2000 BC – Silver mentioned in Egyptian Writings
500 BC – Greek, Romans use silver vessels for water purification
1800 – Doctors used silver sutures in surgical wounds
1900 – Pioneers and frontier settlers use silver coins in their drinking water and milk to prevent spoilage

- Silver products are being developed and marketed commercially
- Silver is used to combat wound infections during WW1
- Silver is used widely in hospitals
- Several commercial airlines use silver water filters
- NASA selected silver-based system for space shuttle
- Improved silver products rise in popularity
- New superior structured silver technology developed in both liquid and gel form

- The pictures have something in common. These are objects we see in the dinner table. Silver is toxic to bacteria like Escherichia coli and Bacillus typhosus. The use of silver to provide bacteria-free tableware, pacifiers and storage vessels has been practiced throughout history.
- Raulin recorded the first clinical description of the water-cleansing effect by silver in 1869. He observed that Aspergillus niger could not grow in silver vessels.

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**History Of Silver Hydrosol In Medicine**

- **Carey Lea (1891)** announces the creation of the first silver hydrosol.
- **Carl Nageli (1893)** first defined the oligodynamic effect (from the Greek oligos = few, and dynamis = power; originally oligodynamisch) as the power of extremely small concentration of metal ions (e.g., silver and copper) to exert potent biocidal actions.
- **The Lancet (1912 & 1918)** and the **British Medical Journal (1917)** report stunning results utilizing silver hydrosols.
- **Goetz (1940)** clarifies that oligodynamic silver is only applicable to low concentrations of silver ions (Ag⁺). Contrarily, microcidal actions of heavy metal salts can only derive from high concentrations. This clarifies why heavy metal salts are poisonous.
Bioavailability is the proportion of any given supplement or drug that actually enters into circulation in the body and has an active effect. The bioavailability of colloidal silver is anywhere from 15-65% (depending on the manufacturer), whereas the bioavailability of silver solution exceeds 95%!

There are two clear “bookends” for illustrating the extremes of the potential for silver ion release from silver substances: namely silver sulfide (highly insoluble, hence a low potential for silver ion release) and...
silver nitrate (completely soluble, maximum potential for silver ion release). The release potential of different silver materials can be distributed between the silver sulfide and silver nitrate extremes (Figure 1), above slide.

Materials that store discrete silver ions in a matrix show a high potential for releasing silver ions, only marginally less than silver nitrate. Silver salts such as silver chloride show a lower release potential than the ion-based materials and so are positioned further from silver nitrate. At the other extreme, bulk silver metal (e.g., silver ingot) releases silver ions to a small extent and so has a potential closer to the silver sulfide extreme. As the size of silver metal is decreased from bulk through to micrometer-sized particles through to nanosized particles, the potential for releasing silver ions increases because of increasing surface availability per mass of silver and because both the solubility and dissolution kinetics of silver may vary as a function of size as silver metal size decreases. Therefore the potential for releasing silver ions increases and so the behavior moves away from the silver sulfide bookend toward silver nitrate. It is important to note that while the tendency for higher silver ion release improves with smaller silver particle size, the silver salts and silver-ion materials still show higher potential and antimicrobial activity than the nanosized silver metal materials.

**ABSTRACT:** Nanosilver is one nanomaterial that is currently under a lot of scrutiny. Much of the discussion is based on the assumption that nanosilver is something new that has not been seen until recently and that the advances in nanotechnology opened completely new application areas for silver. However, we show in this analysis that nanosilver in the form of colloidal silver has been used for more than 100 years and has been registered as a biocidal material in the United States since 1954. Fifty-three percent of the EPA-registered biocidal silver products likely contain nanosilver. Most of these nanosilver applications are silver-impregnated water filters, algicides, and antimicrobial additives that do not claim to contain nanoparticles. Many human health standards for silver are based on an analysis of argyria occurrence (discoloration of the skin, a cosmetic condition) from the 1930s and include studies that considered nanosilver materials. The environmental standards on the other hand are based on ionic silver and may need to be reevaluated based on recent findings that most silver in the environment, regardless of the original silver form, is present in the form of small clusters or nanoparticles. The implications of this analysis for policy of nanosilver is that it would be a mistake for regulators to ignore the accumulated knowledge of our scientific and regulatory heritage in a bid to declare nanosilver materials as new chemicals, with unknown properties and automatically harmful simply on the basis of a change in nomenclature to the term “nano”.
cannot be compared to conventional chemicals or bulk materials. Nanosilver is one of the nanomaterials that is under the most scrutiny today and its release and effects are studied widely. Although changes in nomenclature over the decades have created confusion among scientists and policy makers, it is undeniable that products containing nanoscale silver particles have been commercially available for over 100 years and were used in applications as diverse as pigments, photographics, wound treatment, conductive/antistatic composites, catalysts, and as a biocide. With this long and diverse history of use it is clear that an extraordinary amount of research into the chemistry of nanoscale silver has been conducted over the past 120 years; it should be noted that most research, until very recently, did not use “nano” nomenclature.

