

Colloidal Silver

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Abstract: Colloidal silver is pure, metallic silver (not a chemical compound) of particles 15 atoms or fewer, each with a positive electric charge, and attached to a molecule of simple protein. There are three types of silver that are labeled and sold on the market: (1) colloidal silver (ionic silver); (2) silver protein; (3) true colloidal silver. Colloidal silver can be a drug in the clinical treatment for many functions, but it is debated if Colloidal silver has toxic or not. [The Journal of American Science. 2007;3(3):74-77]. (ISSN: 1545-1003).

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Introduction

Silver (Ag) is the number 47 atomic element, with an atomic weight of 108. It is one of the heavy metals, along with lead, mercury, cadmium, and gold. But unlike other heavy metals silver is non-toxic to animals, and it has a long history as a medicine dug (over 6000 years). Normally to say, silver is non-toxic, and it can be an antibiotic under the suitable dosage (Alt, et al, 2004).

All the living things are naturally colloidal. According to Thomas Graham' definition, colloidal had the following characterizations: Substances that diffused through water at very low rate in comparison with crystalline substances such as sodium chloride, and the amorphous bodies were designated as colloids. The crystalline substances were easily diffused and were designated as crystalloids. When a plant or animal consumes water, that water is then structured primarily into highly organized octagonal shaped liquid crystals, very few of the water molecules consumed remain unorganized. Living things accomplish this by using highly charged colloids, which form the nuclei around which the highly organized crystalline lattice forms. The volume of living bodies is mostly water, and we are colloids (Ling, 1988).

Colloidal silver is a small amount of silver molecules suspended in water. Colloidal silver can be a natural antibiotic and healing agent, on the skin or drink that promotes healing or fight disease in the body. Silver has been used for thousands of years in alternative healing practices and in Eastern medicine. Colloidal silver also has anti-fungal and anti-viral properties, and play function on the immune system.

Colloidal silver was in common use until 1938. People use to put silver money in mile and other solutions to keep them fresh at room temperature. Before to 1938, colloidal silver was used as important antibiotic. A letter from the Food and Drug Administration (FDA) states: "These products may continue to be marketed . . . as long as they are advertised and labeled for the same use as in 1938 and as long as they are manufactured in the original manner." (9/13/1991). Some of the manufacturing methods used before 1938 are still used today (Natural Health and Longevity Resource Center, 2006).

The argyria can be happened following the use of dietary supplements containing colloidal silver protein. Gulbranson et al observed a patient who was using a silver-containing product for cold and allergy prophylaxis. They reviewed the past and present medicinal roles of silver and include a differential diagnosis for argyria. The hyperpigmentation of argyria was usually permanent, and it followed a sun-exposed distribution. This case report highlighted the potential for toxicity following the use of dietary supplements and demonstrates the importance of physician inquiry regarding alternative medicines. Finally, they examine the limited role of the Food and Drug Administration (FDA) in regulating alternative medicines marketed as dietary supplements (Gulbranson, 2000).

Principle Application

Colloidal silver is pure, metallic silver (not a chemical compound) of particles 15 atoms or fewer, each with a positive electric charge, and attached to a molecule of simple protein. Orally, colloidal silver has been used to treat ear infections, emphysema, bronchitis, fungal infections, Lyme disease, Rosacea, sinus infections, stomach ulcers, yeast infections, chronic fatigue syndrome, AIDS, and tuberculosis, etc. It has been used orally for antibacterial, food poisoning, allergies, appendicitis, arthritis, blood parasites, bubonic plague, cancer, cholera, colitis, cystitis, conjunctivitis, atopic dermatitis (cradle cap), diabetes, dysentery, eczema, gastritis, and gonorrhea. It also has been used to promote rapid healing and subdue inflammation, to treat gum diseases, to improve digestion, and to prevent flu and colds. Other uses include impetigo; hay fever; herpes; leprosy; leukemia; lupus; lymphangitis; malaria; meningitis; parasitic infections; pneumonia; pneumococci; psoriasis; prostatitis; rhinitis; ringworm; scarlet fever; and septic conditions of the eyes, ears, mouth, and throat. It has been also used for Salmonella, septicemia, shingles, skin cancer, syphilis, tonsillitis, toxemia, trench foot, viruses, warts, and yeast infections. Colloidal silver has been used during pregnancy to aid the baby's growth and health as well as the mother's delivery and recovery. Topically, colloidal silver has been used for acne, burns, eye infections, fungal infections, throat infections, skin infections, and Staphylococcus infections.

