

Many hair extensions contain toxic chemicals that scientists now link to breast cancer and other serious health risks.

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For millions of women around the world, hair extensions are more than just a beauty accessory. They are a symbol of identity, confidence, and cultural expression. From salons in bustling cities to small shops in rural towns, extensions are sold as a quick fix for thinning hair, a way to experiment with new styles, or a means of embracing cultural traditions. But beneath the glossy packaging and promises of glamour lies a troubling reality: many hair extensions contain toxic chemicals that scientists now link to breast cancer and other serious health risks.

In 2025, researchers at the Silent Spring Institute conducted one of the most comprehensive studies ever undertaken on hair extensions. They tested 43 products—both synthetic and human hair—and found that 41 contained harmful chemicals. More than 900 chemicals were detected in total, but only 169 could be identified, leaving hundreds of unknown substances whose effects remain a mystery. Among the identified chemicals were phthalates, flame retardants, and organotins, all of which are known endocrine disruptors.

Endocrine disruptors interfere with the body's hormonal system, which regulates everything from growth and metabolism to reproduction. When these chemicals enter the body they can mimic or block natural hormones, leading to a cascade of health problems. In particular, they have been linked to breast cancer, uterine cancer, fibroids, infertility, and metabolic disorders.

In over the head

According to the study, the chemicals of concern include phthalates, which are commonly used to make plastics flexible but are notorious for disrupting oestrogen and testosterone levels, with prolonged exposure shown to increase the risk of breast cancer and reproductive issues. Organotins, once used in boat paint but banned due to toxicity, were detected in hair extensions and are linked to immune system damage and hormone disruption. Flame retardants, designed to reduce flammability, have been associated with thyroid problems, metabolic disease, and cancer. In addition, the study identified hundreds of unidentified substances, raising serious concerns about the long-term effects and cumulative risks of exposure.

Beauty products such as hair extensions are subject to minimal regulation in many countries. There are no mandatory safety tests before they reach consumers, and manufacturers are not required to disclose all ingredients. This lack of oversight brings with it several risks particularly for women who use extensions regularly or for long periods. Chemicals can leach from the hair fibres onto the scalp, where they are absorbed through the skin. Heat styling, sweating, and prolonged contact can accelerate this process, increasing exposure levels.

Dr Alfred Jatho, the head community cancer services at Uganda Cancer Institute (UCI), told *Weekend Monitor* that several of the detected substances are classified as carcinogenic or possibly carcinogenic, while others—though not di-

Hair-raising revelations on cancer in hair pieces



Students during a practical lesson. Beauty products such as hair extensions are subject to minimal regulation in many countries. PHOTO/ANGEL MUSINGUZI

rectly linked to cancer—pose health risks with long-term exposure. These risks extend beyond the user to those around her (spouse, children, friends, colleagues) who may inhale or come into contact with these chemicals.

"Flame retardants, which contain bromine (BFRs), chlorine, phosphorus, nitrogen, and antimony oxide, are commonly present in forms such as polybrominated diphenyl ethers (PBDEs), hexabromocyclododecane (HBCDD), and tetrabromobisphenol A (TBBPA). According to IARC [the International Agency for Research on Cancer], chloroacetic acid and chlorinated paraffins are considered possibly carcinogenic to humans (Group 2B), while TBBPA has shown carcinogenic properties in experimental animals, with its effects in humans still under evaluation," said Dr Jatho, adding that control measures include phasing out harmful substances like PBDEs and switching to materials with lower flammability and reduced health risks for hair extensions.

Deadly chemicals

Hair extensions are especially popular among Black women, who often use them as part of cultural and beauty practices. For many, extensions are not just a fashion choice but a necessity, offering protection for natural hair and versatility in styling. However, this widespread use means Black women are disproportionately exposed to the harmful chem-

ISSUE

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icals found in these products.

This adds another layer to existing health disparities. Black women already face higher rates of certain cancers, including aggressive forms of breast cancer. The discovery that hair extensions may contribute to these risks is deeply troubling, raising urgent questions about equity, safety, and accountability in the beauty industry.

Dr Jatho disclosed that the Phthalates, which are diesters of 1,2-benzenedicarboxylic acid primarily used as plasticisers to make PVC flexible, are identified as endocrine-disrupting compounds that may act as carcinogens, with some evidence linking them to breast cancer through disruption of oestrogen receptor signalling. Restricting their use and promoting phthalate-free products are recommended.

Dr Jatho added that pesticides, including organophosphates, chlorinated hy-

drocarbons, and triazines, pose further risks. Glyphosate, malathion, and diazinon are classified as probably carcinogenic to humans (Group 2A), while tetrachlorvinphos and parathion are possibly carcinogenic (Group 2B). Protective measures such as wearing clothing on areas where extensions rest, using masks to avoid inhalation, and producing pesticide-free products are advised.

