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Think Before You Ink – US-FDA Measures for Tattoos and Permanent Makeup

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ABSTRACT

A tattoo is a form of body modification by inserting indelible ink into the dermis of the skin to change the pigment. Permanent makeup is a cosmetic technique which employs tattoos as a means of producing designs that resemble makeup. In the United States, the percentage of adults with minimum one tattoo has increased from 21% in 2012 to around 38% in 2016. The process of tattooing exposes the recipient to risks of infections with various pathogens, which are serious and difficult to treat. Other risks include allergic reactions, swelling and burning, granulomas, keloid formation and complications with MRI. Removal of tattoo is cumbersome. The pigments used in the inks are color additives, which are subject to premarket approval under the Federal Food, Drug, and Cosmetic Act. However, because of other competing public health priorities and a previous lack of evidence of safety problems specifically associated with these pigments, FDA traditionally has not exercised regulatory authority for color additives on the pigments used in tattoo inks. FDA only monitors problems from tattoos and permanent make-up and alerts the public when they become aware of a problem. Consumers should be aware of the risks involved in order to make an informed decision. FDA urges consumers and healthcare providers to report adverse reactions from tattoos, permanent makeup, and temporary tattoos, as well as problems with tattoo removal. But it's high time that FDA takes a strong call on this matter and strictly regulates these practices to prevent further harm to public.

Keywords: Tattoo, US-FDA, Permanent Makeup, Regulations

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INTRODUCTION

A tattoo is a form of body modification, made by inserting indelible ink into the dermis layer of the skin to change the pigment. The American Academy of Dermatology distinguishes five types of tattoos: traumatic tattoos, also called "natural tattoos", that result from injuries; amateur tattoos; professional tattoos, both via traditional methods and modern tattoo machines; cosmetic tattoos, also known as "permanent makeup"; and medical tattoos¹.

Tattooing involves the placement of pigment into the skin's dermis, the layer of dermal tissue underlying the epidermis. After initial injection, pigment is dispersed throughout a homogenized damaged layer down through the epidermis and upper dermis, in both of which the presence of foreign material activates the immune system's phagocytes to engulf the pigment particles. As healing proceeds, the damaged epidermis flakes away (eliminating surface pigment) while deeper in the skin granulation tissue forms, which is later converted to connective tissue by collagen growth. This mends the upper dermis, where pigment remains trapped within fibroblasts, ultimately concentrating in a layer just below the dermis/epidermis boundary. Its presence there is stable, but in the long term (decades) the pigment tends to migrate deeper into the dermis, accounting for the degraded detail of old tattoos.¹

Permanent makeup is a cosmetic technique which employs tattoos as a means of producing designs that resemble makeup, such as eye lining and other permanent enhancing colors to the skin of the face, lips, and eyelids. It is also used to produce artificial eyebrows, particularly in people who have lost them as a consequence of old age, disease, such as alopecia totalis, chemotherapy, or a genetic disturbance, and to disguise scars and white spots in the skin such as in vitiligo. It is also used to restore or enhance the breast's areola², such as after breast surgery. Refer Figure 1 and Figure 2



Figure 1: Tattoo on hand



**Figure 2: Permanent makeup
Before and after**

Because it requires breaking the skin barrier ², tattooing carries health risks including infection and allergic reactions. As with tattoos, permanent makeup may have complications, such as allergies to the pigments, formation of scars, granulomas and keloids, skin cracking, peeling, blistering and local infection. Most commonly called permanent cosmetics, other names include micropigmentation, and cosmetic tattooing, the latter being most appropriate since permanent makeup is, in fact, tattooing. In the United States and under similar arrangements in some other countries, the colourant additives used in permanent makeup pigments are subject to pre-market approval as cosmetics and or color additives under the Federal Food, Drug, and Cosmetic Act. However, because of other competing public health priorities and a previous lack of evidence of safety problems specifically associated with these pigments, FDA traditionally has not exercised regulatory authority for color additives on the pigments used in tattoo inks.

DISCUSSION:

Some get tattoos for beauty, self-expression, or cultural events. Traditional (i.e., decorative) and cosmetic tattoo procedures have been performed for thousands of years. Cosmetic tattoos or “permanent cosmetics” are used to reshape, recolor, recreate, or modify eye shadow, eyeliner, eyebrows, lips, beauty marks, and cheek blush. Additionally, permanent cosmetics are used aesthetically to enhance nipple-areola reconstruction procedures and for other applications. Unfortunately, there is much confusion regarding the overall safety aspects of permanent cosmetics.

