



Safety of Using Silver and the Risk of Argyria

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Introduction

Humanity has had a love affair with silver for thousands of years, and it has touched almost every facet of life for those who could afford it. Historically, the precious metal was used in medicine, eating utensils, plates, cups, food containers, jewelry, money/coins, clothes, building materials, and as a disinfectant for water and human infection. Now, after hundreds of years of study and significant gains in knowledge, science and technology, silver is still being used for medicine, eating utensils, plates, cups, food containers, jewelry, money/coins, clothes, building materials, wound care, and as a disinfectant. It remains an important part of our lives because of the exquisite nature and time-tested utility of the metal. It is safe to say that silver is being used in some way almost every day by every man, woman, or child in the civilized world.



Why Would Someone Want to Use Silver Products?

Infection is a common issue among medical patients today, just as it was in olden days. Some healthcare providers today combat this through the use of antibiotics or other medications known to have a variety of clinically significant adverse side-effects. However, before the popularity of antibiotics, the use of silver products to treat infection was a front line technology. It is well documented that silver has been used as an antimicrobial for centuries, and certain types of silver are also associated with accelerated wound healing, as well as Anti-inflammatory activity (Nadworny et al, 2023, pg. 2)⁸. For these reasons silver products are still used by large numbers of healthcare professionals around the world today.

Can Silver Cause Heavy Metal Poisoning or Toxic Nephropathy?

Many misinformed doctors, scientists, and media have been claiming for years that silver is a problem because it is a heavy metal, and as such can cause problems in the body. The problem is not with the silver but with the misinformation and inaccurate knowledge being spread by the people speaking about silver. The real answer is that silver is not toxic when used at reasonable levels and quantities. Any substance, even water, in excessive amounts can be fatal. Toxic nephropathy or heavy metal poisoning is defined as, "Any functional or morphologic change in the kidney produced by an ingested, injected, inhaled, or absorbed drug, chemical, or biological agent."¹ The MERCK Manual is sometimes referred to as the "Scientific Bible of Diagnosis and Therapy" by many scientists and doctors. Silver is not listed in the manual for causing heavy metal poisoning, because it does not cause it. (See MERCK manual, 17th Edition, Pg 1880, table 226-1, third item listed, for the full list of heavy metals that cause toxic nephropathy)¹³. In a peer-reviewed paper "*Ultradilute Ag-Aquasols with extraordinary bactericidal properties: the role of the system Ag-O-H₂O.*" (Materials Research Innovations, vol. 11, no. 1, (2007) pages 3-18)² on the subject of the safety of consuming metallic silver, the paper states (page 1, first paragraph of the introduction), "A recent paper by Das et al. Provides the remarkable datum that some 275,000 kg [(605,000 pounds)] of edible metallic silver foil are consumed every year (in food) in India. No known adverse health effects have ever been recorded. This epidemiological evidence that silver as a metal is not toxic in any way needs no further comment. Further support for the obvious safety of consuming metallic silver (Ag₀) is in the worldwide consumption of (so called) silver colloids, often made at home in primitive electrochemical cells by probably some millions of citizens, again with no ill effects."

What Is Argyria?

What is Argyria and will I get it if I use silver products? These are two very common questions. They are important because each of us needs to know that any product we are using or giving to our families will not hurt them nor do them any harm at all.

Silver products alone generally have no negative side effects if used in reasonable amounts. However, the extreme misuse of some silver salts or chemical silver compounds may cause a condition called argyria. Argyria has no known negative side effects except that it causes a greying or bluing of the skin color. The condition is non-toxic and only cosmetic in nature (U.S. EPA RED Document on Silver, Page 3, Paragraph 3)³.

What Causes Argyria?

Put simply, argyria can result if there is so much chemical or ionic silver in the body at one time that the body cannot wash it out fast enough through its normal excretion systems. In order to get rid of this excess silver, the body walls it off in the cells, as it does with all the products it doesn't have time to get rid of. In most cases the discoloration is permanent. It is the equivalent of getting a tattoo by misusing silver products in an extreme way. The condition is very rare, even in people who consume large amounts of ionic or chemical silver products at high levels, over years of use.

