

Cosmetics and Your Health: NIEHS Research Findings

What is a cosmetic?

Cosmetics are products you may use to modify your appearance or cleanse your body. The Federal Food, Drug, and Cosmetic (FD&C) Act, which is administered by the Food and Drug Administration (FDA), defines cosmetics by intended use: “to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body ... for cleansing, beautifying, promoting attractiveness, or altering the appearance.”

The common term makeup refers to cosmetics such as foundation, eye shadow, mascara, and lipstick. Products for hair coloring, straightening, cleansing, or styling are considered cosmetics. Other cosmetics may include nail polish, perfumes, and body lotion, cream, and wash.

Under the FD&C Act, most cosmetic products do not require FDA approval before going on the market. However, the law requires manufacturers to report the safety of cosmetics to the FDA. Exceptions include color additive ingredients and hair straightening products, which are regulated.

Drugs are also defined, in part, by intended use: “in the diagnosis, cure, mitigation, treatment, or prevention of disease.” Drugs must be approved by the FDA before they go on the market.

Some products may meet the definitions of both cosmetics and drugs. For example, foundation makeup products with sunscreen have two intended uses. They alter the skin’s appearance and may help prevent harm to skin. The sunscreen ingredient in foundation puts the product in both categories.



What is NIEHS doing?

The National Institute of Environmental Health Sciences (NIEHS) works to better understand if ingredients in certain products affect health. These studies add to all research and increase knowledge about cosmetic chemicals and potential harms.

For example, some chemical ingredients may be carcinogens. Formaldehyde is classified as a cancer-causing agent in humans.¹ Some hair relaxers and other hair products may contain formaldehyde or have chemicals that convert and release formaldehyde when processed.

Other chemicals in cosmetics are considered endocrine disrupting, which means they can interfere with the body’s hormones. The endocrine system keeps our bodies in balance and guides growth and development. Across all life stages, endocrine-disrupting chemicals, both natural and human-made, may affect health. Here are two examples of such chemicals.

- **Parabens** are synthetic chemicals used to preserve the shelf life of some cosmetic and scented products. While parabens are known to be hormone-disrupting chemicals, their specific health effects are uncertain. Studies show that parabens in personal care products can penetrate human skin without breaking down and being absorbed in the body.² Research is ongoing.



- **Phthalates** are synthetic chemicals found in scented products, certain cosmetics such as nail polish and hair spray, and plastic packaging. According to the FDA, a phthalate called diethyl phthalate, used as a solvent and fixative in fragrances, is commonly used in cosmetics. Regulations do not require the listing of individual chemicals in fragrances or flavors. As a result, a consumer may not be able to determine from the ingredients listed on the label if phthalates are used in the product.

In research partially funded by NIEHS, an increased risk of uterine fibroids (leiomyomas), the most common noncancerous tumor among women, was linked to phthalate exposure. This finding may lead to further research and development of new strategies related to fibroids.³

Exposure to phthalates is a particular concern during pregnancy because it may affect both maternal and fetal health. NIEHS-supported researchers found that exposure to phthalates in early pregnancy is linked to reduced fetal growth.⁴ Fetal growth restriction contributes to infant mortality and to health problems and mortality across the lifespan. Phthalate exposure may also be a risk factor for preterm birth.⁵

Puberty may also be affected by exposure to certain endocrine-disrupting chemicals. For example, an NIEHS-funded study found that daughters of women who had higher levels of diethyl phthalate and triclosan in their bodies during pregnancy experienced puberty at younger ages (i.e., earlier menarche and earlier breast and pubic hair growth), but early puberty was not seen in boys.⁶



Hair products

The potential for long-term health effects from certain chemicals in hair products is an interest area for the large-scale, long-running NIEHS Sister Study. This study includes more than 50,000 women across the U.S., including Puerto Rico, whose sisters had breast cancer. The study design offers the ability to identify environmental exposures over the life course that increase the chance of developing breast cancer and other diseases, and to identify how genes and the environment interact to increase disease risk. Relevant findings follow.

- There is increasing evidence that hair dye use is associated with breast cancer risk. Sister Study researchers found that women who regularly used hair dye were 9% more likely to develop breast cancer than women who did not. Among Black women, using permanent dyes every five to eight weeks or more was associated with a 60% increased chance of developing breast cancer, as compared with an 8% increased risk for White women.⁷
- Frequent use of straighteners and perms during adolescence was linked to breast cancer later in life, particularly prior to menopause.⁸ This research suggests that some chemicals in certain products may be harmful to health, even when used decades before.
- Adult use of hair straightening products was associated with the incidence of breast, ovarian, and uterine cancers. Frequent use of hair straightening products or relaxers (four or more times per year) was associated with twice the risk of ovarian and uterine cancers compared to women who did not use the products.^{9,10} These findings are particularly relevant for Black women, who are more likely to use straighteners or relaxers. No associations were found between uterine cancer and use of hair dyes, bleach, highlights, or perms.



