

Toxic Tattoo Inks

Enacting Legislation to Eliminate the Sale and Use of Tattoo Inks that Contain Heavy Metals

Tag Words: heavy metals in tattoo ink; tattoo legislation in New Jersey

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Summary: There has been research that confirms the use of various heavy metals in the inks used for tattoos. These heavy metals are dangerous in varying quantities for humans when they are in the blood stream. The focus of this project would be to examine the effects on tattooed individuals with the heavy metals in the tattoo ink. I would discuss the health risks that are more immediate. I would also look into alternative types of inks that do not contain heavy metals. The current solution to this problem is to not get a tattoo or to use alternative inks which do not have the heavy metals. I contacted a member of government who could enforce the regulations on which inks can be sold in the state of New Jersey. In addition I communicated with local tattoo parlors to explain the risks facing their clients.

Video Link: <https://youtu.be/Khg72y8cbcE>

Tattoos and their Risks

In the United States, there are approximately forty-five million people with at least one tattoo in 2013. These people represent around fourteen percent of the country's population (1). Every single one of these people exposed themselves to the rapid ink injections with a needle. The process of tattooing one's body comes with several well-known risks, including getting an infection from the open wound and the various diseases that can be spread if the needles are not properly sterilized. Even if the tattooing procedure is carried out in the most sanitary way, the ink can be a source of medical problems once injected. Following the mixing of the ink, it ought to be sterilized to prevent passing on any pathogens. This does not necessarily happen, but when it does the inks are still not guaranteed to be safe for the users. Manufacturers can supply the market with concoctions of pigments filled with heavy metals and other less than alluring chemicals.

Heavy Metals

The multitude of heavy metals in the tattoo inks are associated with a wide range of dangerous side effects. Despite the well understood research about the individual metals effects on people; there has been relatively little research about what long term exposure to the metals in the inks could lead to, other than the obvious allergic reactions. It is important to first consider which heavy metals are used and they can do to a body. A selection of the metals include:

Mercury, which is a neurotoxin and is consistently linked to brain damage. Mercury is also known to cause other brain related problems, including physical and emotional impairment. Mercury poisoning can lead to symptoms that include the diminished peripheral vision and loss

of coordination. Elemental mercury exposure, (vapor inhalation) leads to the most drastic reactions that include emotional instability and neuromuscular distress (2, 3). Mercury is also a common allergen and even a brief exposure can trigger a reaction.

Lead, which is known to affect most major organs in the body, as well as cause serious mental problems. In the cases of extreme exposure seizures, comas and death are possible. Lead is known to affect humans in specific ways at different ages. Exposed children will often have lowered IQs, delayed development, hearing problems, and anemia. In adults lead is linked to high blood pressure, hypertension, kidney failure, and reproduction difficulties. Pregnant women are particularly at risk because in conjunction with the risks for adults, the growth of their fetuses' can be stunted (2, 4).

Long term exposure to Beryllium can lead to Beryllium Disease. Some of the known symptoms of this disease include weakness, coughing, fever, and difficulty breathing. There is no cure to this disease, however some of the symptoms can be treated. Beryllium poisoning causes heightened chances of getting lung cancer (2, 5).

Cadmium can cause problems with respiratory functions, cardiovascular functions, renal functions, bones, Cancer is one of the major risks of overexposure to Cadmium. Hypertension is a possible side effect as well. Very small amounts of Cadmium can be the source of all of the aforementioned ailments (2).

Arsenic, has the potential to damage the genes of those who have been overly exposed. Long term inhalation can contribute to the occurrence of lung cancer. If the arsenic is ingested, studies have shown that individuals have an increased chance of developing liver or bladder cancer (2, 6).

