Study, prospective cohort 59,000 black women 21-69 years old. Enrolled in 1995, queried about hair product use in 1997.	
Publication (exposure, outcome, both)	**Results**
Bertrand 2023[20] (40263, 347, 309)	Overall heavy relaxer use not associated with uterine cancer (HR=1.18 95% CI:0.81-1.71). Heavy use and long-term use (20+ years) associated with increased risk of uterine cancer for postmenopausal women (HR=1.64 95% CI: 1.01-2.64, HR=1.71 95% CI: 1.08-2.72, respectively), but not premenopausal women (HR=0.63 95% CI: 0.32-1.24, HR=0.74 95% CI: 0.38-1.47 respectively).
Chang 2022[10] (3036, 378, 38)	Hair relaxer use in the past year was associated with higher uterine cancer rates (HR = 1.80, 95% CI = 1.12-2.88), higher for frequent use (HR = 2.55, 95% CI = 1.46-4.45)

For more detail on these studies and their findings, see Table 1 in Farooq et al.'s systematic review.[9] In this publication, a sub-analysis of studies evaluating the use of hair relaxer and breast cancer[c] found evidence was insufficient to determine if an association exists (HR=1.13, 95% CI 0.85-1.40).

Hair relaxers and other outcomes

Some studies have linked hair relaxer use to other reproductive health ailments including:

- Increased risk of uterine fibroids[18]
- Lower fecundability[19]
- Early menarche[23,24]
- Premature or abnormal sexual development related to use of hormone-containing hair products[7]

We also found evidence hair relaxer use was associated with other negative outcomes that might be important to patients such as scalp burns[6] and hair damage or loss.[25]

[c] This sub-analysis included the studies in Table 1 of this document excluding Rosenberg 2007 and White 2021a and including Taylor 2018.[26] Taylor's analysis from the Sister Study was excluded from Table 1 in this document because hair relaxer use in that study was analyzed in combination with pomade, hair spray, and conditioner use.

Conclusion

While more research is warranted, good quality research has demonstrated an association between hair relaxer use and ovarian and uterine cancers. Lawsuits[d] and advocacy campaigns are moving forward with the evidence that currently exists. We recommend **health systems develop talking points and shared decision-making tools** to help providers respond to patients who have questions about the safety of hair relaxers.

[d] There are ongoing lawsuits against L'Oreal, Revlon, and others based on Chang et al's 2022 study linking use to ovarian and uterine cancer (consumersafety.org).

References

1 Llanos AAM, McDonald JA, Teteh DK, Bethea TN. Chemical Relaxers and Hair-Straightening Products: Potential Targets for Hormone-Related Cancer Prevention and Control. *JNCI J Natl Cancer Inst* 2022;**114**:1567–9. https://doi.org/10.1093/jnci/djac169.

2 Eberle CE, Sandler DP, Taylor KW, White AJ. Hair dye and chemical straightener use and breast cancer risk in a large US population of black and white women. *Int J Cancer* 2020;**147**:383–91. https://doi.org/10.1002/ijc.32738.

3 Gaston SA, James-Todd T, Harmon Q, Taylor KW, Baird D, Jackson CL. Chemical/straightening and other hair product usage during childhood, adolescence, and adulthood among African-American women: potential implications for health. *J Expo Sci Environ Epidemiol* 2020;**30**:86–96. https://doi.org/10.1038/s41370-019-0186-6.

4 James-Todd T, Senie R, Terry MB. Racial/Ethnic Differences in Hormonally-Active Hair Product Use: A Plausible Risk Factor for Health Disparities. *J Immigr Minor Health* 2012;**14**:506–11. https://doi.org/10.1007/s10903-011-9482-5.

5 Villarosa L. What to Know About Chemical Hair Relaxers and Health. *N Y Times* 2024.

6 Coogan PF, Rosenberg L, Palmer JR, Cozier YC, Lenzy YM, Bertrand KA. Hair product use and breast cancer incidence in the Black Women's Health Study. *Carcinogenesis* 2021;**42**:924–30. https://doi.org/10.1093/carcin/bgab041.

7 Stiel L, Adkins-Jackson PB, Clark P, Mitchell E, Montgomery S. A review of hair product use on breast cancer risk in African American women. *Cancer Med* 2016;**5**:597–604. https://doi.org/10.1002/cam4.613.

8 Schildroth S, Geller RJ, Wesselink AK, Lovett SM, Bethea TN, Claus Henn B, *et al.* Hair product use and urinary biomarker concentrations of non-persistent endocrine disrupting chemicals among reproductive-aged Black women. *Chemosphere* 2024;**361**:142442. https://doi.org/10.1016/j.chemosphere.2024.142442.

9 Farooq H, Mhatre P, Aggarwal R, Robinson MT, Joseph E, Segars J, *et al.* A systematic review of association between use of hair products and benign and malignant gynecological conditions. *Eur J Obstet Gynecol Reprod Biol* 2024;**295**:160–71. https://doi.org/10.1016/j.ejogrb.2024.02.012.