Now what about the first report of nanosilver? Over 120 years ago, in 1889, M. C. Lea reported the synthesis of a citrate stabilized silver colloid. The average diameter for the particles obtained by this method is between 7 and 9 nm. Their size in the nanoscale and the stabilization by citrate are identical to recent reports about nanosilver formation using silver nitrate and citrate, e.g., refs 19 and 20. Also the stabilization of nanosilver using proteins has been described as early as 1902. Under the name “Collargol” such a kind of nanosilver has been manufactured commercially since 1897 and has been used for medical applications. Collargol has a mean particle size of 10 nm and as early as 1907 its diameter was determined to be in the nanorange. Other nanosilver preparations were also invented in the next decades, for example the gelatin stabilized silver nanoparticles patented by Moudry in 1953 with 2-20 nm diameter and silver nanoparticle impregnated carbon with a diameter of silver particles below 25 nm. It is important to note that the inventors of nanosilver formulations understood decades ago that the viability of the technology required nanoscale silver, e.g., by the following statement from a patent: “for proper efficiency, the silver must be dispersed as particles of colloidal size less than 250 Å [less than 25 nm] in crystallite size.”

**Silver In Medicine**

- There are 2 distinct kinds of colloidal silvers: (1) silver-proteins, (2) Silver Hydrosol (a subset of colloidal silver).
- Silver hydrosols may contain very small particles which are not uniform in size (0.8-20.0 nm) that may remain suspended in water without forming an ionic solution.
- Uniform NanoSilver silver hydrosol contains suspended uniform colloidal silver particles in ultra-pure water typically 0.8-8.0 nm in size, endowing exponential surface area and surface energy to the silver.
- In dramatic contrast, a solution of silver-salt is one in which the ions of silver remain dissolved in water, which endows exponentially less therapeutic activity and can be toxic at high doses.
- For example, in addition to being exponentially less active than NanoSilver silver hydrosol, silver salts and silver proteins are excreted much more slowly than the smaller silver hydrosol particles and can accumulate in tissues.

**SILVER SALTS ARE NOT COLLOIDAL SILVER**

Silver salts have mistakenly been called colloidal silver products by some misguided individuals. By definition, the word colloidal means a system in which particles larger than molecules in size (in this case retaining their metallic identity) of one substance are suspended throughout a second substance. In the case of American Biotech Labs’ silver products, finite particles of metallic silver are suspended within highly purified water. Silver salts readily dissolve in water, and therefore are not colloidal in nature.
Small can mean different things to different people. So here, we're talking about things that we are measuring in billionths of a meter, or nanometers. So that's about a billionth of this [stretches out arms or hold up meter stick] which is really small. Almost too small to imagine.

To put in perspective just how small these nanosilver pieces are, we can think of their size in a couple of different ways.

One nanometer is about the distance that your fingernail will grow between now and now. Which, as you can imagine, is very small. Or, if you were to pull one hair from your head, on average, the thickness of a hair is about 100,000 nanometers. We’re talking about pieces of silver that are only a few nanometers thick.
If you break it into small pieces, it reacts fast. (Optional section on surface area could go here) What that does to help us is that silver kills germs faster and more efficiently.

But why exactly is that?

To help us think about this, I’m going to bring out one more example, and that is this wooden block. I’ve painted one dot on all 6 sides of this block. So let’s imagine that I have a lot of these blocks – 27 of them – and I’ve assembled them all into one big cube like this:

How many dots are showing on the outside of this big cube? Well, we’ve got 1,2,3,4,5,6,7,8,9 on the front, and 9 on each other side, too. So with 6 sides, that means we can see 54 total dots.

But what if I break my big cube up into all the little blocks?
How many dots can you see on the outside now? Well, we’ve got 6 dots showing on each cube, and 27 cubes, so that means we can see 162 total dots.

- In the left panel is a rhinovirus, the pathogen which causes colds and one of the smallest viruses. In the center panel is a 10 nm particle from a very good conventional colloidal silver. In panel 3 is a representation of a Nano-Silver particle.

- It is easy to see the particle size advantage of Nano-Silver in this example. A staphylococcus bacteria is roughly 40 times the size of the Rhinovirus.

- Small enough to interact with proteins, carbohydrates and other components of organisms that cause disease.