Phthalates and hydrocarbons, which can cause damage to the liver, kidneys, lungs, and reproductive systems. Black tattoos in particular will contain these compounds. The specific type of phthalates and hydrocarbons found in the black tattoos are called polycyclic aromatic hydrocarbons (PAHs). A considerably dangerous compound found in these inks is called benzo(a) pyrene. It has been identified and categorized by the Environmental Protection Agency as a powerful carcinogen (2). Karin Lehner, Francesco Santarelli, Rudolf Vasold, Randolph Penning, Alexis Sidoroff, Burkhard König, Michael Landthaler, and Wolfgang Bäuml, discussed how PAHs used in tattoo inks do not stay in the tattoos, in their article *Black Tattoos Entail Substantial Uptake of Genotoxic polycyclic Aromatic Hydrocarbons (PAH) in Human Skin and Regional Lymph Nodes*. Through their research they were able to find traces of the PAHs in the lymph nodes of recently deceased individuals with tattoos. There were also significant levels of PAHs in the tattoos (7). The presence of these toxins in both regions strongly indicates that the PAHs in the lymph nodes are directly correlated with the PAHs in the tattoos.

Lack of Regulation

One of the reasons why all of these harmful metals are legally allowed to be in the inks is because there is little regulation of the materials used in tattoos, with the state of New Jersey's laws offering very little clarification about what can and cannot be used. The only explanation of what can be used is, "All dyes used in tattooing shall be non-toxic, non-irritating to tissue, stable to

light and inert to tissue metabolism” (8). With a small explanation that, “Pigments shall not contain talc” (8). So the only explicit regulation is on the use of talc. While the metals are considered toxic and irritating, the language is too weak to be regulatory alone. They have not been proved to be toxic or not, in the scope of their use in tattoos. The evidence that has been collected about what these metals can do to organisms is primarily related to industrial exposure or smoking.

The regulation regarding permanent makeup is slightly more stringent. The only additions to what cannot be used in the pigments in permanent makeup includes, “Pigments shall not contain talc, coal tar or any known carcinogens.” and “Colorants shall be free of acrylic monomers or polymers”(8). Even these few extra words provide some restrictions that can protect the customers. These guidelines are step in the right direction in order to ensure the safety of all who wish to acquire tattoos. Many of the heavy metals are carcinogens, therefore undeniably unacceptable ingredients.

It is imperative for the state governments to regulate the pigments used in tattoos because they are not controlled by the Food and Drug Administration. “The FDA regulates tattoo inks as a cosmetic, which means ingredients are subject to a pre-market approval process” (9). Meaning they are not regulated in the capacity in which they are actually used. Furthermore the, “FDA has not approved any tattoo pigments for injection into the skin. This applies to all tattoo pigments, including those used for ultraviolet (UV) and glow-in-the dark tattoos. Many pigments used in tattoo inks are industrial-grade colors suitable for printers’ ink or automobile paint” (10). The federal government and the FDA has not cleared any of the tattoo inks for use, unfortunately it is up to the states to regulate the tattoo parlors in their borders. Beyond the brief explanation in the New Jersey State Sanitary Code, nothing is done to restrict the application of tattoo inks containing heavy metals.

Legal Action

Due to the harmful nature of the heavy metals used in tattoo inks, there was a lawsuit in California filed by the American Environmental Safety Institute. It was explained in the court document produced during this lawsuit regarding the legal process that ensued:

On or about July 24, 2003, the Institute served a 60-Day “Notice of Violation of Proposition 65” (the “Notice”) on the California Attorney General, the District Attorneys of every county in California, the City Attorneys of every California city with a population greater than 750,000, and on the Defendant, alleging that Defendant was in violation of the Safe Drinking Water and Toxic Enforcement Act of 1986, Health and Safety Code 25249.5 et seq. (“Proposition 65”) for failing to warn purchasers of Unimax’s Products sold in California that use these Products expose users to Antimony, Arsenic, Beryllium, Cobalt, Lead and Lead compounds, Nickel and Selenium (collectively “Heavy Metals”) (11).

Following this case, the company Unimax is required to place a warning on its products that explains, “Warning: Tattoo inks and pigments contain toxic metals, including Arsenic, Lead, Nickel and others, all of which are known to the State of California to cause cancer or birth defects and other reproductive harm” (11). This kind of warning gives the individuals purchasing the tattoos a better understanding of the possible consequences of using inks with heavy metals. This lawsuit did not change what can be sold. It does bring the For now it is still the tattoo

parlors and the buyers responsibility to seek out tattoo inks that are a less dangerous, however with the proper legal restrictions it could be the obligation of the ink manufacturers to develop inks that do not require this label.

