

Cancer Risk In Tattoos: A Review

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Abstract: *Tattoos are forms of art and identity and are a permanent mark or design made on the skin by a process of pricking and ingraining a large amount of metallic salts and organic dyes that remain in the skin for the lifetime of the bearer, by raising scars. There are many complications associated with the introduction of pigment into the skin. This review aims at spreading awareness of possible tattoo hazards.*

Keywords: *Tattoo, pigments, cancer*

I. Introduction:

The word tattoo comes from the Tahitian "tatu" which means "to mark something." Tattooing has been practiced for more than 12,000 years BC. Since 1990, the presence of tattoos has become so popular that, in our environment, 3% to 8% of the general population has some type of tattoo. Today, tattooing is making a strong comeback. It is more popular and accepted than it has ever been. This rise in popularity has placed tattooists in the category of "fine artist". Current artists combine the tradition of tattooing with their personal style creating unique and phenomenal body art. With the addition of new inks, tattooing has certainly reached a new plateau¹. The potential local and systemic carcinogenic effects of tattoos and tattoo inks remain unclear. Several studies have shed light on the presence of potential carcinogenic or procarcinogenic products in tattoo inks². There may be many complications associated with the introduction of pigment into the skin and include acute inflammatory allergic hypersensitivity, granulomatous, lichenoid, or pseudolymphomatous types of histopathologic reactions and in some patients, they can be a marker for systemic diseases such as AIDS, Hepatitis B, Hepatitis C, tetanus, syphilis, tuberculosis and other blood-borne diseases³.

II. Potential Carcinogenic Products In Tattoo Inks:

The precise composition of tattoo inks is not regulated. The US Food and Drug Administration has not approved any ink for use in tattooing². Control and regulation remain difficult because most inks are purchased abroad via the internet or during tattoo conventions. Tattoo colourants include pigments which can be inorganic metallic salts or different types of organic molecules and organic dyes. Auxiliary ingredients are usually added to modify the properties of the ink and make it suitable for the tattooing procedure. The composition of inks has changed over the past 20 years. Studies were done in the 1980s and 1990s of tattoos created 10–20 years before and their results might not apply to tattoos performed nowadays⁴. Inks are less likely than before to contain inorganic salts such as mercury, cadmium, and cobalt. Aluminium, oxygen, titanium, and carbon are common ingredients of tattoo inks irrespective of the colour. Several studies have shown that different colours can share a component, whereas a similar colour might not and that some metallic salts are still commonly used. Known allergenic metals such as chromium, nickel and cobalt have been found to exceed safe allergic limits. Surveyed tattoo inks were composed of several metallic salts, some found at high concentrations and others at low or trace concentrations. The traditional classification, based on the rule that one colour equals one metallic salt (ie. red=mercury, blue=cobalt, green=chromium, purple=magnesium etc), which is still mentioned in some textbooks and reviews is too restrictive and definitely out-of-date^{5,6}. European market studies have shown that most of the current commercially available tattoo compounds are azo pigments or polycyclic compounds, classified by their chemical constitution. Among the organic colourants identified in tattoo inks, 60% were azo compounds, some of which are classified as carcinogenic (anisidine, nitro-o-toluidine, chloro-o-toluidine, and 3,3'-dichlorobenzidine). 3,3'-dichlorobenzidine is thought to be released from the azo pigments found in these products⁴. Table 1 summarises some of the potential procarcinogens & carcinogens in tattoo ink.

III. Table

CARCINOGENIC INORGANIC SALT COMPOSITION	CARCINOGENIC ORGANIC SALT COMPOSITION
MERCURY	PHENOL
CADMIUM	3,3-DICHLOROBENZIDINE
LEAD	TOLUENE
COBALT	NITRO-O-TOLUIDINE
ALUMINIUM	ANISIDINE
MAGNESIUM	CHLORO-O-TOLUIDINE
TITANIUM	
CHROMIUM	
NICKEL	