Argyria has resulted from the extreme misuse of very strong silver solutions usually consisting of silver salts, including silver nitrate, silver arsphenamine, silver chloride and possibly silver iodide. These products were sold until about 1975 under various labels with solutions containing levels of silver ranging from 5-30%. That means that these products were used at levels as high as 50,000 - 300,000 ppm (parts per million) (Federal Register, FDA-21CFR Part 310, pg. 53685)⁴. That is the equivalent of 5,000 to 30,000 times more silver than is used in most silver supplement products sold today, which would be from 10-32 ppm depending on the use. Argyria has also been known to result from the extreme misuse of some homemade products (usually small machine - battery produced products) where they are consumed daily in large quantities (8-24 ounces daily) over years of time.

Minimum Amount of Silver Intake Known to Cause Argyria Historically

The normal human body contains some silver already, approximately 1 milligram (mg) of silver⁹, with no evidence of argyria. This can be obtained from normal food, water, and other sources. The smallest amount of silver reported to have produced generalized argyria in humans ranges from 4-40 grams (g) depending on the study and the patient's predisposition (Padlewska et al, 2022)⁹(EPA IRIS Report on Silver)⁶. That is a very large amount of silver. For a typical silver supplement at a 10ppm concentration, the recommended dose is generally 1-3 teaspoons daily. Each teaspoon contains roughly 50 micrograms (mcg) of silver in water. This means that an individual would have to consume between 80,000 and 800,000 teaspoons of a 10ppm silver supplement to reach the lowest level ever known to cause argyria. It would take between 26,667 days (73 years) and 800,000 days (2,192 years) of continuous use, to consume the lowest level ever known to cause argyria, if taking the typical recommended daily dose. These numbers assume their body retained all the silver they ingested. However, as is referenced below, most of the silver is not retained at all, and leaves the body after a short amount of time.⁶

It should be noted that the EPA standards for the amount of silver that can be safely consumed daily in regular drinking water is about the amount contained in 3.27 fluid ounces of 10 ppm silver solution (Oral Rfd of .014 mg/kg/day – EPA IRIS Report page 2)⁶. According to these standards, you could safely consume about 20 teaspoons every day of your life, based on a typical 70 year lifespan, with no significant degree of risk of developing argyria. That is more than 6 times the standard daily dose of 3 teaspoons of a 10ppm silver liquid, and yet the EPA still considers it safe. It is also important to note that even during the years from 1918 to 1940, when very high content silver products (sometimes more than 10,000 ppm) were commonly used across the medical field worldwide, there were still relatively few cases of generalized Argyria. For this reason some studies are limited to older information, simply because this condition is so rare.

Only Ionic or Chemical Forms of Silver Can Cause Argyria

A peer-reviewed report from Pennsylvania State University was released after years of studying a number of colloidal silver and silver aquasol or nano products purchased from the U.S. market. The paper was authored by Professor *Rustum Roy*, along with seven other professors and scientists from leading universities. In the report cited on page 1, on the subject of ionic vs. metallic silver for human use, Dr. Roy states (page 2, fourth paragraph): *“In spite of this enormous range of data, it is extraordinary that no major effort has been made to confirm and expand on the role of metallic silver in human health—especially in light of its huge advantage in lack of side effects. (Ingestion of excessive amounts of ionic (soluble) silver, not metallic solid particles is reported to have resulted in a very rare condition labeled argyria, an (irreversible?) darkening of the skin. No one has died of this condition. The safety of metallic silver sols is firmly established by the data cited above.)”*²

The safer “metallic solid particles” or “metallic silver sols” he is referring to are silver particles that have a hard crystalline structure, which are often referred to as ‘Nano Silver’ due to their crystalline structure creating particle sizes 1 nanometer or larger (ie. Nano-silver is Nano-sized). These larger particles are still small enough to enter your bloodstream (see below), but they are not metabolized, and have never been shown to build up in the body.

Nano-Silver Washes Out of The System Quickly



According to a published human ingestion report, as reported to the US FDA "*In vivo human time-exposure study of orally dosed commercial silver nanoparticles*", (also published: *Nanomedicine. 2014*)⁵ a nano silver liquid at an average size of 5-7 nanometer particles, when ingested, hit their height in the bloodstream within two hours. They also reported that the silver washed out very quickly, meaning within 24 hours with no measurable residual (silver left in the body).