Types of Tattoos: ³

Permanent Tattoo: A needle inserts colored ink into your skin. Permanent tattoos last a lifetime.

Permanent Make-Up: A needle inserts colored ink into your skin to look like eyeliner, lip liner, eyebrows or other make-up.

Henna: Plant dye called henna or Mehdi is used to stain your skin.

Black Henna: Developed from henna, may contain hair dye or other dye to darken the stain and make it last longer.

'Sticker' Temporary Tattoo: A tattoo design is on a coated paper. It is put on your skin with water. Temporary tattoos may last up to 3-4 weeks. Sticker tattoos last hours to days.

Safety and Regulatory Background: ⁴

FDA considers the inks used in intradermal tattoos, including permanent makeup, to be cosmetics. When a safety problem identified is associated with a cosmetic, including a tattoo ink it is investigated and action is taken, as appropriate, to prevent consumer illness or injury. The

pigments used in the inks are color additives, which are subject to premarket approval under the Federal Food, Drug, and Cosmetic Act. However, because of other competing public health priorities and a previous lack of evidence of safety problems specifically associated with these pigments, FDA traditionally has not exercised regulatory authority for color additives on the pigments used in tattoo inks. The actual practice of tattooing is regulated by local jurisdictions.

During 2003 and 2004, FDA became aware of more than 150 reports of adverse reactions in consumers to certain permanent makeup ink shades, and it was possible that the actual number of women affected was greater. The inks associated with this outbreak were voluntarily recalled by the company that marketed them in 2004. In the spring of 2012, reports were received of infections from contaminated inks, resulting in their recall and market withdrawal. In addition, concerns raised by the scientific community regarding the pigments used in tattoo inks have prompted FDA to investigate their safe use. FDA continues to evaluate the extent and severity of adverse events associated with tattooing and is conducting research on tattoo inks. As new information is assessed, FDA will consider whether additional actions are necessary to protect public health.

In addition to the reported adverse reactions, areas of concern include tattoo removal, infections that result from tattooing and the increasing variety of pigments and diluents being used in tattooing. More than fifty different pigments and shades are in use, and the list continues to grow. Although a number of color additives are approved for use in cosmetics, none is approved for injection into the skin. Using an unapproved color additive in a tattoo ink makes the ink adulterated. Many pigments used in tattoo inks are not approved for skin contact at all. Some are industrial grade colors that are suitable for printers' ink or automobile paint. Refer Figure 3 and Figure 4



Figure 3: Infection due to tattooing

Figure 4: Granuloma due to tattooing

Nevertheless, many individuals choose to undergo tattooing in its various forms. For some, it is an aesthetic choice or an initiation rite. Some choose permanent makeup as a time saver or because they have physical difficulty applying regular, temporary makeup. For others, tattooing is an adjunct to reconstructive surgery, particularly of the face or breast, to simulate natural

pigmentation. People who have lost their eyebrows due to alopecia (a form of hair loss) may choose to have "eyebrows" tattooed on, while people with vitiligo (a lack of pigmentation in areas of the skin) may try tattooing to help camouflage the condition.

Whatever their reason, consumers should be aware of the risks involved in order to make an informed decision.

FDA's Role: FDA-

- has not approved any inks for injecting into your skin.
- has not approved henna or hair dye for use on your skin. Some people have reported serious skin problems after using henna or black henna.
- does not regulate tattoo parlours.
- does monitor problems from tattoos and permanent make-up.

Tattoo Pigment Components⁵

Tattoo pigments are composed of inorganic and synthetic organic pigments. Inorganic tattoo pigments obtained from mineral sources such as metal oxides, salts, and minerals. Magnetite ($\text{FeO}\cdot\text{Fe}_2\text{O}_3$) and charcoal (C) are often found in black tattoo ink; hematite (Fe_2O_3) and cinnabar (HgS) are used in red ink; limonite ($\text{FeO}\cdot\text{OH}\cdot n\text{H}_2\text{O}$) is used for yellow pigment; corundum (Al_2O_3), rutile (TiO_2), and zincite (ZnO) are used for white pigment, and blue pigment can be achieved with ferric ferrocyanide ($\text{Fe}_4\text{Fe}(\text{CN})_{63}$) and cobaltous aluminate (CoAl_2O_4). These compounds are naturally occurring, but they may fade or change color over time. Mercury and cadmium salts are no longer found in tattoo inks because of their toxicity. Synthetic organic pigments, such as anthraquinone (yellow), phthalocyanine (blue, green), azo (mostly yellow, orange, red, magenta, purple), and indigoid (violet–blue), are synthesized chemical compounds that create brighter, more-diverse colors. Newer fluorescent inks may even glow under black light. In addition to pigment, tattoo inks contain diluents and preservatives, such as glycerin or ethanol, which facilitate the dyeing process in the skin.

