

Tattoo Ink Can Cause Organ Failure and Allergies

Analysis by [Dr. Joseph Mercola](#)

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STORY AT-A-GLANCE

- › Researchers with Binghamton University in New York analyzed 54 tattoo inks from nine different brands common in the U.S.
- › Among them, 45 contained additives and/or pigments that weren't listed
- › More than half of the inks contained polyethylene glycol (PEG), which can cause organ damage
- › Fifteen of the tattoo inks analyzed contained propylene glycol, a potential allergen that could cause health issues due to systemic absorption
- › Most of the dangers from tattoo inks come from iron oxides, which can cause high iron levels; the most effective way to lower your iron is to donate blood two to four times a year

In the U.S., 32% of adults have a tattoo.¹ Among them, 22% have more than one. In most cases (69%), people get tattoos to remember or honor a person or event, while 47% get tattoos to make a statement about something they believe in. Another 32% of Americans surveyed said they got a tattoo to improve their personal appearance.²

But what many don't consider is that tattoos can have a negative effect on physical health, due to adulterants commonly found in tattoo ink. In short, this form of personal expression comes with a price, one that could be as high as organ damage or allergic reactions.³

Analysis Reveals Potentially Toxic Adulterants in 83% of Tattoo Ink

Researchers with Binghamton University in New York analyzed 54 tattoo inks from nine different brands common in the U.S. Among them, 45 contained additives and/or pigments that weren't listed. More than half of the inks contained polyethylene glycol (PEG), a synthetic, water-soluble polymer used in a variety of products, including pharmaceuticals, cosmetics and personal care items.

In tattoo ink, PEG may act as a solvent or a carrier for the pigment, helping to maintain the ink's consistency. However, PEG "can cause organ damage through repeated exposure," a Binghamton University press release noted.⁴ Allergic reaction to PEG is another risk, with symptoms ranging from mild skin irritations to more severe responses, such as anaphylaxis.

Another health concern related to PEG in tattoo inks is its potential role in systemic absorption and distribution, leading to questions about the long-term impact of these substances on the body's systems. The disruption of the skin barrier during tattooing could theoretically increase the risk of systemic exposure.

"Pigments may accumulate in the lymph nodes or other organs as they are in direct contact with the skin tissue and lymphatic system," researchers explained in *Chemical Research in Toxicology*.⁵

Further, 15 of the tattoo inks analyzed contained propylene glycol, another potential allergen that could cause additional issues due to systemic absorption. "Other contaminants included an antibiotic commonly used to treat urinary tract infections and 2-phenoxyethanol, which poses potential health risks to nursing infants," the news release reported.⁶

It's unknown whether the contaminants were intentionally added or the result of contaminated or incorrectly labelled materials.

The research was conducted by John Swierk, an assistant professor of chemistry, and colleagues, who are seeking to understand the molecular composition of tattoo inks to uncover any potential risks:⁷

"Tattoo inks are particles of pigments suspended in a water solution. Inks are usually made of a mixture of solid particles, molecular dyes, binders, and water. The color of the tattoo comes from light being reflected or absorbed by the particles and dyes ... we don't really understand the potential risks of tattoos.

The scientific and medical literature do document many instances of undesired reactions to tattoos, with long-term allergic reactions being most common."

Anything Goes in the Tattoo Ink Market

The U.S. Food and Drug Administration (FDA) regards inks and pigments used in tattoos as cosmetics,⁸ which means, like most of the cosmetics market, there's very little oversight. The FDA even notes that many pigments used in tattoo inks are industrial-grade colors suitable for printers' ink or automobile paint, not specifically approved for skin contact.⁹

In late 2022, Congress passed the Modernization of Cosmetics Regulation Act (MoCRA), which allowed the FDA to regulate tattoo inks. "The FDA is still figuring out what that is going to look like and we think this study will influence the discussions around MoCRA," Swierk said, adding:¹⁰

"This is also the first study to explicitly look at inks sold in the United States and is probably the most comprehensive because it looks at the pigments, which nominally stay in the skin, and the carrier package, which is what the pigment is suspended in."

The featured study only included adulterants at high concentrations of 2,000 parts per million (ppm) or more. In Europe, where tattoo inks are more strictly regulated, substances are considered in the 2 ppm range. In future studies, the researchers plan to see if pigments banned in Europe are present in U.S. tattoo inks.

"Our goal in a lot of this research is to empower artists and their clients. Tattoo artists are serious professionals who have dedicated their lives to this craft and they want the best possible outcomes for their clients," Swierk said. "We're trying to highlight that there are some deficiencies in manufacturing and labeling."¹¹

Still, even in the European Union, separate research found 93% of tattoo inks tested violated European legal requirements on labeling. While 50% of the inks listed at least one pigment ingredient incorrectly, 61% contained pigments of concerns, with red inks being particularly problematic.¹²

In addition, tattoo ink residues — particularly acrylonitrile butadiene styrene particles — are one source of plastic particle pollution that's been detected in human blood.¹³

Most of the Danger in Tattoo Inks Comes From Iron

Metals are also common in tattoo ink, with one study finding that iron, aluminium, titanium and copper were most abundant.¹⁴

Iron oxides, which are compounds formed by iron and oxygen, are used as pigments in tattoo inks due to their stability and vibrant hues. They vary in color depending on the specific chemical composition and structure. For instance, black iron oxide is used to create black inks, while red iron oxide is often used for red inks.

