Can Tattoos Cause Cancer?

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**Myth:** Tattooing has risen in popularity, but can this body art increase the risk of cancer?

**Answer:** Tattoos and body piercings have been prevalent for thousands of years in many cultures. Tattooed mummies from Egypt, Peru, and the Philippines have been radiocarbon dated to 2000 BC. The word tattoo is derived from the Tahitian word *ta-tau*, which means “the result of tapping.” Modern artists use an electrically powered instrument to inject tattoo pigment 50–3,000 times per minute to a depth of about a 64th to a 16th of an inch into the dermis (Armstrong & Murphy, 1997). The instruments use sets of one to 14 vibrating needles (Sperry, 1992).

**Tattoo Procedures and Regulations**

Tattooing is an invasive procedure. Although licensed artists use sterile, disposable needles, tattooing sometimes is performed in unsterile environments, such as commercial studios, flea markets, rock concerts, and fraternity parties. As a result, tattooing can cause infections, including hepatitis and AIDS. Depending on the skill of the artist and choice of pigment and diluents, allergic reactions and poor cosmetic results may be potential outcomes and should be a consideration for risk. Vegetable dyes and carbon have been used for tattoo pigment in the past; current colorants include azo pigments (which are used in automobile paints and silk screening), vegetable dyes, minerals, metals, and plastics. Solvents that liquefy powdered pigments (ethyl alcohol, denatured alcohol, or distilled water) are used at artists’ discretion (Helmenstine, 2002).

Impurities in pigments may cause adverse skin reactions. Colorants also may be transported to other parts of the body, such as the lymph nodes (Moehrl, Blaheta, & Ruck, 2001), which can present clinical challenges when specimens are dyed for pathology tests. Tattoo pigment has been mistaken for melanoma in lymph nodes (Chikkamuniyappa, Sjuve-Scott, Lancaster-Weiss, Miller, & Yeh, 2005).

The U.S. Food and Drug Administration (FDA) considers tattoo ink and permanent makeup to be cosmetics, and the pigments for color additives require approval under the Federal Food, Drug, and Cosmetic Act. However, no standards exist for the usage of tattoo inks, their contents, or the amount used on any particular area of the body (FDA, 2009). To date, the practice of tattooing is regulated by state jurisdiction. Nurses should advise patients to screen tattoo artists for safety procedures (see Figure 1).

The FDA is aware of more than 150 reports of adverse skin reactions (e.g., rashes, blistering, swelling) in consumers and continues to evaluate the extent and severity of events believed to be associated with tattooing. The FDA is conducting research on tattoo inks to examine ink metabolism, chemical composition, safety, and short- and long-term effects (2009).

**Pigments and Cancer Risk**

Evidence has indicated that m’-methyl-p-dimethylaminobenzene, or red azo dye (also known as red 22 or PR22), produced liver cancer in rats when used as a food coloring (Cook, Griffin, & Luck, 1949). The administration of azo dye decreased the amount of riboflavin present in the rats’ livers. However, increasing riboflavin within the rats’ livers appeared to partially protect the liver from the carcinogenic effects of azo dye. Liver cirrhosis was detected in the rats after four weeks of azo administration. The measurable amount of dye diminished at 20 weeks, even though the dye was ingested continually (Rusch, Baumann, Miller, & Kline, 1945).

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**Figure 1. Tattoo Artist Safety Guidelines**

*Note.* Based on information from Centers for Disease Control and Prevention, 2008.

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be able to spot affected areas of the skin. However, tattoos can make those areas more difficult to identify, particularly when the tattoos are darker colors, such as black, dark blue, or dark green (Morse, 2007).

Although tattoo removal has not been linked to cancer, past procedures have used destructive methods that were very damaging to the skin, leaving permanent scars and deformities (Bernstein, 2007). Key tools currently used in tattoo removal include photothermolysis (the ability to selectively remove tattoos without destroying the surrounding skin and leaving minimal scarring) and ruby lasers that operate in the millisecond range with an intense pulsed light source (Bernstein).

Two cases were reported by Mortimer, Chave, and Johnston (2003) involving skin reactions from red pigment. The cases involved painful, pruritic areas in the red portions of leg tattoos in two patients. Biopsies of both patients showed lichenoid basal damage.

Tattoos can make skin cancer more difficult to observe. Patients who are diagnosed with melanomas in the colored area of a tattoo present a clinical challenge because of the inability to see changes in color, shape, and pigment of the lesions. A literature search showed a few cases of malignant melanoma associated with tattoos. One from 1938 involved a 9-year-old boy with a tattoo made with an indelible pencil (Sharlit, 1938). Other cases involved a 55-year-old man with a melanoma lesion in a tattoo and a 50-year-old man with an axillary metastasis believed (but not confirmed) to be related to a tattoo from 27 years earlier (Kirsch, 1969). Radiation to tattoo sites was implicated in four patients: a person with melanoma in a tattoo site two years after radiation therapy, a young man with Hodgkin disease who developed two separate melanoma nodules at tattoo sites after radiation therapy, and two middle-aged men diagnosed with malignant melanoma on their tattoo sites after radiation therapy to the tattoo area (Paradisi et al., 2006). Early detection is essential for treating skin cancers, and physicians need to take extra precaution when examining patients with tattoos for melanoma.

Conclusions

Many medical professionals believe that substances in current tattoo pigments (e.g., copper, lead, lithium) (Helmenstine, 2002) and procedures increase the risk for developing skin cancer and cause other types of blood-borne diseases (Sperry, 1992). Studies of the effects of sun exposure on tattoo pigment only determined that sun exposure is linked to skin cancer (Hudson, 2009). No studies have definitively related tattooing to skin cancer. However, tattoos can mask a skin cancer or be mistaken for cancer in a lymph node. Therefore, healthcare providers should take extra precaution when examining patients with tattoos for melanoma.

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References


References