To be clear, NIEHS research does not show that certain hair products cause cancer. Many factors affect whether cancer develops or not.

NIEHS also funds hair products research that is conducted by grant recipients.

- Safer hair product availability could depend on where someone lives. Retail stores in neighborhoods with a higher percentage of residents of color or of lower income were more likely to sell products with higher levels of harmful chemicals than those sold in more affluent areas.¹¹
- Chemical hair straightener use may affect an ability to conceive. Fecundability is a term used to describe the probability of pregnancy during a single menstrual cycle. Compared to women who never used hair straighteners, women who were current and former users of hair straighteners had slightly lower fecundability.¹² This finding contributes to a growing body of research that documents associations between exposure to certain chemicals found in beauty products and reproductive health.

Other personal care products

Sister Study researchers were the first to analyze if “everyday” products for beauty, hygiene, and skin care, as used by women, may jointly affect breast, ovarian, and uterine cancers. These diseases are considered hormone-sensitive cancers. Results show that exposure to a mixture of endocrine-disrupting chemicals, particularly from beauty products, may collectively affect the development of hormone-sensitive cancers.¹³

Talc is a mineral sometimes used in powders. Because using feminine hygiene products, including genital talc and douching, could introduce particles and toxicants into the upper reproductive tract, the NIEHS Sister Study looked at plausible health effects associated with their use.

- The results of a large, pooled analysis that included several studies found no association between using powder in the genital area and uterine cancer. But the researchers also noted that further study of long-term powder users may be warranted.¹⁴
- Findings from the Sister Study indicate that douching may increase the risk of ovarian cancer.¹⁵

Further Reading

FDA: Cosmetics and U.S. Law

<https://fda.gov/cosmetics/cosmetics-laws-regulations/cosmetics-us-law>

FDA: Cosmetic Products and Ingredients

<https://fda.gov/cosmetics/cosmetic-products-ingredients>

FDA: Facts About Sunscreen

<https://fda.gov/news-events/rumor-control/facts-about-sunscreen>

FDA: Phthalates in Cosmetics

<https://fda.gov/cosmetics/cosmetic-ingredients/phthalates-cosmetics>

Cleansers

Antimicrobials, such as triclosan, are used in cleansers and other products. Triclosan is regulated by the FDA as a drug intended to reduce or prevent bacterial contamination. In 2017, the FDA banned the use of triclosan in over-the-counter antiseptic products, such as hand soap, due to data on safety and effectiveness. But the chemical is still used in medical-grade antibacterial soaps and personal care products such as toothpaste, shaving cream, and some cosmetics. If triclosan is in a product, it should be included in the ingredient list on the label.

An NIEHS-funded study in mice found that triclosan can be transferred by lactation to newborns, causing fatty liver. These findings are relevant because triclosan has been detected in human breast milk, and cases of pediatric non-alcoholic fatty liver disease are increasing in the U.S.¹⁶

NIEHS-funded researchers reported that triclosan should be considered as an environmental toxicant that affects the biology of many species in the environment and has the potential to harm human health.¹⁷ Ongoing studies are analyzing the safety of triclosan.



Sun protection

Sunscreen lotions, creams, and sprays help prevent sunburn and resulting skin damage. The FDA regulates sunscreens as over-the-counter drugs to ensure they meet safety and effectiveness standards. Manufacturers are required to test their sun protection products before they are sold.

Specific chemicals in these products, known as ultraviolet (UV) filters, absorb or block UV radiation from the sun. These chemicals may be added to some makeup products.

Toxicologists at NIEHS are assessing the safety of UV filters. While these studies are ongoing, findings to date do not suggest endocrine-disrupting effects from those chemicals.¹⁸



For more information on the NIEHS Sister Study, visit <https://sisterstudy.niehs.nih.gov/English/index1.htm>.

For more information on the National Institute of Environmental Health Sciences, visit <https://www.niehs.nih.gov>.

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- 3 Iizuka T, et al. 2022. Mono-(2-ethyl-5-hydroxyhexyl) phthalate promotes uterine leiomyoma cell survival through tryptophan-kynurenine-AHR pathway activation. *Proc Natl Acad Sci* 22;119(47):e2208886119.
- 4 Stevens DR, et al. 2023. Early pregnancy phthalates and replacements in relation to fetal growth: The human placenta and phthalates study. *Environ Res* 229:115975.
- 5 Welch BM, et al. 2022. Associations between prenatal urinary biomarkers of phthalate exposure and preterm birth: A pooled study of 16 US cohorts. *JAMA Pediatr* 1;176(9):895-905.
- 6 Harley KG, et al. 2019. Association of phthalates, parabens and phenols found in personal care products with pubertal timing in girls and boys. *Hum Reprod* 1;34(1):109-117.
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- 18 National Toxicology Program: UV Filters. Available: <https://ntp.niehs.nih.gov/whatwestudy/topics/uvfilters>.