Precautionary Principle

Lawsuits are a way to enact protective legislation. An alternative would be to take the route of the precautionary principle. While there is ample research in the area of the effects of the heavy metals on humans, currently there is little research if the inks contain the heavy metals are harmful for humans. For the time being, an alternative to just guessing that these inks won't cause harm along the way, would be to eliminate sales of the products with heavy metals. This kind of reaction would not be out of the ordinary. A little over ten years ago many of the large electronics companies removed heavy metals from their products. They had to change their production policy to remain competitive in the European market that had implemented policies that forbade the use of heavy metals in electronics. The precautionary principle is relevant under the assumption that, without thorough investigation there is a responsibility to protect people from the harm that has been explained in previous paragraphs.

Medical Complications

MRI

Tattoos have been linked to an array of medical complications. A more severe consequence of tattoos is a higher sensitivity to MRI machines. During an examination, MRIs strong magnetic fields and radio waves are used to produce an image of the observed body. Negative reactions have been strongly linked to tattoos with ferrous oxide and weakly linked to tattoos without ferrous oxide, but the inks still contain heavy metals.

Tattoos with ferrous oxide are more likely to induce the caustic reaction. It is believed when these tattoos are exposed to the magnets, the reaction between the highly powered magnet and the heavy metals in the inks will generate an electric current. This current will cause the skin temperature to rapidly rise to cause a cutaneous burn (12). This is outlined in a paper called, *Tattoo-Induced Skin "Burn" During Magnetic Resonance Imaging in a Professional Football Player*. This paper explains that professional athletes are currently among the best test subjects for understanding why MRIs cause cutaneous burns in people with tattoos. Professional and semi-professional athletes will often have many MRIs during and following their careers. It is also a growing trend for athletes to get many tattoos throughout their bodies. The case report presented in this paper explains that the otherwise healthy, but injured player experienced a burning sensation around tattoos during a normal MRI scan. It resulted in swelling in the area and erythema around the tattoos. Shortly after the MRI, all of the physical reactions subsided and eventually went back to normal. This reaction is not the first of its kind and the FDA does warn people who decide to get tattoos that reactions are possible. They are also warned to communicate with their physician to explain additional precautions may be necessary (10).

Nonferrous tattoos were assumed to not cause the cutaneous burns, however a woman with permanent makeup proved that it is still very possible for burns to occur. During the procedure she experienced the same type of burning sensation as the football player. Upon examination by

her doctor found an erythema similar to the football players on her upper eyelids, where the permanent make-up had been applied (13). Her makeup still included other heavy metals including lead and mercury. Not unlike cases with ferrous oxide, shortly after the exam the reaction subsided. This case study evidenced the very real possibility for any tattoo with any metals in them to cause first degree burns.

Allergic Reactions

Many of the heavy metals will cause what would be classified as allergic reactions, however two in particular, mercury and nickel are well known allergens with distinguishable reactions. Mercury is found in shellfish, therefore individuals allergic to shellfish should take precautions to avoid red inks for their tattoos. These inks will often have mercury in detectable levels. Nickel, like silver or gold, is capable of causing skin irritations. The typical reactions include a burning sensation or the skin touching and around the metal will turn green or yellow. This has become such a common allergy, you can walking into any piercing parlor to find hypoallergenic options that are nickel free. Nickel allergies can develop with time and people are not necessarily born with them. If a person were to develop this allergy after the application of a tattoo containing nickel, the reaction could persist for extended periods of time. If a person has either of these allergies then their tattoo will probably cause long term problems and likely need to be removed (14).

Medical Tattoos

Beyond the sometimes pleasing or shocking aesthetics that tattoos provide, they can serve another purpose. Recently a woman named Basma Hameed, from Canada has been using tattoo's to cover extremely damaged skin. She matches the tattoo colors to the skin tone of her patrons to hide evidence of damage. The people that seek treatment from her require tattoos to cover areas where the burns have left regions of skin without the individual's original pigmentation. In extreme cases all of the pigment has been burned off. These tattoos are often the only way to restore color to the affected regions (15). This unique kind of service could easily be provided anywhere, including in New Jersey. Burns are very prone to infection and if the inks used for these medicinal tattoos are not safe for the user, their already serious condition could become exacerbated.