Risks Involved in Tattooing:⁶

The following are the primary complications that can result from tattooing:

Infection:

Unsterile tattooing equipment and needles can transmit infectious diseases, such as HIV, hepatitis, and skin infections caused by *Staphylococcus aureus* ("staph") and other bacteria. People with tattoos received at facilities not regulated by state or at facilities that use unsterile equipment (or re-use ink) should be prevented from being accepted as a blood or plasma donor for twelve

months. Infections also have resulted from contaminated tattoo inks, even when the tattoo artist has followed hygienic procedures. These infections can require prolonged treatment with antibiotics.

Removal problems:

Despite advances in laser technology, removing a tattoo is a painstaking process, usually involving several treatments and considerable expense. Complete removal without scarring may be impossible.

Allergic reactions:

Although FDA has received reports of numerous adverse reactions associated with certain shades of ink in permanent makeup, marketed by a particular manufacturer, reports of allergic reactions to tattoo pigments have been rare. However, when they happen they may be particularly troublesome because the pigments can be hard to remove. Occasionally, people may develop an allergic reaction to tattoos they have had for years.

Granulomas:

These are nodules that may form around material that the body perceives as foreign, such as particles of tattoo pigment.

Keloid formation:

If one is prone to developing keloids -- scars that grow beyond normal boundaries, they are at risk of keloid formation from a tattoo. Keloids may form any time the person injures or traumatizes their skin.

MRI complications:

There have been reports of people with tattoos or permanent makeup who experienced swelling or burning in the affected areas when they underwent magnetic resonance imaging (MRI). This seems to occur only rarely and apparently without lasting effects. There have also been reports of tattoo pigments interfering with the quality of the MRI image. This seems to occur mainly when a person with permanent eyeliner undergoes MRI of the eyes.

Photosensitivity is also another problem.

A Common Problem: Dissatisfaction

A common problem that may develop with tattoos is the desire to remove them. Removing tattoos and permanent makeup can be very difficult. Although tattoos may be satisfactory at first, they sometimes fade. Also, if the tattooist injects the pigments too deep into the skin, the pigments may migrate beyond the original sites, resulting in a blurred appearance.

Another cause of dissatisfaction is that the human body changes over time, and styles change with the season. The permanent makeup that may have looked flattering when first injected might later clash with changing skin tones and facial or body contours. People who plan to have facial cosmetic surgery are advised that the appearance of their permanent makeup may become distorted. The tattoos that seemed stylish at the time may become dated and embarrassing later on.

Refer Figure 5



Figure 5: Adverse reactions due to Permanent makeup

Removing Tattoo: ⁷

Permanent tattoos can be hard and painful to remove. It may take several treatments that cost a lot of money.

- may not be able to completely remove the tattoo.
- could get a scar when the tattoo is removed.

Laser Removal:

The FDA has approved certain laser devices to remove tattoos. Lighter colors such as yellow, green, and red are more difficult to remove than darker colors such as dark blue and black. It may take 6-10 treatments to remove a tattoo. Some side effects may include bleeding, redness or soreness.

Surgery:

Tattoos can sometimes be removed by cutting out the tattooed skin then sewing the skin back together. Other times, the skin can be sanded down to remove the tattoo.

Ointments and Creams:

The FDA does not approve tattoo removal ointments and creams or do-it-yourself tattoo removal kits. These products may cause skin rashes, burns or scars.

Dermabrasion involves abrading layers of skin with a wire brush or diamond fraise (a type of sanding disc). This process itself may leave a scar.

Salabrasion in which a salt solution is used to remove the pigment, is sometimes used in conjunction with dermabrasion, but has become less common.

Scarification involves removing the tattoo with an acid solution and creating a scar in its place.

