

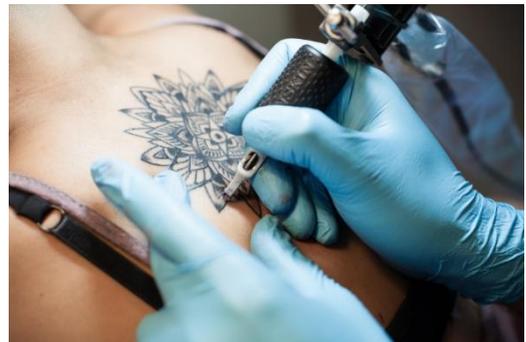
Cancer Association of South Africa (CANSA)



Fact Sheet and Position Statement on the Health Risks of Tattoos

Introduction

A tattoo can be described as a type of body modification making use of the insertion of various colours of inks, dyes and other pigments into the skin (dermis layer) to create a permanent or temporary image. It is also referred to as a form of body art. International literature informs that tattoos are becoming increasingly popular especially among the younger generations. It is estimated that 20% of the German population has at least one tattoo.



[Picture Credit: Tattoo]

Jungueira, A.L., Wanat, K.A. & Farah, R.S. 2017.

“Tattooing, which involves the placement of ink into the skin, is an ancient decorative technique that has remained popular in modern society. Tattoos have long been known to cause cutaneous reactions, which include the emergence of neoplasms such as keratoacanthoma (KA) and squamous cell carcinoma (SCC) in tattooed areas of the skin. We review the clinical presentations, histology and treatment options for squamous neoplasms, primarily KA and SCC, arising in tattoos.”

Although inks used in tattoos are subject to regulation by the U.S. Food and Drug Administration (FDA) as cosmetics and colour additives, the same cannot be said of South Africa where tattoo inks are mostly imported without any restriction.

Types of Tattoos

One popular classification of the different types of tattoos provide the following as the major types of tattoos:



[Picture Credit: Post-mastectomy tattoo]

- Professional tattoos. Modern day tattooing performed with a sterile machine and inks (permanent tattoo)
- Amateur tattoos created by unskilled individuals often found among gang members (permanent tattoo)
- Cosmetic tattoos to create permanent enlarged lips or eyebrows (permanent tattoo)

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July 2021

- Medical tattoos such as creation of an artificial areola on the breast (permanent tattoo)
- Spray-on tattoos (temporary tattoo)
- Henna tattoos (temporary tattoo)

Inks Used in Tattooing

Every brand and colour of tattoo ink has different ingredients, according to a Northern Arizona University study. Tattoo inks may be made from titanium dioxide, lead, chromium, nickel, iron oxides, ash, carbon black, and other ingredients. Some of the pigments are industrial grade and used as automobile paint. According to an Environmental Health News report, an ingredient found in black tattoo inks - benzo(a)pyrene - has caused skin cancer in animals. It also noted that tattoo inks migrates into the lymph nodes, which play a significant role in immune system health.



[Picture Credit: Tattoo Ink]

Serup, J. 2017.

“Tattoo colourants are colourful nano- and microparticles, which are practically insoluble and thus permanent once installed in the dermis by the tattooist. Tattoo ink also has soluble ingredients and contaminants. Pigments can distribute via the lymph and possibly also directly to the blood, and a minute fraction may over time undergo metabolic breakdown and as hapten(s) induce allergic reactions of red tattoos. Carbon black of black tattoos has a tendency to agglomerate and form larger bodies that can elicit foreign body reactions in black tattoos and even granuloma formation with overlap to sarcoidosis in the clinic. Very little is known about the biokinetics and safety profile of the many tattoo pigments in use, and no specific pigment-related chemical of tattoo ink causing identified adverse reactions in humans has been depicted. Inks have many ingredients and contaminants. Insoluble and soluble ingredients of inks supposedly have very different characteristics of absorption, distribution, metabolism, and excretion, with pigments being extremely slowly excreted, contrasting soluble ingredients with fast elimination. Tattoos are a single-dose exposure. Controlling the safety of tattoo inks by banning potentially critical chemicals hitherto has been unsuccessful due to lacking documentation of clinical and epidemiological relevance and because the tattoo industry is already internationally established, free, and in the ownership of the people. Doctors treating patients with tattoo complications consequently have a key role in identifying risk situations and local outbreaks, which needs clarification, therapy, and the intervention of authorities. In the treatment of complications, as seen in general practice and in other specialties, basic insight into the fate of tattoo pigments in the body is necessary. Tattoo complications are complicated and faceted with many entities and disease mechanisms; they are a new subspecialty in medicine and dermatology.”