And these interactions can and do result in killing of the organisms...viruses, bacteria and funguses.
During the period 1948–56, Roy developed the sol–gel process for making ultrapure and ultra-fine (sub-nanometer as needed) powders of virtually any simple or complex ceramic composition. The second generation (1987) review of the field by Roy includes the development of di-phasic aquasols (i.e. mixed nano-solids in the same liquid, water) as the route to ultrahomogeneous nanocomposites. A relevant finding from this work is the remarkable phenomenon of solid state epitaxy where one solid phase – usually crystalline – can serve as a template and impart its structure to the amorphous solid phase to ‘force’ the amorphous phase to crystallize in the crystalline structure of the template. This laboratory has a long familiarity with sols, and it is an obvious area in which we may be able to contribute to what has proven to be an extremely complex problem, i.e. the surprising health effects of ultradilute sols, especially those involving metallic solids.

Colloids, specifically, including metallic sols, have been studied by more of the greatest scientists than any other similar category of materials. Faraday pioneered the creation by electrolysis, of noble metal sols, the stability of which as homogeneous liquids is attested to by the fact that his purple gold sol is still preserved in an ordinary 10 cm³ bottle in the Royal Institution in London. Svedberg, Perrin and Zsigmondy all won Nobel prizes studying colloids (two in the same year, 1926), and Einstein’s most cited paper is his 1905 Brownian motion paper. He is apocryphally reported to have commented that a ‘colloid acts like an atom’, implying, presumably, some ‘structuring’ of the water by the presence of the charged solid phase. Phase diagram textbooks are not even clear as to whether a sol is to be treated as a one phase or a two phase system.


From Dr Gordon Pederson's Presentation video on water & silver: https://youtu.be/n0MMLucQH3I

Video transcription:
What is structured water? Well let’s take a look at the word “structure.” It’s something that’s organized and is put together for a purpose. For instance, coal has a structure and a chemical structure that’s identical to the chemistry of a diamond. The difference is in the vibration, in the resonance, in the magnetism, in the electric field associated with that chemistry, you get a diamond or you get coal.
Structure can be applied to water. I know it sounds funny. Water, with a magnetic structure? Yes, magnetism moves water just like the tide coming in and going out with reference to the moon and its magnetism. Electrically, we know water transfers electricity, you’ve seen people electrocuted by it.

With this in mind, the proper electricity, the proper magnetism, the proper structure, all can be put together in one molecular particle called structured silver water where it has anti-microbial effects.

https://youtu.be/oehcbymIRBU

Video transcription:
Structured silver water is very significant because it has the ability to destroy bacteria, viruses and yeast. It can do so inside the body. It can do it on the outside of the body. It can purify your water. You can actually use it to disinfect your shower from the mold that’s growing there.

So this structured silver water is significant because it has a molecular structure. Within this structure it has an enhanced ability to kill pathogens and recharge itself so that you don’t have to take silver at such a high dose.

In addition to that, you’re going to find that the structure is so significant that a single silver ion can kill one pathogen, 1 bacterial cell, while the structured silver water, has the ability to function like a machine gun, rapid fire destruction, continuous destruction of bacteria and virus and yeast, all at the same time.

http://www.silverhealthinstitute.com/

See this:

The Structure Of Liquid Water; Novel Insights From Materials Research; Potential Relevance To Homeopathy

http://www.academia.edu/7499033/The_Structure_Of_Liquid_Water_Novel_Insights_From_Materials_Research_Potential_Relevance_To_Homeopathy


See figure on bottom half of page 594

Fig. 14.

A cartoon model of epitaxial transfer of structural information from one crystal to another, and to the liquid adjacent to the crystal without any transfer of composition. The graphite to diamond “determined” by the presence of H° but no H is left in the diamond.

Subtleties of terminology appear in various papers, but it is structural “information” that is definitely transferred (for a recent example of the subtleties of the what and how information can be transferred in the preparation of certain industrially important phases, see Roy, Guo, 7

It is also plausible as reported by John Ives that especially with the succussing process, trace amounts of the glass (which is probably a complex aluminosilicate) are dispersed as nano-heterogeneities of silicate islands. (“Recent data on homeopathy research”, Proceedings at the Whole Person Health Summit, Washington, D.C., April 2005)

Pages 596-602

......
The striking results of the segregation of micron-size heterogeneities at ultradilute concentrations of NaCl, DNA, fullerenes, etc., by Samal and Geckeler are very compatible with our models [47]. The reported calorimetric thermodynamic data from Elia and Niccoli and the thermoluminescence data on highly diluted alkali halide solutions by Rey all add to the data bank [91, 92, 93]. A completely different but obviously related and convincing bridge from classical materials science observations to the regime of homeopathy is found in the world of biologically active ultradilute metal (specifically silver) colloids. While the dilution does not surpass the Avogadro limit, the same criticism of ultradilution is implied; yet in these cases the in vitro biological effects cannot be challenged, and they can be immediately replicated.

