



## Use of Hair Dyes Following Chemotherapy

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**Question:** Why are patients advised to avoid hair color products during hair regrowth after chemotherapy-induced alopecia? Does hair dye use or exposure to these dyes increase the risk of developing cancer?

**Answer:** Hair provides no vital function but does protect the surface of the skin, conserves body heat, and contributes to self-image. Hair is associated with femininity (e.g., long hair) and masculinity (e.g., facial hair) and, for many, closely associated with sexuality (DeViliez, 2003; Ehmann, Sheehan, & Decker, 1991). Although not considered life threatening, chemotherapy-induced hair loss can emotionally devastate a patient who has endured life-threatening side effects associated with cancer therapy.

The American Cancer Society (ACS) and others provide information about techniques to assist with cancer therapy-related hair loss. These techniques include choosing a wig, hairpiece, or toupee before the onset of treatment to match hair color, texture, and style, and treating the hair and scalp gently beginning before hair loss and continuing throughout hair regrowth. This includes use of a mild shampoo, soft hairbrushes, satin pillowcases, low settings on hair dryers, and scarves and hats to protect the scalp from the sun and prevent loss of body heat in cold weather, as well as avoiding brush rollers, permanents, and hair dyes (ACS, 2003a).

An estimated 20%–40% of people in the United States regularly use hair color products (Sinnott, 1998). Although no research findings suggest that use of hair dye during hair regrowth following chemotherapy is harmful, most healthcare providers recommend that patients do not use hair dyes until hair returns to “normal,” a process that may take up to six months (ACS, 2003b). Some professional hair colorists assert that the new hair growth is “virgin” hair and, therefore, fragile and more vulnerable to the effects of hair dyes, especially those containing harsh chemicals such as peroxide.

## Effects of Dyes

An average scalp contains approximately 100,000 hairs. Hair is constantly growing, shedding, and replacing itself, making it a target of chemotherapy. Hair grows from primary follicles that are not vascularized in the early stages of development. The follicles enlarge and sprout hair, and capillary networks develop. Actively growing scalp hair follicles extend to the entire epidermis and dermis as well as subcutaneous adipose tissue. Scalp follicles and hair undergo many cycles of regrowth, beginning in the neonatal period and continuing throughout adolescence (DeViliez, 2003).

Steinman and Epstein (1995) assert that chemical hair dyes are absorbed easily into the body via the scalp, which is comprised of highly vascular tissue. Animal and human studies have shown that the body rapidly absorbs chemicals from permanent and semipermanent dyes. The rinses that are used to remove the hair dyes increase this absorption (Epstein & Steinman, 1997). On the other hand, mild bleaching agents, non-permanent vegetable dyes, and henna have not been associated with concerns about systemic absorption (Steinman & Epstein).

Some studies have found that small amounts of the chemicals in hair dyes are absorbed from the scalp or skin and travel to internal organs, such as the bladder (Epstein & Steinman, 1997; U.S. Food & Drug Administration, 2003). Concerns about absorption for people having their hair dyed, as well as for people who dye hair (e.g., hair salon workers), have been expressed since 1975 (Shafer & Shafer, 1975). Although hair color product formulations are being updated continually, the basic chemicals that comprise hair dyes have not changed since their inception.

Hair product manufacturers prepare Manufacturers' Safety Data Sheets (MSDSs) in accordance with the requirements of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. These sheets contain information about hazardous ingredients (1% concentration or greater, 0.1% for carcinogens), effects of acute and chronic exposure, and safe handling and use. For instance, the MSDS for a semipermanent hair dye remover stated that it contains lauramide and cocamide diethanolamines (DEAs). DEAs are classified by OSHA as a carcinogen. The MSDS for this dye remover cited National Toxicol-

ogy Program research that found an increased incidence of kidney and/or liver tumors in mice dermally exposed to DEAs for their lifetime. The MSDS also noted that the significance of these findings and their potential relevance to humans are not clear (Clairol Professional, 2003).

Dark brown and black hair dyes contain a higher number of chemicals than lighter dye colors, and one chemical contained in many dark dyes, phenylenediamine, is known to be extremely irritating. Steinman and Epstein (1995) consider permanent hair dyes containing phenylenediamine to be carcinogenic and assert that temporary hair dyes that contain Acid Orange 87, Solvent Brown 44, Acid Blue 168, or Acid Violet 73 should be viewed as potentially carcinogenic.

In 1994, considerable media attention was given to the findings of a study conducted by ACS and reported in the *Journal of the National Cancer Institute*. In this study, hair dye use and cancer development among 573,369 women were analyzed over a seven-year period. Women who used black hair dyes for 20 years or longer had a statistically significant increased risk of developing non-Hodgkin's lymphoma and multiple myeloma (Thun et al., 1994). This study, and others, raised concern about the type of hair dye (permanent versus temporary) and color (dark-colored dyes versus light) and the development of various types of cancers.

## Risk for Bladder Cancer

A study conducted in Los Angeles, CA, comparing 897 patients with bladder cancer who used hair dye with a similar number of healthy adults (matched controls) found that the women who used permanent hair dye at least once a month were twice as likely to develop bladder cancer than women who did not use hair dye. People who worked for 10 or more years as hairdressers or barbers were five times more likely to have bladder cancer compared to people who are not occupationally exposed to hair dyes (Gago-Dominguez, Castelao, Yuan, Yu, & Ross, 2001).

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