A new study, done by chemistry students at Northern Arizona University, looked at the chemical composition of a variety of tattoo inks to better understand their potential health risks. The findings were presented at the 229th national meeting of the American Chemical Society, the world's largest scientific society. The authors suggested that closer regulation of the tattoo industry may be warranted.

McGovern, V. 2005.

“Despite the art’s growing popularity, the toxicology of tattoos is poorly understood. Now some ink components—particularly heavy metals—have raised concerns. Titanium and aluminum are often used as colorants in tattoos; more worrisome, inks using non-metal colorants may include traces of antimony, arsenic, beryllium, chromium, cobalt, lead, nickel, and selenium (AESI filed over the latter eight metals). Sivas

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says the ink used for a 3 by 5 inch tattoo contains 1–23 micrograms of lead, versus the 0.5 micrograms per day permitted under Proposition 65.”

Possible Health Risks of Tattoos

According to various sources, the risk of health complications due to tattoos is higher if a person has one or more of the following listed medical conditions:

- diabetes
- allergies, especially if the person has ever had a reaction that caused him/her to break out in red bumps, swelling of the throat, or difficulty breathing
- skin disorders, such as eczema or psoriasis
- a weak immune system

The United States Food and Drug Administration (FDA) has a programme of regularly checking on the manufacturing and distribution of tattoo inks within the United States of America. It has, on occasion, found it necessary to recall certain tattoo inks from the market because of bacterial contamination.

According to the FDA: “Commonly reported symptoms of tattoo-ink-associated infections include the appearance of rashes or lesions consisting of red papules in areas where the contaminated ink has been applied. Some tattoo infections can result in permanent scarring. Indications of an infection can be difficult to recognize as other conditions (e.g., allergic reactions) may initially have similar signs and symptoms, leading to misdiagnosis and ineffective treatments.”

Other health risks identified in the scientific literature includes:

- tattoo-associated skin cancer. While the strength of association remains unclear, the literature reports many cases of tattoo-associated skin cancer. Among these cases, black, blue, and red inks were particularly worrisome for their carcinogenic potential.
- squamous cell carcinoma
- basal cell carcinoma
- malignant melanoma
- keratoacanthoma - considered to be a variant of the keratinocyte or non-melanoma skin cancer, squamous cell carcinoma (SCC)
- other rare skin malignancies
- potential for phototoxicity - also called photoirritation - is a chemically induced skin irritation
- substance migration
- possible metabolic conversion of tattoo ink ingredients into toxic substances

Kluger, N. 2021.

Ten to 30% of the population is currently tattooed. This trend does not spare athletes and sports medicine specialists may have to manage tattooed athletes. The purpose of this study was to review the possible issues associated with tattoos among athletes. Overall, tattooed athletes are exposed to the same complications as anyone, mainly healing issues, skin infections and allergic reactions to a tattoo color. Besides, the main pitfall in sports medicine remains invasive gestures such as puncture or infiltration, as they must be avoided at all cost if the tattoo is recent and under healing. Issues associated with imaging are rather limited (artifacts, visible calcification). Burns during magnetic resonance imaging may occur but they are rather rare. Local neuromuscular complications attributable to tattooing are exceptional. Whether tattoos may have a "systemic" impact on the prevalence of unexplained symptoms in athletes (fatigue, distant tendon or musculoskeletal wounds) remain unknown.