Tattoo Removal

Tattoos are intended to be permanent. The pigments are not supposed to be moved once they are applied. There are many methods for removing the physical appearance of the tattoo. The oldest removal method involves scraping the skin off. More modern techniques include using a laser treatments or skin grafts. Katy Burris, MD and Karen Kim, MD discuss the primary processes that go into removing tattoos in *Tattoo Removal*, including explanations of several of the different laser options. The best option is Q-switching which allows the dermatologists to blast a powerful pulse of energy that will hit the tattoo in order to break up the pigment. This process allows for selective photothermolysis (16). The laser treatment is considered the most effective, however it is not always and then the patient is left with scars or poorly faded tattoos. Moreover, this process does not remove the pigments from patients' skin, instead they are broken up and are free to move into the bloodstream.

Conclusion

Previous research papers concluded that there is not enough evidence to prove one way or another if the heavy metals in the inks have negative long term effects. I would also conclude, again like my predecessors, to encourage banning the heavy metals from the tattoo inks, until further studies can come to conclusions. If they are proven to be harmless, only then may products containing heavy may be sold in the market. If conclusive proof can be drawn that the inks will cause long term harm, then an effective permanent ban should be put into place. Given the short term problems caused with using inks containing the heavy metals, manufacturers should provide inks without the metals regardless of legislation in order to protect the consumer.

Community Action: Providing alternative ink options, communicating with tattoo associations, and informing legislators.

The easiest solution to avoiding complications from a tattoo would be to completely abstain from getting them. This is also completely unrealistic with growing cultural trends. Tattoos are very integrated into American culture and are considered a vital form of self-expression. The realistic solution is to provide access to safer options while eliminating access to potentially toxic inks. The following table provides a comparison between the harmful and safe options for different ink colors.

Table 1

Ink Color(s)	Toxic Contents	Alternative Contents
White and Black	Iron Oxide (Fe ₃ O ₄) and (FeO) Phthalates hydrocarbons	Black: Carbon Logwood White: Titanium dioxide
Yellow, Greens and Blues	Cadmium sulfide Chrome Yellow (PbCrO ₄ , often mixed with PbS)	Yellow: Turmeric Green: Monoazo -carbon based Blue: Sodium Aluminum Copper-for those who are not allergic
Reds and Purples	Iron oxide (Fe ₂ O ₃) (rust) Cinnabar Cadmium red	Red: Naphthol-may still cause problems In general red tattoo inks should be avoided as much as possible Purple: Dioxazine

		Carbazole
Neon		None

(17)

Companies that Provide Safer Tattoo Ink

Since regulation of tattoo inks falls to the states, New Jersey Government officials that can introduce measures to further regulate tattoo inks have been contacted. A list of reputable tattoo ink companies that are known to monitor their contents were provided to these legislators. Due to many companies refusal to provide actual ingredients, my explanations are based on claims about their inks. In addition to requesting that our legislators enact legislation ban the use of inks with heavy metals in them in all New Jersey tattoo parlors, a letter was sent to tattoo associations to inform them about the safer inks and suggest that they at least I also intend to write a letter to several local tattoo parlors and implore them to consider using heavy metal free inks or vegan inks.

After searching in forums and on the websites of tattoo ink manufactures, the following companies provide the safest tattoo inks:

1. Intenze Tattoo Ink - <http://www.intenzetattooink.com/i/>
Intenze is a tattoo company that manufactures their inks in New Jersey. They provide documentation about all of their inks. Chemical Technology Lab Certificates (CTL) and Materials Safety Data Sheets (MSDS) are provided on their website. The CTLs provided include, Aromatic Amines, Dyestuff, Heavy Metals, PAH (PAK), and Sterility.

An example of their ink is American Rose. The following links are specific to this Intenze ink. These documents are provided for their other inks as well.