The short summary description of the structure of water that emerges is that liquid H2 O is a nanoheterogenous statistical mechanical distribution mainly of several molecular species including oligomers and polymers along with a minority of monomers. The structure can be easily affected by epitaxial effects, pressure during succussion, the formation of colloidal nanobubbles, and electric and magnetic fields. This distribution is very easily changed, and all the intensive and extensive variables including magnetic and electric fields can cause substantial changes in the distribution of the nanoregions and hence the structure and hence the properties of water. The change in the internalized model for the structure of water that is proposed is a de-emphasis on the precise possible molecules into which water may polymerize as shown below, taken from the masterpiece of chemical structure compilation by Martin Chaplin [38]. Future presentations on the structure of water molecules should emphasize the ratios in which they occur, the clusters into which they form, the packing of such clusters or nanoregions, and the anisodesmicity (unequal bonding in the structure) of water and its consequences in the ease of property changes. A very crude image or cartoon of the structure which emphasizes these elements is presented in Fig. 18.

See conclusions on page 604

Conclusions

In 1971, Henry Franks, who was recognized as the leading researcher on water, wrote: “

The current consensus view of water seems to be that water can be treated as a three dimensional hydrogen bonded network with the bond length and angles being increasingly distorted with rising temperature, but without a significant number of non-bonded H2 O molecules!!”

This shows a leaning to the random network homogeneous structure view. F. Franks in his book “Water: Matrix of Life”, in the chapter on “Structure of Water” devotes one page to diffraction methods, followed by nine pages of “theoretical” and “computational” approaches [117]. He ends with the quote from Henry Franks, cited above, and then goes onto say:

“Almost three decades later, progress has indeed been made, but it is probably clear that despite its molecular simplicity, water in the bulk liquid still presents major puzzles to physical and life scientists.”

In other words, we know a lot about the units present, but not how they are put together.

-More on “conclusions” pages 604-606.

The Structure Of Liquid Water; Novel Insights From Materials Research; Potential Relevance To Homeopathy

http://www.academia.edu/7499033/The_Structure_Of_Liquid_Water_Novel_Insights_From_Materials_Research_Potential_Relevance_To_Homeopathy

Pages 596-602
• Ag404 MOLECULE: A thin multivalent silver oxide coating, built of numerous Ag404 molecules, surrounds the metallic nano-sized silver core.

• MORE STABLE AND BIOAVAILABLE: With the Ag404 coating, the nano silver particle is attracted to the surrounding water molecules, and as such, becomes part of the structure of the water. This makes the silver much more stable and bioavailable than other forms of silver.

• MULTIPLE MODES OF ACTION: Testing has uncovered multiple modes of action by which the Metallic Nano-silver Particle functions. First, it has an ability to steal multiple electrons (compared to ionic silvers which can only steal one). Second, each particle is permanently embedded with a resonant frequency, which allows the particles to have a positive effect on things, without needing direct contact with them. Lastly, the particles also utilize a very useful electrostatic charge.
Mild silver proteins are simply another form of ionic silver. The only difference being that, because ionic forms of silver are not generally stable and because they contain unusually large amounts of silver, they are sometimes bound to a protein.

The idea behind binding the ionic silver to the protein is to help make the product more stable than traditional forms of ionic silver, as well as, hopefully making the ionic solution more bioavailable.

However, as a result of this binding with protein, the silver ion is less functional and useful than traditional ionic silver ions. Consequently, higher levels of silver (ppm) are needed to obtain the desired effect. Are you ready to start experience the many Nano Silver benefits?

A lot of non-specific binding occurs with ionic silver. This may result in toxicity and loss of any therapeutic benefit.

Close, though agreed on loss of therapeutic benefits. See emailed comments:

**Which is More Effective and Safe, Metallic Silver or Ionic Silver?**

Many claims are made about the effectiveness of metallic vs ionic silver products, each side claiming their type of silver product to be the most effective. In a study at Brigham Young University, a professor found that most of the silver products purchased and tested from the public market, *claimed to be metallic silver products, but were actually just ionic or chemical forms of silver*. Most ionic forms of silver are very easy to make. *Usually a chemical form of silver (ie. Silver Nitrate) is taken and diluted down to a certain ppm level, and then a protein is added to the silver because most ionic forms of silver are not stable*. The added protein helps to keep the silver from falling out of suspension. *Ionic or chemical forms of silver tend to kill bacteria one or two minutes faster than metallic particles in test tube studies, but are much less effective in human studies*. They are less effective because once inside the body, *ionic silver takes electrons from other cells and are thus are quickly neutralized in their first pass through the liver*. In other words, the effectiveness of ionic silver is very short term. *True metallic nano-particles are not neutralized in the first pass through the liver*, but continue to function until they are ultimately washed through the system, which is estimated to take two days.
• Ionic Silver is one of the most common forms of silver liquid found in the supplement industry today. Many are made by diluting chemical forms of silver, like silver nitrate, to a desired parts per million (ppm), which is then bottled and sold to the public.