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Huisman, S., van der Bent, S.A.S., Majjer, K.I., Tio, D.C.K.S. & Rustemeyer, T. 2020.

“Tattooing is creating a permanent design by placing exogenous pigment particles and additives into the dermis. An adverse reaction may occur due to the act of tattooing and subsequent application of aftercare products. Numerous articles report the wide spectrum of adverse reactions related to tattooing, ranging from superficial infections and vasculitis to Koebner triggered autoimmune diseases. These reactions have different time of onset of symptoms, appearing immediately after placement of the tattoo until several years later. In this article we will give an overview of cutaneous non-allergic adverse reactions of tattoos.”

Kluger, N. 2020.

“Complications associated with tattoos are mostly of cutaneous origin. They include chiefly ink allergy, local infection, benign tumors or malignant lesions and elective localization of various dermatoses. Tattoo-related systemic diseases and infections have more rarely been described, the most common being sarcoidosis and hepatitis C. However, unusual associations have also been reported, even though they may be anecdotal or likely unrelated with the procedure.”

Alsing, K.K., Johannesen, H.H., Hansen, R.H. & Serup, J. 2020.

“Tattooed patients undergoing magnetic resonance imaging (MRI) can develop cutaneous complications during the procedure. Our aim was to review all published case reports on MRI-induced tattoo complications to identify a possible pattern. So far, 17 cases have been reported. Five (29%) of the cases were in cosmetic tattoos. Symptoms are abrupt and painful with fast onset during MRI, sometimes requiring termination of the procedure. Clinical signs are absent or manifested as inflammation sensed as burning. No thermal skin burns have been recognized. Full recovery is fast, with no sequelae. MRI-induced tattoo complications are uncommon. Patients with cosmetic and traditional tattoos can undergo routine MRI.”

Tattoo Inks and Cancer

Some studies have pointed towards the carcinogenic potential of some tattoo inks, however, there appears to be some evidence that some pro-carcinogenic products may be present in some tattoos. There also appears to be an increase in the increased incidence of malignant melanoma arising in tattoos.

Kluger, N. & Koljonen, V. 2012.

“The introduction in the dermis of exogenous pigments and dyes to obtain a permanent design (tattooing) represents a unique in-vivo situation, where a large amount of metallic salts and organic dyes remain in the skin for the lifetime of the bearer. 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 inks. We extensively reviewed the literature and found 50 cases of skin cancer on tattoos: 23 cases of squamous-cell carcinoma and keratoacanthoma, 16 cases of melanoma, and 11 cases of basal-cell carcinoma. The number of skin cancers arising in tattoos is seemingly low, and this association has to be considered thus far as coincidental.”

Ricci, F., Paradisi, A., Maier, S.A., Kovacs, M., Podda, M., Peris, K. & Abeni, D. 2018.

Background: Malignant melanoma cases arising in tattoos have been increasingly described, however, there is no clear relationship between this practice and the development of cutaneous malignancies.

Objectives: We report a new case of melanoma in a dark-blue tattoo and we review all cases of melanoma reported in the medical literature from 1938 to date.

Materials & methods: Pubmed and Google Scholar were searched using the terms "melanoma tattoo", "tattoo skin tumour" and "ink melanoma".

Results: In most cases, the melanoma occurred on dark blue (10/30), black (8/30), or blue ink (3/30). The Breslow thickness at diagnosis was ≤ 1 mm in 13/30, 1-2 mm in 3/30, 2-4 mm in 2/30, >4 mm in 5/30, and Clark II in 2/30 (not available in 5/30).

Conclusions: Both the incidence of melanoma and the number of tattoos have been increasing in recent years, but a possible carcinogenic effect of tattoos remains unproven. The spread of this decorative custom will make observation of melanoma in tattoos more frequent in dermatological practice, therefore these cases should be reported in national skin cancer registries.