Colloidal silver near a virus, fungus, bacterium or any other single cell pathogen disables its oxygen metabolism enzyme. Within a few min, the pathogen suffocates and dies, and is cleared out of the body by the immune, lymphatic and elimination systems. Normal pharmaceutical antibiotics possibly destroy animals' enzymes, but colloidal silver leaves these tissue-cell enzymes intact, as they are radically different from the enzymes of primitive single-celled life. So that colloidal silver is safe for humans, reptiles, plants and other multi-celled living matter.

High concentrations of silver do not kill disease germs more effectively than the safe range of 3 to 5 parts per million (ppm). 1 teaspoon of 5 ppm colloidal silver equals about 25 micrograms (mcg) of silver. 1-4 teaspoons per day (25-100 mcg) is generally considered to be a "nutritional amount" and is reported to be safe to use for extended periods of time. Amounts higher than this are generally considered "therapeutic amounts" and should only be used periodically. In cases of illness, natural health practitioners have often recommended taking double or triple the "nutritional amount" for 30 to 45 days, then dropping down to a smaller maintenance dose. Amounts from 1-32 ounces per day have reportedly been used in acute conditions.

There are three types of silver that are labeled and sold on the market: (1) colloidal silver (ionic silver); (2) silver protein; (3) true colloidal silver. The three types of products normally labeled as "colloidal silver" can be categorized as ionic silver solutions, silver protein, and true colloidal silver.

Silver is also widely used in the bioassays (Koshi, 2005). For example, by Zagorskina's studies, fitness of dot immuno-analysis for detection of Brucella antigens labeled with colloid silver was evaluated. Soluble lipopolysaccharides and protein-saccharide antigen and corpuscular antigens of 22 Brucella strains (7 species) pathogenic for humans and animals in the S and R forms were used. The specificity of the method was tested on 10 heterologous microorganisms whose antigens were closely related. The suggested test system was simple, economic, highly sensitive (from 62 thousands to 8 million CFU/ml) and specific, requires no expensive equipment, and was an alternative to enzyme immuno-assay and dot immuno-analysis with gold immunosole (Zagorskina, et al, 2002).

In the silver application, the size of silver is important. As Chairman of Natural-Immunogenics Corp. Stephen L. Quinto, emphasized at 3rd International Silver Conference (Changsha, China, October 20th-21st, 2004): "The silver hydrosol we have developed presents with almost perfect dispersion [in electron microscopy]. That dispersion demonstrates the powerful charge each particle possesses. Thus isolated, they have a mean diameter of 0.8 nm (or 8 Angstroms), although that has been rounded up to 1 nm in the electron microscopy lab at the University of Miami Medical School where such work was recently done. We won't quibble over 2 Angstroms!" (Quinto, 2004).

Research reports on colloidal silver

Multiresistant bacteria have become an important problem in prosthetic joint infections. Their frequent resistance against gentamicin, which is commonly used in antibiotic-loaded bone cements, makes a new prophylaxis necessary. In Alt's study, NanoSilver bone cement did not show any significant differences compared to the non-toxic control group. If these promising in vitro results can be confirmed in vivo, NanoSilver bone cement may be of considerable value in total joint arthroplasty (Alt, et al, 2004).

Argyria is a rare cause of cutaneous discoloration caused by silver deposition. In 2003, White and the colleagues reported a case of dramatic and diffuse argyria secondary to ingestion of colloidal silver protein over a 1-year period. Stained electron microscopy with spectral analysis was used to confirm the clinical diagnosis. Silver-protein complexes are deposited in the skin and reduced to inert silver salts by sunlight in a process similar to that harnessed in photography (White, et al, 2003).