• Although ionic silver products have the smallest particle size, they are often the least stable and can easily fall out of solution.

• Additionally, ionic forms of silver only have one mode of action. Once each silver ion steals its missing electron, it becomes neutral and is no longer useful.

• Lastly, ionic forms of silver are metabolized, and as a result, can bind up in the body. Over extended periods of time, this build up could cause a skin condition known as Argyria, otherwise known as the blue man's syndrome.
Silver NP AgNO3 In Medicine

Images of E. coli cells: (A) Untreated E. coli. Flagella can be seen. (B) E. coli grown on agar plates supplemented with Ag+ (AgNO3). Arrows indicate partially damaged membranes. These cells are viable. (C) E. coli treated with triangular silver nanoparticles. Silver nanoparticles appear as dark irregular pits on the cell surface. (D) E. coli treated with spherical silver nanoparticles. (E) Enlarged image of part of the bacterial cell membrane treated with triangular silver nanoparticles. The cell membrane is damaged in multiple locations. Disrupting a germ’s outer membrane proteins; Inactivation of bacterial enzymes; Inhibition of bacterial replication via DNA binding. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1828795/

Pulmonary Toxicity of Instilled Silver Nanoparticles: Influence of Size, Coating and Rat Strain

Abstract
Particle size and surface chemistry are potential determinants of silver nanoparticle (AgNP) respiratory toxicity that may also depend on the lung inflammatory state. Pulmonary resistance increased and compliance decreased at day 1, with persistence at day 7. The 20 nm, but not the 110 nm, AgNPs increased bronchial hyperresponsiveness on day 1, which continued at day 7 for the citrate-capped AgNPs only. The 20 nm versus the 110 nm size were more proinflammatory in terms of neutrophil influx, but there was little difference between the citrate-capped versus the PVP-capped AgNPs. AgNPs can induce pulmonary eosinophilic and neutrophilic inflammation with bronchial hyperresponsiveness, features characteristic of asthma.

Characterisation of AgNPs
TEM images confirmed that the AgNPs tended to agglomerate following incubation in water for 24 hours at 37°C, pH 7. denser agglomerates were observed for the 20nm compared with the 110nm particles (Fig. 1A). Addition of dipalmitylophosphatidylcholine (DPPC) reduced agglomeration for all AgNPs, with greatest effects on the 110nm particles. EDS spectra, taken under identical acquisition conditions, confirmed a higher local concentration of silver from within the aggregates before and after the addition of DPPC. Both 110nm particles (25 µg/mL, pH 7) showed negligible dissolution in H2O over 200 hours (data not shown), while dissolution of the 20 nm particles was dependent on the type of coating agent and the presence of DPPC (Fig. 1C). Ag20/PVP NPs showed less dissolution than the Ag20/citrate. Addition of DPPC lowered the dissolution rate of the 20 nm NPs to 0.05% (PVP) and 3.1% (citrate) of the total mass of silver.

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0119726

This pubmed is one of the few that clarify what the engineered ‘Silver Nanoparticles’ are made of in the abstract. One usually needs to go to the characterization of nanoparticles in methods to find out the details.
• NanoSilver uniformity compared to larger particle colloidal silver
• Schematic of Coronavirus Juxtaposed With NanoSilver particles:
  For Every Atom of Virus, There Will Be One Silver Particle Present To Enable Complete Viral Destruction.

Structured silver is by definition non-toxic to higher life forms, yet lethal to 99% of lower life forms such as:

- Viruses;
- Bacteria;
- Fungi;
- Protozoa;
- Resistant Pathogens;
Silver Hydrosol In Medicine

- Silver-based drugs are the most documented universal, broad-spectrum antimicrobial agents in modern history.

- Over 700 viral, bacterial, fungal and protozoan pathogens are documented to succumb to silver-based drugs.

- No other single antimicrobial agent competes with silver’s proven track record of safety and broad-spectrum application.