The Position of the Cancer Association of South Africa (CANSAs) on Tattoos

The Cancer Association of South Africa (CANSAs) has taken cognisance of the following findings of various peer-reviewed scientific articles:

- Very little is still known about the biokinetics and safety profile of many tattoo pigments in use
- Controlling the safety of tattoo inks has been unsuccessful due to lacking documentation of clinical and epidemiological relevance
- Some tattoo inks contain heavy metals and non-metal colourants which include: titanium, aluminium, antimony, arsenic, beryllium, chromium, cobalt, lead, nickel, and selenium
- Tattoo pigments can distribute via the lymph and possibly also directly to the blood and a minute fraction may, over time, undergo metabolic breakdown and induce allergic reactions
- Several studies have shed light on the presence of potential carcinogenic or pro-carcinogenic products in tattoo inks.

CANSAs noted from recent scientific research that:

- The risk of health complications due to tattoos is higher if a person has one or more of the following medical conditions
 - A weak immune system (as seen in cancer patients undergoing treatment)
 - Diabetes
 - Skin disorders, such as eczema and psoriasis
 - Allergies
- A group of scientists identified scientific publications which show evidence of tattoo-associated skin cancer, including squamous cell carcinoma, basal cell carcinoma, malignant melanoma, keratoacanthoma, and other rare skin malignancies
- Both the incidence of melanoma and the number of tattoos have increased in recent years, although a possible carcinogenic effect of tattoos remains unproven.

The Position of the Cancer Association of South Africa (CANSAs) on Tattoos and Tattoo Ink

In view of the scientific findings around tattoos and tattoo ink, CANSAs wishes to caution individuals about the possible lurking health-related and possible cancer-specific complications that may arise from having a tattoo.

Individuals who consider having a tattoo should discuss their intention to have a tattoo done with their respective treating physician and/or oncologist prior to having any tattoo procedure done.

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Henna Temporary Tattoos

For additional information on Henna tattoos, kindly refer to CANSA's Fact Sheet and Position Statement on Henna Temporary Tattoos.

Other Temporary tattoos

According to the US Food & Drug Administration (FDA), just because a tattoo is temporary it does not mean that it is risk free. Some consumers report regarding reactions that may be severe and long outlast the temporary tattoos themselves. MedWatch, FDA's safety information and adverse event (bad side effects) reporting programme, has received reports of serious and long-lasting reactions that consumers had not bargained for after getting temporary tattoos. Reported problems include redness, blisters, raised red weeping lesions, loss of pigmentation, increased sensitivity to sunlight, and even permanent scarring.

Medical Disclaimer

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

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Sources and References Consulted and/or Utilised

Alsing, K.K., Johannesen, H.H., Hansen, R.H. & Serup, J. 2020. Tattoo complications and magnetic resonance imaging: a comprehensive review of the literature. *Acta Radiol.* 2020 Dec;61(12):1695-1700.

Boy, H., Bongaerts, E., Slenders, E., Bijmens, E.M., Saenen, N.D., Gyselaers, W., Van Eyken, P., Plusquin, M., Roeffaers, M.B.J., Ameloot, M. & Nawrot, T.S. 2019. Ambient black carbon particles reach the fetal side of human placenta. *Nat Commun.* 2019 Sep 17;10(1):3866. doi: 10.1038/s41467-019-11654-3.

Huisman, S., van der Bent, S.A.S., Maijer, K.I., Tio, D.C.K.S. & Rustemeyer, T. 2020. Cutaneous non-allergic complications in tattoos: an overview of the literature. *Presse Med.* 2020 Dec;49(4):104049.

Jungueira, A.L., Wanat, K.A. & Farah, R.S. 2017. Squamous neoplasms arising within tattoos: clinical presentation, histopathology and management. *Clin Exp Dermatol.* 2017 Aug;42(6):601-606. doi: 10.1111/ced.13183. Epub 2017 Jun 29.

Kluger, N. 2021. Tattoos among athletes: a matter of concern. *J Sports Med Phys Fitness.* 2021 Apr;61(4):600-603.

