

Argyria Following the Use of Dietary Supplements Containing Colloidal Silver Protein

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The onset of argyria following the use of dietary supplements containing colloidal silver protein is presented. The patient was using a silver-containing product for cold and allergy prophylaxis. We review the past and present medicinal roles of silver and include a differential diagnosis for argyria. The hyperpigmentation of argyria is usually permanent, and it follows a sun-exposed distribution. This case report highlights the potential for toxicity following the use of dietary supplements and demonstrates the importance of physician inquiry regarding alternative medicines. Finally, we examine the limited role of the Food and Drug Administration (FDA) in regulating alternative medicines marketed as dietary supplements.

Although colloidal silver protein dietary supplements are promoted as benign, they can induce argyria. We report the insidious onset of bluish discoloration of the fingernails in a patient who had taken such silver supplements.

Case Report

A 56-year-old white man had noted blue color changes of his fingernails for the past few months. At the time he consulted his internist, he had no other complaints, and his physical examination and plasma lead levels were otherwise normal. The patient's occupational history was significant for heavy metal exposure to nickel, gold, and copper because of previous employment in the plating department of the National Cash Register for almost 15 years. However,

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FIGURE 1. Bluish discoloration of fingernail lunulae (A and B).

this exposure ended when he moved to Arizona in the mid 1980s and became self-employed. He denied any other known heavy metal exposure, including silver, and he was well developed, alert, and oriented. His face had a dusky appearance, and there was no scleral or conjunctival discoloration nor hyperpigmentation of the gingiva. The patient's fingernails were remarkable for a blue to gray proximal band of discoloration. The lunulae of both thumbnails were also involved (Figure 1, A and B). His toenails

were uninvolved, and the rest of his skin showed no discoloration.

The patient declined a nail bed biopsy. Because his examination was consistent with argyria, blood was drawn to assess serum silver levels. These levels were markedly elevated compared to normal (85.0 mcg/L vs nL < 5.0).¹ His serum hepatic and renal panels were all within normal limits as were assays for lead, iron, and ceruloplasmin. The patient's wife noted during a telephone conversation that he had taken colloidal silver for the past 3 years. He was an independent distributor for the manufacturer of the silver product and had been using it as an allergy and cold medication, following the recommended regimen of 1 teaspoon of the 200 ppm silver solution 3 times daily. Although he has since stopped using the colloidal silver product, he reports no improvement in the appearance of his fingernails over a period of 3 months. The patient was advised to avoid sun exposure to prevent further nail discoloration and to use sunscreens to guard against the occurrence of accompanying hyperpigmentation of sun-exposed skin. However, the patient continues his work as a distributor of the silver supplement.

Discussion

Argyria is a predictable consequence of chronic exposure to silver-containing products. Although generally benign,^{2,3} the slate-gray to blue mucocutaneous discoloration is clinically significant because it is readily confused with more serious disease processes. The differential diagnosis for argyria includes cyanosis; disseminated melanoma; Addison's disease; Wilson's disease; hemochromatosis; methemoglobinemia; subungual pseudomonal infections; and exposure to mercury, gold, antimalarials, amiodarone, or chlorpromazine.^{3,6}

The characteristic discoloration in argyria is caused more by melanocyte stimulation and the reduction of elemental silver than the mass effect of silver deposition.⁴ There is an apparent synergy between photoexposure and silver deposition such that a passive photosensitivity occurs within the dermis, specifically along the glandular portion of the sweat glands.⁷⁻¹⁰ The term *passive photosensitivity* is descriptive, as it implies that light acts as a catalyst for the reduction of silver in a process that is analogous to the development of a negative in photography.⁷ Hence, the most prominent areas of blue-black hyperpigmentation occur in a sun-exposed distribution, although the silver is systemically deposited throughout visceral and mucosal tissues. The argyric discoloration fades very little with time and resists chelation therapy with British anti-Lewisite (BAL) or intralesional injections of sodium thiosulfate or potassium ferrocyanide. Thus, a patient with argyria

rarely shows significant improvement, even after discontinuing the use of the supplements.^{3,11}

Historically, silver salts were used in treating mental illness; epilepsy; nicotine addiction; gastroenteritis; and infectious diseases, including syphilis and gonorrhea.^{7,12,13} Silver nitrate is still used to treat burn injuries and as a cauterizing agent and, occasionally, as prophylaxis for ophthalmia neonatorum.^{3,5,11} Thus, iatrogenic argyria is now rare. Occupational exposures to silver products, as well as silver concentrations endemic to local food and water reservoirs, may also contribute to argyria. However, today a more likely cause of argyria is dietary supplements, as in our patient. Colloidal silver supplements have been marketed broadly as a treatment for AIDS, diabetes, herpetic infections, and cancers. Although the manufacturers of colloidal silver products claim these agents provide a "second immune system" with an ability to kill disease-causing organisms, the FDA has concluded that there is no scientific evidence for such claims and has cited the potential for toxicity.¹¹ Because colloidal silver products are considered dietary supplements, manufacturers are not required to present evidence of purity, efficacy, or safety.

As a result of the 1994 Dietary Supplements Health and Education Act (DSHEA), the FDA has no regulatory authority to remove an over-the-counter product unless it is demonstrated to be hazardous when used according to the directions on the label. Thus, the responsibility for determining the safety of dietary supplements and the veracity of product claims is that of consumers and manufacturers. In addressing the many questions and concerns surrounding DSHEA, labels on dietary supplements are now required to contain specific product information, including a supplement facts panel detailing serving size and amount and identity of the active ingredient. Further, dietary supplement labels must now include a disclaimer from the FDA stating "This product has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease."

This case report highlights the potential for toxicity following the use of dietary supplements and as a majority of patients use alternative medicines,^{8,14} it demonstrates the importance of physician inquiry regarding such usage.

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