- With the rise of antibiotic-resistant bacteria, highly advanced silver hydrosols (i.e., structured silver in water) are re-emerging as primary antimicrobial agents because there are no valid drug resistant strains to silver.

- Silver hydrosol is the best candidate to thwart bacterial or viral epidemics and pandemics.

Silver Hydrosol In Medicine

- Colloidal Silver Uses In The Home

Until 1975, the FDA actually authorized 132 colloidal silver uses. So what changed during those 47 years that the benefits of silver solutions were deemed to be not just fine, but effective in recent years?

From 1975 onward, only very few colloidal silver uses have received approval, so the FDA granting safety approval on a Silver Sol product is a monumental breakthrough.
Study shows that the ABL product did not impede the action of any other P450 drugs when ingested with the silver. http://medicine.iupui.edu/clinpharm/ddis/main-table/


The Silver Sol product is FDA approved as a Dietary Supplement with dosing included.

Dietary Supplements: Over 60 Billion Doses a Year and Not ONE Death, But Still Not Safe?


In addition to talking with your health care provider about dietary supplements, you can search on-line for information about a particular dietary supplement. It is important to ensure that you obtain information from reliable sources such as:

- Fact sheets on dietary supplements from the National Institutes of Health
- Nutrient Recommendations: Dietary Reference Intakes (DRI) and Recommended Dietary Allowances (RDA)
- PubMed Dietary Supplement Subset
- Dietary supplement warnings and safety information from the U.S. Food and Drug Administration
• Consumer information from the Federal Trade Commission

For tips on evaluating sources of healthcare information on the Internet, please see the following document: How to Evaluate Health Information on the Internet: Questions and Answers.

Wikipedia gives us an idea of how much product has been sold...


In up to January 2013 the company has sold **10 million of products based on the SilverSol technology**.[24]

![Figure 2. Schematic model of a virus infecting an eukaryotic cell and antiviral mechanism of metal nanoparticles.](image)

![Mechanism of Action](image)

1. Silver Oxide coating protects through the liver to keep its bioavailability
2. Viral DNA disruption.
3. UV light. No other colloidal silver has that technology.
Defense Threat Reduction Agency (DTRA) 2009 Department of Defense (DOD) funded study finds silver nanoparticle neutralization of hemorrhagic fever viruses including Ebola, Marburg, South American HFV and Lassa Fever


Not only was the absolute effect of the correct Nano Silver on Ebola virus establish research, the precise mechanism of nutrient action was determined.

Genotoxicity, Acute Oral and Dermal Toxicity, Eye and Dermal Irritation and Corrosion, and Skin Sensitization Evaluation of Silver Nanoparticles

To clarify the health risks related to silver nanoparticles (Ag-NPs), we evaluated the genotoxicity, acute oral and dermal toxicity, eye irritation, dermal irritation and corrosion, and skin sensitization of commercially manufactured Ag-NPs according to the OECD test guidelines and GLP. The Ag-NPs were not found to induce genotoxicity in a bacterial reverse mutation test and chromosomal aberration test, although some cytotoxicity was observed. In acute oral and dermal toxicity tests using rats, none of the rats showed any abnormal signs or mortality at a dose level of ~2000 mg/kg. Similarly, acute eye and dermal irritation and corrosion tests using rabbits revealed no significant clinical signs or mortality and no acute irritation or corrosion reaction for the eyes and skin. In a skin sensitization test using guinea pigs, one animal (1/20) showed discrete or patchy erythema, thus Ag-NPs can be classified as a weak skin sensitizer.


Table II: Comparison of biocidal effectiveness (measured as the minimum inhibitory concentration MIC in ppm) of keyantibiotics with ASAP-10, a colloidal silver prepared in a 11,000 volt AC field with a concentration of 1 atom per 10^6 molecules of H2O. (The MIC for the colloid applies in humans to topical applications) (Personal communication, Prof. R.W. Leavitt, Brigham Young University)
2. Re:

Also...health freedom is a catch phrase for alternative medicine people, some of whom have been ordained as “quacks”. I would never call a drug harmless....even with conservative use.

These results, in a preliminary way, are parallel to the many empirical observations made by physicians for the last 100 years on the use of metallic silver and water in various combinations for human health.