Kluger, N. 2020. Systemic diseases and infections, anecdotal complications and oddities associated with tattooing. *Presse Med.* 2020 Dec;49(4):104055.

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Kluger, N. & Koljonen, V. 2012. Tattoos, inks, and cancer. *Lancet Oncol.* 2012 Apr;13(4):e161-8. doi: 10.1016/S1470-2045(11)70340-0. Epub 2012 Mar 30.

Laux, P., Tralau, T., Tentschert, J., Blume, A., Dahouk, S.A., Bä Umler, W., Bernstein, E., Bocca, B., Alimonti, A., Coebrook, H., de Cuyper, C., Dähne, I., Hauri, U., Howard, P.C., Janssen, P., Katz, L., Klitzman, B., Kluger, N., Krutak, L., Platzek, Y.T., Scott-Lang, V., Serupp, J., Teubner, W., Schreiber, I., Wilkniß, E. & Luch, A. 2016. A medical-toxicological view of tattooing. *Lancet.* 2016 Jan 23;387(10016):395-402. doi: 10.1016/S0140-6736(15)60215-X. Epub 2015 Jul 23.

McGovern, V. 2005. Metal toxicity: tattoos: safe symbols? *Environ Health Perspect.* 2005 Sep; 13(9): A590.

Paprottka, F.J., Krezdorn, N., Narwan, M., Turk, M., Sorg, H., Noah, E.M. & Hebebrand, D. 2018. Trendy tattoos – maybe a serious health risk? *Aesthetic Plast Surg.* 2018 Feb;42(1):310-321. doi: 10.1007/s00266-017-1002-0. Epub 2017 Nov 9.

Post-mastectomy Tattoo

<https://breastcancernews.org/about-us/news-personal-stories/why-i-chose-get-mastectomy-tattoo>

Ricci, F., Paradisi, A., Maier, S.A., Kovacs, M., Podda, M., Peris, K. & Abeni, D. 2018. Melanoma and Tattoos: a case report and review of the literature. *Eur J Dermatol.* 2018 Feb 1;28(1):50-55. doi: 10.1684/ejd.2017.3184.

Serup, J. 2017. From technique of tattooing to biokinetics and toxicology of injected tattoo ink particles and chemicals. *Curr Probl Dermatol.* 2017;52:1-17. doi: 10.1159/000450773. Epub 2017 Mar 10.

Simunovic, C. & Shinohara, M.M. 2014. Complications of decorative tattoos: recognition and management. *Am J Clin Dermatol.* 2014 Dec;15(6):525-36. doi: 10.1007/s40257-014-0100-x.

Tattoo

<https://www.ahchealthenews.com/2016/12/01/know-getting-tattoo-2/>

Tattoo Ink

<https://www.scienceinschool.org/content/science-under-your-skin-activities-tattoo-inks>

<https://naturallysavvy.com/care/are-tattoos-safe-the-truth-about-tattoo-inks/#:~:text=Tattoo%20inks%20may%20be%20made,and%20used%20as%20automobile%20paint.>

https://www.eurekalert.org/pub_releases/2005-03/acs-it030705.php

https://azdailysun.com/nau-chem-majors-tackle-tattoo-ink/article_4b70a8dd-0495-5116-9e32-e71caadc2910.html

Tattoos

<https://www.healthline.com/health/beauty-skin-care-tattoos-piercings#healthrisks>

<https://www.mymed.com/health-wellness/body-modifications/the-complete-guide-to-tattoos/types-of-tattoos>

US Food and Drug Administration (FDA)

FDA Advises Consumers, Tattoo Artists, and Retailers to Avoid Using or Selling Certain Tattoo Inks Contaminated with Microorganisms

<https://www.fda.gov/cosmetics/cosmetics-recalls-alerts/fda-advises-consumers-tattoo-artists-and-retailers-avoid-using-or-selling-certain-tattoo-inks>

<https://www.fda.gov/consumers/consumer-updates/temporary-tattoos-may-put-you-risk>