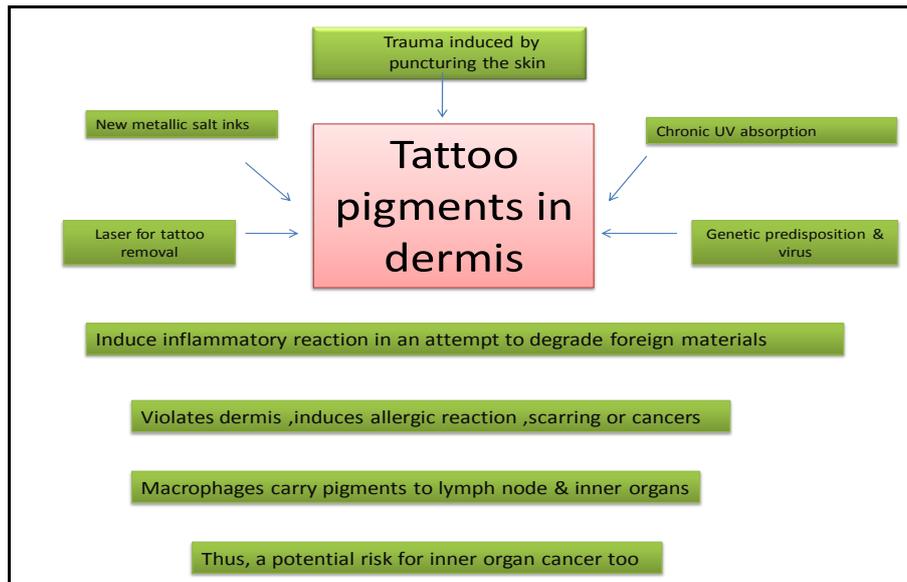
IV. Potential Links Between Tattoos And Skin Cancers :

If there is a true link between tattooing and skin cancer, carcinogenesis is most likely to be the result of a multifactorial process. The trauma induced by the procedure (puncturing the skin) has typically been identified as one of the main causes. Tattoo pigments do not remain inert in the dermis; an inflammatory reaction occurs over the lifetime of the bearer, in an attempt to degrade all foreign material⁵. Chronic ultraviolet sun exposure has been suggested as another potential factor for skin carcinogenesis in tattoos. Tattoos might be located on ultraviolet-exposed or intermittently exposed body areas. Wiener and Scher suggested that pigments might alter ultraviolet absorption in the skin. Moreover, it could be postulated that a tattooed individual would show off their tattoos, especially during summer time, exposing the tattooed skin to sun and ultraviolet radiation with the potential long-term risks⁶.

Does the colour of the tattoo matter? Red and black have always been the most commonly used colours for tattoo.

Red is known to be the main colour responsible for hypersensitivity tattoo reaction⁸ and according to Nicolas Kluger & Virve Koljonen was the most common colour for occurrence of SCCs, keratoacanthomas, and pseudoepitheliomatous hyperplasia². Different compositions of inks might therefore have crucial roles for different pathogenic processes. Unfortunately, most studies have focused on black and red inks. To our knowledge, except for the presence of metallic salts, the presence of potential carcinogenic components in other colours has not been investigated^{5,6}. Finally, there might be other undetermined factors, such as a genetic predisposition and viruses in the skin, with potential role in carcinogenesis associated with tattoos.

Tattoo can be a potential risk factor for inner organ cancers too. Tattoo pigments reside mainly in the dermis, either within fibroblasts or between collagen bundles. Macrophages, in an attempt to eliminate the pigments, assimilate them and migrate to the lymphatic vessels then to the regional lymph nodes. Cases of macroscopic, often asymptomatic, lymph nodes filled with black pigments have been reported. As a generalisation, any individual with a tattoo might have a regional black lymph node. Black lymph nodes can also become palpable, raising the concern for potential infection or malignancy and leading to lymph node excision or dissection by a surgeon who suspects metastatic melanoma⁶. So far, there is no data regarding the potential localisation of tattoo byproducts elsewhere in the body. Nevertheless, some researchers stress that the long contact time between skin and tattoos allows continued exposure to toxic or allergenic metals with consequent accumulation in the body. The potential diffusion of nanoparticles also remains speculative¹⁰. Tattoo pigments might be discharged from the body without any further health-related complications. It might be thought better off undergoing laser tattoo removal. Unfortunately, while the tattoo might be erased by the treatment, blasting away that pigment releases it into the body a second time¹¹. Table 2 summarises the potential link between tattoos & skin cancer.



V. Prevention:

If tattooing is not done ,it should be avoided.Safety of pigments in tattoo colourants should be searched for,before undergoing tattooing.The instruments and machine used should be sterilized.If the person is already tattooed ,he should avoid going in the sun.The sun exposed parts should be covered with clothings before going in the sun and application of sunscreen lotions and the use of umbrellas may help further in this regards.Laser removal of the tattoo should be avoided.

VI. Conclusion:

Permanent tattooing with its health-related issues and potential carcinogenic effect is a topic that should not be neglected by health services, and could be an important upcoming health issue. Regulation of tattoo ink manufacturing is urgently needed ²and safe biological inks must be searched¹¹. The importance of vigilance and of a high index of suspicion for any skin changes within a tattoo, which may otherwise be easily overlooked by the clinician,is recommended.Thus the harmless tattoo is a very serious risk & awareness in this regards is highly recommended.

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