Camouflaging a tattoo entails the injection of new pigments either to form a new pattern or cover a tattoo with skin-toned pigments. However, the injected pigments tend not to look natural because they lack the skin's natural translucence

The FDA is concerned that consumers may be continuing to use contaminated inks for tattoos. FDA became aware of a problem after testing inks and needles included in tattoo kits marketed by White and Blue Lion, Inc. White and Blue Lion recalled these contaminated products on July 11, 2014, but the FDA is concerned that consumers may have purchased such products from other distributors.

The inks in question may be identified by a dragon logo on the packaging and lacks the name and address of the manufacturer. FDA regulations require that the manufacturers name and address appear on the product label. The inks were sold in multiple forms: as single units, in sets, and in tattoo kits. Using these inks for tattoos could cause infection. The FDA has confirmed one case of skin infection involving an individual that used White and Blue Lion tattoo products. The agency is aware of other reports linked to tattoo products with similar packaging.

The FDA is warning consumers not to use tattoo inks and tattoo kits that are part of the recall or that are missing essential information, such as the name and place of business of the manufacturer or distributor. The inks are sold singly and in kits containing anywhere from five to 54, or perhaps more, bottles of ink of various colors. Some of the inks are intended for permanent makeup, as well as for traditional body tattoos. Containers may be marked with “Lotch” and Batch numbers, and “Date produced” and “Best if used by” dates.

MRI Interference:⁸

Traditional (i.e., decorative) and cosmetic tattoo procedures have been performed for thousands of years. Unfortunately, there is much confusion regarding the overall safety aspects of permanent cosmetics. For example, based on a few reports of symptoms localized to the tattooed area during MR imaging, many radiologists have refused to perform examinations on individuals with permanent cosmetics, particularly tattooed eyeliner. This undue concern for possible adverse events prevents patients with cosmetic tattoos access to an important diagnostic imaging technique. While it is well-known that permanent cosmetics and tattoos may cause artifacts and both cosmetic and decorative tattoos may be associated with relatively minor, short-term cutaneous reactions, the frequency and severity of soft tissue reactions or other problems related to MR imaging and

cosmetic tattoos is unknown. In 2002, Tope and Shellock conducted a study to determine the frequency and severity of adverse events associated with MR imaging in a population of subjects with permanent cosmetics. A questionnaire was distributed to clients of cosmetic tattoo technicians. This survey asked study subjects for demographic data, information about their tattoos, and for their experiences during MR imaging procedures. Results from 1,032 surveys were tabulated. One hundred thirty-five (13.1%) study subjects underwent MR imaging after having permanent cosmetics applied. Only two individuals (1.5%) experienced problems associated with MR imaging. One subject reported a sensation of "slight tingling" and the other reported a "burning" sensation. Both incidents were transient and did not prevent the MR procedures from being performed. Based on these findings and additional information in the peer-reviewed literature, it appears that MR imaging may be performed in patients with permanent cosmetics without serious soft tissue reactions or adverse events. Therefore, the presence of permanent cosmetics should not prevent a patient from undergoing MR imaging.

Interestingly, decorative tattoos tend to cause worse problems (including first- and second-degree burns) for patients undergoing MR imaging compared to those that have been reported for cosmetic tattoos. With regard to decorative tattoos, a second-degree burn can occur on the skin. The heating could have come either from oscillations of the gradients or, more likely from the RF-induced electrical currents. However, the exact mechanism(s) responsible for complications or adverse events in the various cases that have occurred related to decorative tattoos is unknown. Additionally a patient might experience a sudden burning pain at the site of a decorative tattoo while undergoing MR imaging using a 1.5-Tesla MR system. Swelling and erythema may resolve within 12 hours, without evidence of permanent sequelae.

Tattoo Ink Research:⁹

In a laboratory within FDA's Arkansas-based National Center for Toxicological Research (NCTR), research chemist Paul Howard, Ph.D., and his team are investigating tattoo inks to find out

- the chemical composition of the inks and how they break down (metabolize) in the body;
- the short-term and long-term safety of pigments used in tattoo inks;
- How the body responds to the interaction of light with the inks.

Some tattoos fade over time or fade when they are exposed to sunlight. And laser light is used to remove tattoos. The research takes into consideration where does the pigment actually go.