**ABSTRACT:** Nanosilver is one nanomaterial that is currently under a lot of scrutiny. Much of the discussion is based on the assumption that nanosilver is something new that has not been seen until recently and that the advances in nanotechnology opened completely new application areas for silver. However, **we show in this analysis that nanosilver in the form of colloidal silver has been used for more than 100 years and has been registered as a biocidal material in the United States since 1954.** Fifty-three percent of the EPA-registered biocidal silver products likely contain nanosilver. Most of these nanosilver applications are silver-impregnated water filters, algicides, and antimicrobial additives that do not claim to contain nanoparticles. **Many human health standards for silver are based on an analysis of argyria occurrence (discoloration of the skin, a cosmetic condition) from the 1930s and include studies that considered nanosilver materials.** The environmental standards on the other hand are based on ionic silver and may need to be reevaluated based on recent findings that most silver in the environment, regardless of the original silver form, is present in the form of small clusters or nanoparticles. The implications of this analysis for policy of nanosilver is that it would be a mistake for regulators to ignore the accumulated knowledge of our scientific and regulatory heritage in a bid to declare nanosilver materials as new chemicals, with unknown properties and automatically harmful simply on the basis of a change in nomenclature to the term “nano”....

From the study:
“It is important to note that the inventors of nanosilver formulations understood decades ago that the viability of the technology required nanoscale silver, e.g., by the following statement from a patent: “for proper efficiency, the silver must be dispersed as particles of colloidal size less than 250 Å [less than 25 nm] in crystallite size”. 26 Whereas it is true for many other engineered nanomaterials that they are novel, e.g., for fullerenes and carbon nanotubes, this is clearly not the case for nanosilver. This long history of rational fabrication and use of colloidal nanosilver has resulted in a lot of research and knowledge about these nanoparticles over the last 100 years, even if this research is not reported under “nano” terminology. The nanosilver formulations mentioned in the preceding section have not only been used by scientists and described in the patent literature, but have consistently found their way into the market. In the early part of the 20th century, the commercial sale of medicinal nanoscale silver colloids, known under different trade names such as Collargol, Argyrol, and Protargol, began and over a 50-year period their use became widespread. These nanosilver products were sold as over-the-counter medications and also used by medical doctors to treat various diseases such as syphilis and other bacterial infections.27”


5. LEVELS OF SILVER USAGE HISTORICALLY DEEMED SAFE

Many different silver products have been and are still being used throughout the medical industry. Up until the advent of chemical antibiotics, as we now know them, which came about in the 1940s, some very strong silver products were being used as antibiotics. Of the millions of people who used these concentrated silver products, there were no reported deaths and only 239 reported cases of generalized argyria (EPA Report ECAO-CIN-026, January 1991, page VI-3). In that same EPA report, on page VI-4, it states that Gaul and Staud (1935) suggested 8 grams of silver arsphenamine (administered by injection at 145,000 ppm strength) as a safe total dose. They also noted that other authors suggested safe total doses of 12 – 15 grams, based on clinical experience. The work of Furchner, et al (1968), as stated above, showed that small amounts of silver did not build up in the system of primates. For argument’s sake, if we assumed that every bit of ingested silver was retained by the body, and that a person was using the American Biotech Labs’ 10 ppm, ASAP Solution at a level of two teaspoons daily, then using the Gaul and Staud’s safe levels of total silver usage of 8 grams, we can state that it would take an individual 235.66 years of daily usage, at two teaspoons, to achieve the total consumption of 8 grams (a level that they deemed safe).

NO COMPARISON BETWEEN NEW AND OLD PRODUCTS

American Biotech Labs’ silver products have been proven to kill bacteria at levels of between 2.5 – 5 ppm, and since the old silver products ranged between 50,000 – 300,000 ppm, there is really no comparison. American Biotech Labs’ products are effective with concentrations of 20,000 – 60,000 times less silver in the solution. A better, patented technology which produces a more useful (bacteria lethal) product would seem to be the difference. Because American Biotech Labs’ silver solutions effectively kill bacteria using thousands of times less silver, the risk of any possible side effects has been all but eliminated.

MINIMUM AMOUNT OF SILVER KNOWN TO CAUSE ARGYRIA

Hill and Pillsbury (1939) stated, “...the ordinary clinical use of colloidal silver compounds practically never gives rise to any gross untoward effect other than argyria.” The minimum amount of silver known to cause argyria in adults, from the use of any silver compound (including salts) is 900 mg of silver taken orally in one year. In order to reach this level of silver intake, an individual would have to consume 380 – 8 oz. bottles of American Biotech Labs’ 10 ppm ASAP Solution silver product within a year. Suggested adult dosage is about ½ to 1 teaspoon taken one to three times daily. This means that an individual
would have to consume over 50 times the normal adult dosage, every day for a year, to even reach the lowest level ever known to cause argyria. It should be noted that **EPA standards** for the amount of silver that can be safely consumed in drinking water is .005 milligrams per kilogram of body weight per day (EPA RED document, page 2, 4th paragraph). This means that a normal sized adult could consume an ounce (6 tsp) of the 10 ppm ASAP Solution every day, for a 72 year lifespan and still be within the safe limits as defined by the EPA. In the EPA RED document for silver, the EPA goes on to state (page 3, 4th paragraph) **“The EPA does not anticipate that dietary exposure to these low levels of silver will be associated with any significant degree of risk.”**

American Biotech Labs has had independent in vivo toxicity tests completed on its ASAP Solution product that showed that at as much as 200 times the normal adult dosage, or the equivalent of an adult consuming 32 full ounces of the 10 ppm product at one sitting, the ASAP Solution was found completely non-toxic to the test animals. As was noted above, most adults using the ASAP Solution only use about 1 – 3 teaspoons a day.