10 Chang C-J, O'Brien KM, Keil AP, Gaston SA, Jackson CL, Sandler DP, *et al.* Use of Straighteners and Other Hair Products and Incident Uterine Cancer. *J Natl Cancer Inst* 2022;**114**:1636–45. https://doi.org/10.1093/jnci/djac165.

11 White AJ, Gregoire AM, Taylor KW, Eberle C, Gaston S, O'Brien KM, *et al.* Adolescent use of hair dyes, straighteners and perms in relation to breast cancer risk. *Int J Cancer* 2021;**148**:2255–63. https://doi.org/10.1002/ijc.33413.

12 Rao R, McDonald JA, Barrett ES, Greenberg P, Teteh DK, Montgomery SB, *et al.* Associations of hair dye and relaxer use with breast tumor clinicopathologic features: Findings from the Women's circle of Health Study. *Environ Res* 2022;**203**:111863. https://doi.org/10.1016/j.envres.2021.111863.

13 Helm JS, Nishioka M, Brody JG, Rudel RA, Dodson RE. Measurement of endocrine disrupting and asthma-associated chemicals in hair products used by Black women. *Environ Res* 2018;**165**:448–58. https://doi.org/10.1016/j.envres.2018.03.030.

14 Zhang Y, Birmann BM, Han J, Giovannucci EL, Speizer FE, Stampfer MJ, *et al.* Personal use of permanent hair dyes and cancer risk and mortality in US women: prospective cohort study. *The BMJ* 2020;**370**:m2942. https://doi.org/10.1136/bmj.m2942.

15 White AJ, Sandler DP, Gaston SA, Jackson CL, O'Brien KM. Use of hair products in relation to ovarian cancer risk. *Carcinogenesis* 2021;**42**:1189–95. https://doi.org/10.1093/carcin/bgab056.
16 Preston EV, Fruh V, Quinn MR, Hacker MR, Wylie BJ, O'Brien K, *et al.* Endocrine disrupting chemical-associated hair product use during pregnancy and gestational age at delivery: a pilot study. *Environ Health* 2021;**20**:86. https://doi.org/10.1186/s12940-021-00772-5.
17 Rosenberg L, Boggs DA, Adams-Campbell LL, Palmer JR. Hair Relaxers Not Associated with Breast Cancer Risk: Evidence from the Black Women's Health Study. *Cancer Epidemiol Biomarkers Prev* 2007;**16**:1035–7. https://doi.org/10.1158/1055-9965.EPI-06-0946.
18 Wise LA, Palmer JR, Reich D, Cozier YC, Rosenberg L. Hair Relaxer Use and Risk of Uterine Leiomyomata in African-American Women. *Am J Epidemiol* 2012;**175**:432–40. https://doi.org/10.1093/aje/kwr351.
19 Wise LA, Wang TR, Ncube CN, Lovett SM, Abrams J, Boynton-Jarrett R, *et al.* Use of Chemical Hair Straighteners and Fecundability in a North American Preconception Cohort. *Am J Epidemiol* 2023;**192**:1066–80. https://doi.org/10.1093/aje/kwad079.
20 Bertrand KA, Delp L, Coogan PF, Cozier YC, Lenzy YM, Rosenberg L, *et al.* Hair relaxer use and risk of uterine cancer in the Black Women's Health Study. *Environ Res* 2023;**239**:117228. https://doi.org/10.1016/j.envres.2023.117228.
21 Gaston SA, James-Todd T, Riley NM, Gladney MN, Harmon QE, Baird DD, *et al.* Hair Maintenance and Chemical Hair Product Usage as Barriers to Physical Activity in Childhood and Adulthood among African American Women. *Int J Environ Res Public Health* 2020;**17**:9254. https://doi.org/10.3390/ijerph17249254.
22 Llanos AA, Rabkin A, Bandera EV, Zirpoli G, Gonzalez BD, Xing CY, *et al.* Hair product use and breast cancer risk among African American and White women. *Carcinogenesis* 2017;**38**:883–92. https://doi.org/10.1093/carcin/bgx060.
23 McDonald JA, Tehranifar P, Flom JD, Terry MB, James-Todd T. Hair product use, age at menarche and mammographic breast density in multiethnic urban women. *Environ Health Glob Access Sci Source* 2018;**17**:1. https://doi.org/10.1186/s12940-017-0345-y.
24 James-Todd T, Terry MB, Rich-Edwards J, Deierlein A, Senie R. Childhood hair product use and earlier age at menarche in a racially diverse study population: a pilot study. *Ann Epidemiol* 2011;**21**:461–5. https://doi.org/10.1016/j.annepidem.2011.01.009.
25 Paula JNH de, Basílio FMA, Mulinari-Brenner FA. Effects of chemical straighteners on the hair shaft and scalp. *An Bras Dermatol* 2022;**97**:193–203. https://doi.org/10.1016/j.abd.2021.02.010.
26 Taylor KW, Troester MA, Herring AH, Engel LS, Nichols HB, Sandler DP, *et al.* Associations between Personal Care Product Use Patterns and Breast Cancer Risk among White and Black Women in the Sister Study. *Environ Health Perspect* 2018;**126**:027011. https://doi.org/10.1289/EHP1480.