Other Forms of Silver Are Excreted Slower than Nano-Silver

The US EPA IRIS Report on silver (Integrated Risk Information Systems, 5th page, 1st paragraph)⁶ it states that several tests were completed to test the absorption and retention of ingested silver in a number of animals, including primates (we are primates). In its conclusion, the test work indicated that between 90-99% of ingested silver was excreted on the second day after ingestion, and greater than 99% was excreted in less than a week. So, in other words, almost all of the ingested silver was out of the body in about two days, and most of the rest was out of the body in a week.

Homemade Silver Products

There is no simple way to accurately control or measure the amount of silver in products that are made in the typical home-made colloidal silver machines. Recent tests on a number of those machines have also shown that the product that they make is usually of very poor quality. In addition, it was found that the home-made products are made up of mostly ionic or soluble silver particles, not metallic particles. There are other problems associated with these machines as well. One is that because the products are so ineffective, the people who use them usually have to drink a lot of the silver to get a positive benefit. This means that the increased amount of silver needed in their home-made product to receive a positive benefit can be way above the amount of silver a person should drink by government guidelines. When people drink large amounts of homemade silver products, they potentially expose themselves to silver build up in their body (argyria). However, even among the possibly hundreds of thousands of people who make their own silver products, the argyria condition is still very rare. The news media seems to love to find one of them every few years or so and put them on TV as part of a shock treatment for ratings. Even when it happens, such as the famed "Blue Man" on TV a number of years ago, extensive testing was completed on him and it was found that he suffered no ill conditions from argyria, except his bluish skin color.

Argyria Causes No Known Negative Effects Other Than Pigmentation

In an EPA report on drinking water (report ECAO-CIN-026 revised Jan.1991- Section VI, pages VI-1)⁷ it states that silver has been used therapeutically for centuries. Two doctors in the report were injecting silver into people for various extreme health ills. Having injected silver into patients over a period of years the doctors stated, (Hill and Pillsbury 1939, page VI-2) "the ordinary clinical use of silver compounds practically never gives rise to any gross untoward effect other than argyria." The paper also states (bottom of page VI-11), "There is no evidence that argyria alone is associated with any adverse effects other than the pigmentation." In other words, the only known potential side effect from the extreme misuse of medicinal silver products is the rare condition called argyria and that condition is cosmetic only.

Safe for Animal Use

Numerous published and private studies exist showing that silver is safe for general animal use. Both oral (ingested) and injected studies are specifically available, and show no negative effects from using silver products with animals. In one U.S. NIH published study, animals were given a 10ppm nano silver liquid to drink as a supplement every day for 14 days. There were no negative effects reported, but the silver was also credited with increasing the survival rate of animals suffering the effects of a H5N1 Bird Flu infection by 100%.¹⁰ It is important to note that the H5N1 Bird Flu is a deadly virus that has killed millions of animals. In another study race horses were being nebulized with a nano-silver product to help eliminate exercise-induced pulmonary hemorrhage and lung infections. The silver was shown to be an integral part of helping the horses to eliminate the infection, and again no negative side effects were reported.¹¹ A nano-silver with a 10ppm concentration was also proven to be safe for injection in animals at levels even up to 50ml/kg which is a fairly heavy dose.¹²

Conclusion

There is no question about the amount of data that exists on the safety and general non-toxicity of using silver in its many typical human and animal uses, especially considering the fact that millions of people use the metal daily. It has been used in almost every facet of human life. Metallic silver causes no nephropathy or heavy metal poisoning in the body. Silver is a natural broad-spectrum antimicrobial and healing agent. According to the EPA (who are in charge of defining safe levels of any mineral in water which is used for ingestion, drinking, or disinfecting), the oral consumption of small amounts of silver in water on a daily basis poses no significant degree of risk. According to historical published information on silver, unless an individual were consistently consuming many times the recommended daily dosage of a typical 10ppm silver product, there should be no realistic possibility of that individual contracting argyria. Metallic crystalline forms of silver have never been shown to build up in the body. Those people who use hundreds or even thousands of times the recommended daily dosages of certain types of silver run a risk of turning their skin blue or grey, but even then, the condition is very rare. There have been no reported deaths from the medicinal use of silver.

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