**ABSORPTION AND RETENTION OF INGESTED SILVER**

According to the EPA IRIS Report on silver (Integrated Risk Information Systems), page 5, 1st paragraph, it states that a number of tests were completed to test the absorption and retention of ingested silver in a number of animals (including primates). **In 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 silver was out of the body in only two days, which indicates that silver does not build up in the system when consumed in small amounts.**

**ASAP SILVER VS PRESCRIPTION ANTIBIOTICS USAGE**

Prescription antibiotic usage, unlike silver, can be very dangerous. In numerous cases it can cause death...which is a fairly serious and permanent side effect. In an article in JAMA (Journal of the American Medical Association), December, 2000, Barbara Starfield estimated that there were 106,000 deaths annually caused by **properly administered** antibiotics. This number does not include deaths from antibiotic usage whereby the antibiotics were used or prescribed incorrectly. There were no reported deaths in 2000 from the use of silver products.

**CONCLUSION**

There is no comparison on the issue of safety in usage between silver products and prescription antibiotics. Silver is obviously much safer to use. According to the EPA, who is in charge of defining safe levels of any mineral in water used for ingestion or drinking, the oral consumption of small amounts of silver in water, on a daily basis, poses no significant degree of risk. Unless an individual were constantly consuming (every day for over a year) over 50 times the recommended daily dosage of the ASAP Solution, at 10 ppm, there is literally no possibility of that individual contracting the non-toxic condition called argyria.

[The above information is taken from the American Biotech Labs’ Product Information Report for ASAP Solution]

**Non-Toxicity Test Work Summary:**

In order to insure not only the best product, but also a safe product, American Silver L.L.C. [American Biotech Labs] hired an independent laboratory to do a toxicology study on the ASAP Solution. The test, called an LD-50 test, was performed in accordance with the guidelines of the Federal Hazardous Substances Act (FHSA) Regulations, 16 CFR 1500.
In the test work, the ASAP Solution was given to a number of both male and female test rats. The amount of ASAP Solution given to the rats was 5g/kg, or the equivalent of a 200 pound man taking 192 teaspoons of about 4 full 8 ounce bottles of the ASAP 10ppm solution at one time (the normal adult dosage is one or two teaspoons/day).

As a result of the test work, the independent laboratory made the following conclusion, “Under the conditions of this study, there was no mortality or significant evidence of toxicity observed in the rats. The test article (ASAP Solution) would not be considered toxic at a dose of 5g/kg by oral route in the rat.”

Former Surgeon General of the Air Force, P.K. Carlton, writes the following letter to the office of homeland security 2007 requesting the following:

“I feel it can be used in the area of bio-defense from bio-terrorism to infectious diseases such as SARS. The anti-microbial has undergone rigorous testing and has been found to kill Anthrax, Bubonic Plague, Hospital Staph and SARS. It is the first new anti-microbial for the hospital in many years. In addition it is non-toxic to humans, EPA approved (Hospital Staph and Bubonic Plague) and currently Sec 18 approval. ABL’s Solution has shown to be a wide spectrum anti-microbial/bio-contaminant that can be used to increase the safety and functionality of health care facilities in the event of bio-terror attack or infectious disease outbreak such as SARS. In short, we currently do not have anything with such a wide spectrum of efficacy in our inventory. As such I recommend that the anti-microbial be evaluated for addition to the National Push-back stockpile. It will make our nation a safer place to live and work.” General P.K. Carlton MD.

(excerpt of a letter to the Dept. of Homeland Security, 2007)

See entire letter and more letters here:


Silver Safety Council
Doctors, university professors, and world leaders in health-freedom advocacy

Guidelines for the safe use of silver supplements in human health

“Anything in excess has consequences. Common substances like table salt and aspirin are harmless with normal use, but excessive intake can become toxic and even life-threatening. With normal responsible usage, silver supplements are entirely harmless to humans.”

— Jeffrey Blumer, MD, PhD; former director of the Center for Drug Research (the world’s largest clinical research center for pediatric drugs)

http://www.silversafety.org/