

Silver NanoParticles Toxicity

<https://journals.sagepub.com/doi/abs/10.1177/0003134820951494>

Gallstones Associated With Chronic Ingestion of Silver Colloid 2020

<https://www.sciencedirect.com/science/article/pii/S221475002300104X>

Colloidal silver ingestion and severe anemia – A case report 2023

Highlights

- Silver is not an essential dietary metal, but oral exposure can occur through intake of fish and use of silver kitchen tools.
- Colloidal silver ingestion as an alternative medicine treatment is becoming more common.
- Our case report shows potential adverse effects of silver intake on the hematopoietic, hepatic, and cardiovascular systems.

A woman in her late sixties was transported to the emergency department because of progressive fatigue and nausea. She had been drinking 150 µg of colloidal silver daily for two to three weeks. Blood sampling revealed severe anemia (red blood cell count 48 g/L) and a whole-blood silver concentration of 20 µg/L. Liver function tests were abnormal and there were signs of incipient heart failure with increased pro-brain natriuretic peptide, troponin T, as well as pleural effusion. She was stabilized with blood transfusion and symptomatic treatment, to be discharged from the hospital after ten days. The patient improved over the following six weeks and the whole-blood silver concentration decreased to 3.3 µg/L after about three months.

<https://pmc.ncbi.nlm.nih.gov/articles/PMC7786010/>

Toxicity of colloidal silver products and their marketing claims in Finland 2020

An important mechanism of the antimicrobial effects of AgNPs is the strong oxidative activity due to an abundant release of silver ions (Ag⁺), which is also the basis of its toxicity in various organs [6].

The World Health Organization (WHO) has issued a No Observable Adverse Effect Level (NOAEL) of 6.5 µg/kg bodyweight/day (bw/d) for all exposure routes for the general population, and the U.S. Environmental Protection Agency (U.S. EPA) has given a Reference Dose (RfD) of 5 µg/kg bw/d for chronic oral silver exposure [7]. However, these guidance values and most of the risk assessments of silver are based on argyria development, which is not the most sensitive endpoint of toxicity. Guidance values of 2.6 µg/kg bw/d and 2.5 µg/kg bw/d based on embryotoxicity in rats [20] and silver nanoparticle induced cytokine response in mice [15], respectively, have been proposed. The draft assessment according to the European Biocides Directive (BPD, 98/8/EC) derived a guidance value of 0.3 µg/kg bw/d extrapolated from a 2-year toxicity study in rats. Most of the colloidal silver products on the market are claimed to contain 10–30 mg/l of silver: therefore the given guidance values can be readily exceeded when drinking colloidal silver. Just a few tablespoons (about 15 mL) of 10 mg/l colloidal silver contains about 300 µg of silver and exceeds the U.S. EPA RfD for a person of 60 kg.

It has been proposed that 1–30 g of ingested soluble silver salts can cause argyria [12]. Argyria is not the only and not the most sensitive toxic effect of silver. Short-term exposure to colloidal silver does not necessarily lead to immediate adverse effects. In a 14-day human study daily oral doses of 100 µg or 480 µg colloidal silver resulted in detectable silver concentrations in serum [28], but a wide range of clinical tests revealed no significant changes. However, when cytotoxicity of five commercial colloidal silver sprays was assessed in vitro, each of the products significantly decreased cell viability in a rat intestinal epithelial cell (IEC-6) model [29]. In addition, many people use colloidal silver for much longer periods, with known side-effects, such as argyria, argyrosis and organ failures (TREFs).

<https://pmc.ncbi.nlm.nih.gov/articles/PMC8212496/>

The potential renal toxicity of silver nanoparticles after repeated oral exposure and its underlying mechanisms 2021

Histopathologic examination revealed degenerative changes in the glomeruli, loss of tubular architecture, loss of brush border, and interrupted tubular basal laminae. These changes were more noticeable in groups treated with 30 and 125 mg/kg. The collagen intensity increased in the group treated with 30 mg/kg in both the cortex and the medulla. Apoptosis was much more evident in middle-dose groups (i.e., 125 and 300 mg/kg). The results of RT-PCR indicated that Bcl-2 and Bax mRNAs upregulated in the treated groups ($p < 0.05$). Moreover, the data related to EGF, TNF- α , and TGF- β 1 revealed that AgNPs induced significant changes in gene expression in the groups treated with 30 and 700 mg/kg compared to the control group.

Conclusion

Our observations showed that AgNPs played a critical role in in vivo renal toxicity.

<https://journals.sagepub.com/doi/abs/10.1177/1060028019844258?journalCode=aopd>

Cases of Argyria Associated with Colloidal Silver Use 2019

We have identified 16 cases of patients who developed argyria following colloidal silver use.....

Of the 16 cases, 15 described chronic use (ongoing use greater than 2 weeks) with a median duration of 2 years.

In most cases, argyria developed following months to years of use. Because the half-life of silver depends on the active ingredients's salt, it can range from days to months.