Figure 6: Tattooing Equipment



Figure 7: Fluorescent Tattoo Ink

NCTR researchers are exploring several possibilities:

- ❖ The body cells may digest and destroy the ink, just as they rid the body of bacteria and other foreign matter as a defense against infection. NCTR studies show that a common pigment used in yellow tattoo inks, Pigment Yellow 74, may be broken down by enzymes, or metabolized. Just like the body metabolizes and excretes other substances, the body may metabolize small amounts of the tattoo pigment to make it more water soluble, and out it goes.
- ❖ Sunlight may cause the ink to break down so it is less visible. NCTR researchers have found that Pigment Yellow 74 decomposes in sunlight, breaking down into components that are colorless. The pigment components may still be there and it is yet unknown the potential toxicity.
- ❖ The skin cells containing the ink may be killed by sunlight or laser light and ink breakdown products may disperse through the body.

Research has also shown that some pigment migrates from the tattoo site to the body's lymph nodes. Lymph nodes are part of the lymphatic system, a collection of fluid-carrying vessels in the body that filter out disease-causing organisms. Whether the migration of tattoo ink has health consequences or not is still unknown. NCTR is doing further research to answer this and other questions about the safety of tattoo inks.

Legal Loopholes in Tattoo and Permanent Makeup Related Matters:¹⁰

Under the Federal Food, Drug, and Cosmetic Act, tattoo inks are considered to be cosmetics, whereas the pigments used in the inks are color additives that require premarketing approval. This law requires that cosmetics and their ingredients not be adulterated or misbranded, which means, among other things, that they cannot contain poisonous or deleterious substances or unapproved color additives, be manufactured or held in unsanitary conditions, or be falsely labeled.

Furthermore, cosmetic manufacturers are supposed to ensure the safety of a product before marketing it.

However, the FDA does not have the authority to require premarketing submission of safety data from manufacturers, distributors, or marketers of cosmetic products, with the exception of most color additives (dyes, pigments, or other substances used to impart color). The FDA does have the authority to take other actions to protect the public health. For example, the agency can conduct investigations, request that a manufacturer recall violative products, and issue advisory letters. The agency can also request that the Department of Justice conduct seizures, enjoin a firm or person from manufacturing or distributing products, or file criminal charges against a firm or responsible persons on behalf of the FDA.

'FDA-Approved Colors' - a Regulatory Myth: ⁵

One shouldn't be lured by ads claiming a practitioner uses FDA-approved colors. They're misrepresenting themselves and the profession. FDA approves colors only for specified end uses. When someone says "FDA-approved colors," we have no way of knowing whether the approval applies to cosmetics, food, or automotive paint, but one thing is certain: no color additive has ever been FDA-approved for injecting under the skin.

Complicating the issue is the fact that some pigments are mixtures of materials and are not required to have ingredients labeled because they're not sold to consumers. These mixtures can be so complex it is very difficult for tattooists to know what they're using.

Through its Cosmetics Adverse Reaction Monitoring program (CARM), the FDA urges consumers and health-care providers to report adverse reactions to tattoos and permanent makeup and problems with removal.

Approved color additives are listed in the U.S. Code of Federal Regulations (21 CFR Parts 73, 74, 82), but this approval does not extend to injected use. No color additives are Food and Drug Administration (FDA) approved for injection into the skin (21 CFR 70.5b) (www.fda.gov). Therefore, no tattoo pigments are approved for use. The majority of tattoo ink is industrial-grade color intended for use as printer ink or automobile paint. Although tattoo ink is subject to regulation by the FDA, state and local health authorities regulate the practice of tattooing, including those performed in salons and tattoo parlors. These departments mainly regulate sanitation requirements and prohibit tattooing minors.

Statistical count: ¹¹

- 1988 to 2003 – FDA received only five reports of adverse reactions
- 2003 to 2004 – FDA received more than 150 reports of adverse reactions

Case Study: ^{12, 13} *FDA Action – Starbrite Ink Contamination*

In 2004 Belgium withdrew “Starbrite Colors” tattoo ink from the market because of microbial contamination. FDA analyses found bacteria (*Pseudomonas aeruginosa*) and mold (*Acremonium*). This resulted in manufacturer recall of Starbrite ink (Class II, reversible injury). Starbrite ink became contaminated because the manufacturer removed alcohol preservative from their ink formula.