"Styrene, an aromatic hydrocarbon used in polystyrene plastics and resins, is classified as probably carcinogenic to humans (Group 2A), making it necessary to limit occupational exposure, substitute safer products, and enforce strict quality regulations," he said.

The UCI official explained that the Tetrachloroethane (1,1,2,2-tetrachloroethane), a chlorinated hydrocarbon solvent, is recognised as toxic, even though related compounds such as 1,1,1-trichloroethane are not classifiable as carcinogenic (Group 3). Restricting industrial use and ensuring strong ventilation in workplaces, offices, and homes are essential.

He said the organotins, compounds containing tin bonded to organic groups such as butyltins and phenyltins, are used as stabilisers in PVC, catalysts in plastics, and biocides, but are linked to toxicity in consumer goods including hair extensions. Prohibiting their use in consumer products is recommended.

Extent of the problem

The study also shows that the behind the statistics are real lives, pointing to Angela, a 32-year-old woman who has worn hair extensions for over a decade. She began using them in her teens, drawn by the promise of fuller, longer hair. Over the years, extensions became part of her identity. But when she was diagnosed with breast cancer last year, she was shocked to learn that her beauty routine might have played a role.

"I never imagined something as simple as hair extensions could be dangerous," she said. "We trust these products, but no one tells us what's inside."

Public health experts and advocacy groups are calling for urgent action, arguing that the beauty industry must be held accountable for the safety of its products. Their key recommendations include mandatory testing, requiring all hair extensions to undergo rigorous safety checks before being sold; ingredient disclosure, obligating manufacturers to list every chemical used in their products; clear labelling, ensuring that items containing toxic substances carry visible warnings; and independent oversight, with governments establishing impartial bodies to monitor and regulate the industry. Without these measures, experts warn, the cycle of exposure and harm will continue unchecked.

Silent Spring Institute's new study published in the American Chemical Society journal *Environment and Health* arrives amid growing concern about the health impacts of hair extensions. More than 70 percent of Black women report wearing hair extensions at least once in the past year, compared with less than 10 percent of women from other racial and ethnic groups. Many wear them for cultural and personal reasons, as well as for convenience.

"While prior reports have found some chemicals of concern in hair extensions, there's still much we don't know about their overall chemical makeup. We wanted to get a better picture of the extent of the problem," the lead author Dr Elissia Franklin, a research scientist at Silent Spring Institute, was quoted by the institute. "This is an industry that has long overlooked the health of Black women, who should not have to choose between cultural expression, convenience, and their health."

Recommendations

Hair extensions can be made from synthetic fibres and bio-based materials, including human hair, and are often treated with chemicals to make them flame resistant, waterproof, or antimicrobial.

"Yet, companies rarely disclose the chemicals used to achieve these properties, leaving consumers in the dark about the health risks from prolonged wear," says Dr Franklin.

The fibres sit directly on the scalp and neck, and when heated and styled, they can release chemicals into the air that wearers may breathe in.

For the study, Dr Franklin purchased 43 popular hair extension products online and from local beauty supply stores. She categorised the products by fibre type—synthetic (mostly plastic polymers) or bio-based (including human, banana or silk)—and then coded them by their claims. Nineteen of the synthetic samples claimed to be flame retardant, three were water resistant, nine heat resistant, and three carried "green" claims such as "no PVC" or "non-toxic".

The researchers used a technique called non-targeted analysis to screen the samples for a wide range of chemicals, including compounds that are not typically tested for in products. Using two-dimensional gas chromatography with high-resolution mass spectrometry, the team detected over 900 chemical signatures, capturing both known and unknown substances. Machine-learning software was then used to match these signatures to a chemical library ultimately identifying 169 chemicals across nine major structural classes.

"All but two samples contained hazardous chemicals, and both of those were labelled as 'non-toxic' or 'toxic-free'..." 48 chemicals appeared on major hazard lists, including 12 listed under California's Proposition 65 for causing cancer, birth defects, or reproductive harm. Four flame retardants were found in both synthetic and bio-based samples, 17 chemicals related to breast cancer were found across 36 samples, including compounds known to alter hormones in ways that increase risk, "the research's key findings reveal."

The research also indicates that nearly 10 percent of samples contained toxic organotins, some at concentrations exceeding health-based levels set in the European Union, where the chemicals are regulated. With the global hair extension market projected to surpass \$14 billion by 2028, and the United States leading in global imports, "these findings make clear that stronger oversight is urgently needed to protect consumers and push companies to invest in making safer products," says Dr Franklin.