According to Gosheger's report: Infection of megaprotheses has a serious complication in orthopedic tumor surgery. Despite the use of systemic and local antibiotic prophylaxis the reported infection rate is between 5% and 35%. Silver-coated medical devices proved their effectiveness in reducing infections. Their studies examined in vivo the antimicrobial efficacy and possible side-effects of a silver-coated megaprosthesis. In a first study, 30 rabbits (15 titanium versus 15 silver-coated Mutars-endoprotheses) were infected with *Staphylococcus aureus*. In a second study, toxicological side effects were analyzed in 10 rabbits with a silver-coated megaprosthesis. The silver group showed significantly ($p < 0.05$) lower infection rates (7% versus 47%) in comparison with the titanium group. Measurements of the C-reactive-protein (CRP), neutrophilic leukocytes, rectal temperature and body weight showed significant ($p < 0.05$) lower signs of inflammation in the silver group. The analysis of the silver concentration in blood (median 1.883 ppb) and in organs (0.798-86.002 ppb) showed elevated silver concentrations without pathologic changes in laboratory parameters and without histological changes of organs. In conclusion, the new silver-coated Mutars-megaprosthesis resulted in reduced infection rates without toxicological side effects, suggesting that this prosthesis might be a promising device in tumor surgery exhibiting antimicrobial activity (Gosheger, 2004).

Colloidal silver preparations are marketed on the internet as omnipotent antimicrobial agents, but scientific support for these claims is lacking. In 2004, van Hasselt, et al reported the results of in vitro tests of colloidal silver's antimicrobial activity against several pathogenic or non-pathogenic microorganisms. They took three samples of colloidal silver: one available commercially on the internet (silver concentration of 22 ppm) and two samples (concentrations of 403 and 413 ppm) which were prepared in our laboratory using standard chemical methods. Their results showed that in an agar-well diffusion assay none of the three colloidal silver solutions had any effect on the growth of the test organisms. All tested bacterial strains were sensitive to ciprofloxacin. Colloidal silver 22 ppm showed no bactericidal activity in phenol coefficient tests. Thus, they concluded that as the tested colloidal silver solutions did not show any antimicrobial effect in vitro on the microorganisms, claims of colloidal silver's antimicrobial potency are misleading and there is no place for it as an antiseptic (van Hasselt, et al, 2004).

In 2003, Tobin and Bambauer published a review. In the review article they described that complications resulting from infection remained a major problem for hemodialysis catheters, with significant numbers of catheters being removed due to catheter-related sepsis. Numerous strategies had been employed to reduce the occurrence of infection and improve long-term outcomes, with varying degrees of success. One promising approach was coating the external surface of catheters with silver using physical vapor deposition processes. This article reviewed results of animal and clinical experiments conducted to assess efficacy and biocompatibility of silver-coated dialysis catheters. It is concluded that silver coatings can reduce bacterial colonization and occurrence of infection associated with these devices (Tobin, 2003).

Discussion

Even the history of silver colloid(s) application in medical application has been over 6000 years and the medical effects are clear for the silver colloid(s), when we checking the Index Medline we can see that most publications on the silver colloid(s) are the topics to show the application of silver colloid(s) in the analytic techniques, rather than in the medical practice. It needs more scientific researches on the silver colloid(s) medicine. Most reports on the clinical silver studies are about silver coating rather than colloidal silver.

There are debates on the topics if silver colloid(s) is toxic or not. For the medical application of silver colloid(s), the toxic needs further explores. Silver is a heavy metal. It needs more cell culture studies, animal studies, and also human studies, including clinical trials.

Atomic absorption, transmission electron microscopy (TEM) and ultraviolet-visible absorption spectroscopy are widely used in the silver detection (Pergolese, et al, 2005).

As Chairman of Natural-Immunogenics Corp. Stephen L. Quinto, emphasized at the 3rd International Silver Conference (Changsha, China, October 20th-21st, 2004): "There is an urgent need for wider

research into silver now, for it brings with it a timely lifesaving promise. You see, we have not only inherited a daunting quagmire of crises; we are also responsible for them. We were taught that Nature had only to be conquered! in a belief system that got it very wrong. And actually continues to believe that these threats can, and will be, solved through an ever-developing technology..... For those who cling to this belief, consider the problem of nuclear waste.... An issue that was raised 60 years ago, and is no closer to being solved today than it was then. How long are we going to pursue empty belief? Where is the desire, let alone the will, to protect us from the increasing danger of exposure to technology?" (Quinto, 2004). "China is the fifth largest primary silver producer and one of the largest secondary silver makers in the world". The 3rd International Silver Conference was held in Changsha of China on October 20th-21st, 2004 (Quinto, 2004).

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