Regulation of Tattooing in Other Countries: ¹¹

- **E.U.** - Tattoos are “non-food products,” not cosmetics- Pigments and implements are being assessed
- **Canada**- Infection control guidelines- In partnership with provincial and territorial governments; Developed for tattoo practitioners
- **Australia and New Zealand** – Regulation is aimed at infection control; Oversight by individual States and Territories; Legislation does not address irritation, allergy, trauma

CONCLUSION

In light of the recent tattoo ink–related outbreaks of various adverse happenings specially non-tuberculous mycobacterial infection, the FDA is committed in pursuing educational and outreach efforts to health care providers, public health officials, consumers, and the tattoo industry. The message is to seek to raise awareness, improve diagnosis, and encourage adverse-event reporting, with the intent of preventing future infections. The FDA encourages health care providers, public health officials, consumers, and tattoo artists to use Med Watch to report to the FDA any tattoo-related infections and any other adverse events related to tattooing. The agency will continue to collaborate with other public health partners in investigating reported adverse events, identifying root causes, and taking the actions necessary to prevent future illnesses. ^{14, 15}

A rise in the number of cosmetic tattoo procedures being performed has prompted further FDA investigation of tattoo ink safety. Adverse reactions to tattoo inks are becoming more common, and the number of complaints is likely greatly underreported.

Consumers and medical professionals are encouraged to report adverse reactions from permanent makeup to the FDA to promote FDA regulation of cosmetic tattoo inks (http://www.fda.gov/ora/fed_state/Small_business/sb_guide/regions.htm).

REFERENCES:

1. Wikipedia. Internet. Available at: <https://en.wikipedia.org/wiki/Tattoo>
2. Wikipedia. Internet. Available at: https://en.wikipedia.org/wiki/Permanent_makeup

3. USFDA Official site. Tattoos and Permanent Makeups. Internet. Available at: <http://www.fda.gov/ForConsumers/ByAudience/ForWomen/ucm118568.htm>
4. USFDA Official site. Tattoos and Permanent Makeups: Fact-sheet. Internet. Available at: <http://www.fda.gov/Cosmetics/ProductsIngredients/Products/ucm108530.htm>
5. Rising Concern over Cosmetic Tattoos. Arisa e. Ortiz, md, and Tina s. Alster, md. Internet. Available at: http://www.researchgate.net/profile/Tina_Alster/publication/51809878_Rising_Concern_o ver_Cosmetic_Tattoos/links/00b495319233353dfa000000.pdf
6. USFDA Official site. Tattoos and Permanent Makeups: Fact-sheet. Internet. Available at: <http://www.fda.gov/Cosmetics/ProductsIngredients/Products/ucm108530.htm>
7. USFDA Official site. Tattoos and Permanent Makeups. Internet. Available at: <http://www.biotouch.com/Biotouch/FDA-Tattoos-Permanent-Makeup>
8. Safety Information Article. Tattoos, Permanent Cosmetics, and Eye Makeup. Internet. Available at: <http://www.mrisafety.com/SafetyInfo.asp?SafetyInfoID=228>
9. USFDA Official site. Think before you ink: are tattoos safe? Internet. Available at: <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm048919.htm>
10. USFDA Official site. Think before you ink: are tattoos safe? Internet. Available at: <http://www.fda.gov/Cosmetics/ProductsIngredients/Products/ucm408557.htm>
11. Survey of Studies on Microbial Contamination of Marketed Tattoo Inks. Bonadonna L. Internet. Available at: https://learningcenter.nsta.org/products/symposia_seminars/fall09/fda/files/WS4-12-17-09.pdf
12. Archives of Dermatology. Adverse Effects of Cosmetic Tattooing: An Illustrative Case of Granulomatous Dermatitis Following the Application of Permanent Makeup. Internet. Available at: http://lib.ajaums.ac.ir/booklist/archives%20of%20dermatology_July-7_24.pdf
13. USFDA Official site. A Tattoo for You? Seven Key Questions to Consider. Internet. Available at: <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm316357.htm>
14. USFDA Official site. FDA Warns Tattoo Artists and Consumers Not to Use Certain Tattoo Inks. Internet. Available at: <http://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm457439.htm>
15. Tattoo Ink–Related Infections — Awareness, Diagnosis, Reporting, and Prevention. The New England Journal of Medicine. Pamela M. LeBlanc, M.P.H., Katherine A. Hollinger,

D.V.M., M.P.H., and Karl C. Klontz, M.D., M.P.H. 2012; 367:985-987 September 13, 2012. Internet. Available at: <http://www.nejm.org/doi/full/10.1056/nejmp1206063>

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