While it's often suggested that iron oxides in tattoo ink is safe, a case report published in the journal *Virulence* showed that tattoos can lead to high iron levels in the blood. The study reported a young woman with profound anemia whose serum iron levels were inexplicably high:¹⁵

"Her high serum iron was not fully explainable until we examined the patient and noticed a large black tattoo on her left flank area. Apparently iron oxide in the ink used for the tattoo was absorbed transcutaneously and led to high serum iron in the face of the other data, which suggested iron deficiency ... We believe that this case report ... illustrates the potential toxicity of tattoo ink."

High Iron Levels Are Detrimental to Your Health

Your body has a limited capacity to excrete iron, so it can easily build up in organs like your liver, heart and pancreas. This is dangerous because iron is a potent oxidizer that can damage your tissues and contribute to a variety of health problems, including cancer. The Chemical Research in Toxicology researchers, from Ege University in Turkey, explained:¹⁶

"In tattoo inks, Fe [iron] forms red (Fe_2O_3), black (Fe_3O_4), yellow ($FeOOH$), and brown (iron oxide mixture) colors in different formulas. Iron oxide is a known darkener used in tattoo inks. These iron oxides are present in inorganic inks, albeit in small quantities. It is reported that it reacts with O_2 [oxygen] and H_2O [water] and turns into different salts.

Iron oxide formation has been associated with significant deleterious effects, such as inflammation, apoptosis, disruption of mitochondrial function, membrane changes, reactive oxygen species formation, increased micronucleus induction, and chromosome condensation, depending on concentration, exposure time, and cell type."

Further, accumulation of iron from these oxides can lower glutathione levels in brain tissues, leading to oxidative stress – a condition where harmful molecules cause damage to cells.¹⁷ Studies have also shown that iron accumulation can lead to an increase in harmful lipid oxidation within cells.

Similarly, iron oxide nanoparticles can damage the membranes of rat brain endothelial cells by generating reactive oxygen species (ROS), harmful molecules that can cause significant damage to cell structures.¹⁸

Elevated ferritin, a protein that's the carrier molecule of iron, is also associated with a 2.9 times higher risk of death from cancer¹⁹ and blood donors have been shown to have a lower likelihood of developing certain cancers than nondonors.²⁰

Elevated ferritin has also been linked to dysfunctional glucose metabolism, raising the risk of diabetes nearly fivefold in men and fourfold in women.^{21,22} High ferritin also increases your risk of metabolic syndrome,²³ a condition associated with an increased risk of high blood pressure, liver disease and heart disease and insulin resistance.

According to research published in 2018, buildup of iron also has a type of "rusting effect" in your brain and is common in most Alzheimer's patients.²⁴

I suspect high iron may actually be a catalyst when it comes to skin cancer, along with high **linoleic acid** (LA) intake. LA is oxidized by iron, creating something called lipofuscin, which is basically iron attached to oxidized LA. A more common term for lipofuscin is liver spots. So, liver spots are a dermal representation of oxidative damage to LA by high iron.

The Most Effective Way to Lower Your Iron Levels

The key to avoiding the health risks associated with tattoos is to not get them in the first place. But if you already have tattoos, there are steps you can take to help mitigate the risks of iron exposure.

The most effective way to lower your iron is to donate blood two to four times a year. If losing 10% of your blood in one sitting is problematic for you, then you can remove blood in smaller amounts once a month on the schedule I have listed below. If you have congestive heart failure or severe COPD, you should discuss this with your doctor, but otherwise this is a fairly appropriate recommendation for most.

Men

Postmenopausal Women

Premenopausal Women

150 ml

100 ml

50 ml

Christy Sutton, D.C., is the author of two books, "[Genetic Testing: Defining Your Path to a Personalized Health Plan: An Integrative Approach to Optimize Health](#)," and "[The Iron Curse: Is Your Doctor Letting High Iron Destroy Your Health?](#)" In our interview, she

reviews the [dangers of excessive iron](#) and also recommends additional strategies to lower your iron levels. One is the supplement curcumin.

"Clinically, I have seen curcumin's ability to lower iron almost to a fault," she says. "... for people that are high in iron or even inflamed with high iron, high ferritin, that's a great place to start, because curcumin binds to iron. It also has all of these other wonderful health-promoting properties. It's so good for your brain — it actually helps remove excess iron from the brain and other organs, the heart, liver, spleen."

Sutton also recommends taking curcumin with an iron-rich meal, such as shellfish or red meat, to inhibit iron uptake. Other supplements that help bind iron include silymarin, an extract from milk thistle. It lowers iron and helps protect and repair the liver. Another thing that binds to and lowers iron is alpha-lipoic acid.

You can have your iron levels checked using a simple blood test called a serum ferritin test. I believe this is one of the most important tests that everyone should have done on a regular basis as part of a preventive, proactive health screen. However, if you have tattoos, this test may be especially important. Aside from a serum ferritin test, a gamma-glutamyl transpeptidase (GGT) test can also be used as a screening marker for excess free iron.

Sutton recommends keeping ferritin below 100 nanograms per milliliter (ng/ml). Ferritin above 100 ng/ml means you're either inflamed, have high iron or both. Studies referenced in Sutton's book suggest anything over 200 is pathological. The higher your ferritin level, the shorter your lifespan. You're also more likely to die of a heart attack and cancer. Remember, if your iron levels are high, donating blood two to four times a year is an effective way to lower them.

Sources and References

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