Aromatic Amines: http://www.intenzetattooink.com/media/pdfdir/CTL/CTL_Aromatic_Part1.pdf

Dyestuff: http://www.intenzetattooink.com/media/pdfdir/CTL/CTL_Dyestuff_Part1.pdf

Heavy Metals: http://www.intenzetattooink.com/media/pdfdir/CTL/CTL_HeavyMetals_Part1.pdf

PAH(PAK): http://www.intenzetattooink.com/media/pdfdir/CTL/CTL_PAH_Part1.pdf

Sterility: http://www.intenzetattooink.com/media/pdfdir/CTL/CTL_Sterility_Part1.pdf

MSDS: <http://www.intenzetattooink.com/i/app/uploads/2014/10/American-Rose.pdf>

2. Alla Prima Ink- <http://www.allaprimaink.com/Alla-Prima-Tattoo-inks-s/107.htm>
Alla Prima provides high quality vegan tattoo inks.
3. Eternal Ink, Incorporated- <http://www.eternaltattooink.com/?act=view&page=Home>
Eternal Ink is vegan and a non-acrylic ink
MSDS: <https://drive.google.com/file/d/0B9IUCBT9X3zcVzBsQzl5UzFiZDQ/view>
The following chemical information is for the inks distributed in the United Kingdom and not necessarily in the United States.

CTS: <http://www.eternalinks.co.uk/application/files/Eternal-Certs.PDF>

Dyestuff: <http://www.eternalinks.co.uk/application/files/Eternal-Certs3.PDF>

Aromatic Amines and Carcinogen Test: <http://www.eternalinks.co.uk/application/files/CTL%20Aromatic%20Amines%20and%20Carcinogens%20Test.PDF>

Tattoo Associations Contacted:

Alliance of Professional Tattooists, Inc.

The Association of Professional Tattoo Artists

Tattoo Artists' Guild

True Artists

Letter to Tattoo Associations

To whom it may concern:

As a college student, I see the artwork that some of the local tattoo artists create on my friends and peers. I see how getting these tattoos are a source of pride and happiness. I hope to make their future tattoo purchases better and safer. Many states and the FDA do not regulate the contents of tattoo ink. It is very possible that the inks purchased by tattoo artists contain heavy metals including mercury, arsenic, nickel, and lead.

In consideration of their customers, I am requesting that you inform tattoo parlors about the availability of safer inks and ones that are considered vegan/organic. Companies that manufacture these inks include: Intenze Tattoo Ink, Alla Prima Ink, Skin Candy, Formula 51, and Eternal Ink. The availability of vegan organic tattoo inks, which certify that they are not derived from animal products, could broaden the tattoo parlors customer base to those that avoid animal products. Additionally, heavy metal-free and organic inks would appeal to many as personal and public health is becoming a greater concern with the general population. These inks may be more expensive than other competing brands, but consumers would likely gladly pay a few extra dollars for something they consider safer. Based on reviews online about these inks, it appears that the quality of the inks are above average as both tattoo artists and customers were very satisfied with the end product. The resulting tattoos tended to be brighter, didn't fade as much, and were less prone to infection.

Customers know that the tattoos they purchase are permanent. They are looking for a tattoo that will keep looking good for their entire lives. Many tattoo shops also have piercing sections, with nickel-free jewelry for customers with the allergy. Purchasing inks without nickel, can give customers with a nickel allergy the opportunity to get a tattoo without having to worry about any kind of adverse reaction.

I truly hope you consider informing tattoo artists about the benefits of switching to or at least offering these safer inks.

Sincerely,

H. Poisner

with

Julie M. Fagan, Ph.D.
Rutgers University

Letter to Our NJ Legislators

When our legislators submit and approve of legislation, it can not only make significant differences to the lives of their constituents, but it can also drive industry. Making changes to industry standards requires that the industry have in place the “infrastructure” to accommodate such changes.

We are writing to our NJ Senators to request that they propose a bill to prevent the sale and use of tattoo inks containing heavy metals. The majority of tattoo artists currently use (and stock) inks with heavy metals even though safer inks are available,. It would be expected that, if legislation were to pass to prevent the use of tattoo inks with heavy metals, that there would be some scramble to obtain the safer inks in order to comply with the new legislation. However, knowing that such a bill was proposed would provide awareness about what was coming down the pike and enable the tattoo parlors to take action well in advance of the bill being passed into law. Awareness of such a bill may also drive the ink manufacturers to reformulate their inks to meet the new safety standards.

Dear Senator _____,

As of now New Jersey legislation, with regards to tattoos and permanent make-up, does not provide language that prevents the use of inks that do not contain heavy metals. This means that tattooed citizens can have lead, arsenic, mercury, or iron oxide (rust) injected into their skin. All of these metals have been connected to serious medical complications that range from mental or physical impairment to death in the most severe cases. The long term effects of exposure has not been studied in individuals with tattoos containing heavy metals. The short term consequences have been documented. These include first degree burns during MRI examinations and allergic reactions.

[Tattoos are generally considered permanent and people may regret their purchase in the future. The only practical option for removing a tattoo is by having high powered lasers break up the pigments. These lasers do not remove the ink, but rather dissolve it into the individuals' skin allowing the byproducts to enter the bloodstream.](#)

An ideal reaction to this letter would include legislation that would ban the use of inks with heavy metals in them in all New Jersey tattoo parlors. For legislation of this drastic nature, alternatives are necessary. There are several tattoo ink companies that would be compliant with restrictions implemented. Intenze Products, Inc. is an example of company based in New Jersey

that provides a high quality and safe ink. Other companies include Skin Candy, Eternal Ink, Formula 51, and Alla Prima. The products that these companies provide offer some kind of security to their clients.

Thank you for your time and consideration. I am interested in your comments and your thoughts about putting our suggestion into practice.

Sincerely,

Hannah Poisner

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Letter to the Editor:

[Dear Editor of the Daily Targum,](#)

[Please consider the following letter to the editor for publication in the opinion section of the Daily Targum.](#)

Toxic Tattoos

[About two weeks ago I saw a line of people waiting to get a \\$13 tattoo from Revolver Tattoo, a tattoo parlor fairly close to the New Brunswick campus. Probably most of the people in line were attracted to the low cost and not thinking much about the impact that the tattoo may have on their health. Figuring that the tattoo parlor had a license to operate, most would conclude that it must be safe. What many of these people may not know is that many inks used today contain heavy metals that may include, among others, lead, arsenic, and mercury. Many pigments used in tattoo inks are industrial-grade colors suitable for printers' ink or automobile paint" \(FDA gov doc\); none of which have been approved for injection by the FDA. Unless this tattoo parlor uses specific inks that do not contain dangerous compounds \(there are some\), they will be injecting heavy metals and pigments \(which they may have an allergic reaction to\) into their skin. All of these metals are associated with a slew of health problems, ranging from an allergic reaction to more serious complications, when people of any age are exposed to them.](#)

[Tattoos are generally considered permanent that people may regret in the future. The only practical option for removing a tattoo is by having high powered lasers break up the pigments. These lasers do not remove the ink, but rather dissolve it into the individuals skin allowing the byproducts to enter the bloodstream.](#)

[Acknowledging that tattoos are an important part of self-expression for some individuals, it is important to ensure that the tattooing process is safe. As of now New Jersey does not regulate tattoo inks, or even enforce any policy of warning about the ingredients in the inks. My home state, California, started in the right direction back in 2005, when a judge ruled that several major ink manufacturers had to label their products and explain that they may contain harmful chemicals. There are safer inks available and this kind of legislation would push tattoo parlors to](#)

use safer inks and allow for people to make a more informed decision about what they put inside their bodies.

If you are considering getting a tattoo, you might want to do your homework and request that the tattoo parlor use nontoxic inks that you specify. You could also write to your state legislator and request that they better enforce the tattooing process, perhaps requiring the clear posting to consumers of a warning (like “tattoo inks may be harmful to your health”) and to phase out the use of toxic inks (by the year ??) to be replaced with nontoxic ones.

Sincerely,

Hannah Poisner
Genetics, 2016, SEBS
Julie M. Fagan, Ph.D.
Associate Professor, SEBS