

# Promising Cure to URTI Pandemics, Including the Avian Flu (H5N1): Has the Final Solution to the Coming Plagues Been Discovered? (Part II)

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## *Virotoxicity of Oligodynamic Silver*

Viruses cause most upper respiratory tract infections (URTIs), such as adenovirus, coronavirus, coxsackievirus, influenza virus, parainfluenza virus, respiratory syncytial virus, and rhinovirus, which account for the majority of cases.<sup>1</sup> A broad-spectrum anti-viral agent that really works is needed to combat over 200 viruses that cause URTIs.<sup>2</sup> Undoubtedly oligodynamic silver fits this bill.

Emerging medical studies confirm the stellar, broad-spectrum virotoxic efficacy of oligodynamic silver both *in vitro* and *in vivo*. This includes some of the most formidable viral organisms like HIV (including co-infections)<sup>3-11</sup> and Herpesvirus hominis (HSV).<sup>12-18</sup> Despite the low yields of oligodynamic silver of the past 100 years common to silver-based drugs, the collective authoritative medical literature has documented efficacy of silver's virotoxicity against over 24 viruses. For the viruses relevant to URTIs, the following are known to succumb to oligodynamic silver:

Adenovirus;<sup>19,20</sup>

Influenzae (strains not identified);<sup>22-24</sup>

Influenza B (*Haemophilus influenzae*);<sup>27</sup>

HSV-(URT), as referenced above.

Coxsackie virus type B-3 (CB-3);<sup>21</sup>

Influenza A;<sup>25,26</sup>

Rhinovirus type 1A;<sup>28</sup> and

## **Bactericidal Properties of Oligodynamic Silver in URTI**

Oligodynamic silver's antimicrobial efficacy extends well beyond its virotoxicity. Oligodynamic silver's lethal effects span across all microbial domains (viral, bacterial, and fungal). The following URTI-related bacteria are known to be susceptible to oligodynamic silver:

Beta hemolytic streptococci,<sup>29-38</sup> which causes tonsillopharyngeal cellulitis, tonsillopharyngeal abscess<sup>39</sup> (including reduced nasopharyngeal abscesses),<sup>40</sup> otitis media,<sup>41-43</sup> plus sinusitis,<sup>44-46</sup> and up to ten percent of cases of adult pharyngitis<sup>47</sup> and the associated condition, and scarlet fever;<sup>48</sup>

*Bordetella pertussis*;<sup>73,74</sup> (causes less than 10% of acute tracheobronchitis cases);

Spring Catarrh (obsolete nomenclature);<sup>83</sup> and Pneumococci<sup>84</sup>/Pneumonia;<sup>85</sup>

And finally, inflammatory conditions of the eyes, ears, nose, and throat.<sup>77-82</sup>

*Streptococcus pneumoniae*;<sup>49</sup>

*Corynebacterium diphtheriae*;<sup>50-53</sup>

*Neisseria gonorrhoeae*;<sup>54-60</sup>

Herpesvirus hominis (HSV);<sup>61-68</sup>

*Klebsiella pneumoniae*;<sup>69-71</sup>

*Haemophilus influenzae*;<sup>72</sup>

*Mycobacterium* (Tuberculosis);<sup>75,76</sup>

## Case History

Perhaps oligodynamic silver's most compelling nature lies in its ability to successfully eradicate pervasive primary and secondary co-infections simultaneously. A major, double-blind, controlled trial concerning advanced AIDS candidiasis and immunity-suppressing moieties demonstrated complete sero-negative conversion after a single treatment with oligodynamic silver hydrosol! The studies were conducted at Lucha Contra el Sida, Comayaguela, Tegucigalpa, Honduras, Central America.

Quoting from the study, "Furthermore, said devices [silver oxide hydrosol] are capable of killing pathogens and purging the bloodstream of immune suppressing moieties (ISM) whether or not created by the AIDS virus (HIV), so as to restore the immune system."<sup>86</sup> (Brackets added by authors.)

This single treatment delivered a total of 200 mg of silver for a 70 kilogram patient, well within the lowest observed adverse event level (LOAEL) established by the EPA for injected silver.<sup>87</sup> Unlike picoscalar oligodynamic silver hydrosol devoid of silver oxide, the former required activation into an oligodynamic state with persulfate. Nevertheless, the results were astounding.

## Pharmacology

Pharmacokinetics is concerned with how the body affects the Absorption, Distribution, Metabolism, and Excretion (ADME) of the silver-based drug:

(1) Time course of Absorption: The absorption of picoscalar silver hydrosol is nearly instantaneous. An average picoscalar particle size of eight angstroms results in a Particle Diffusion Coefficient approaching  $10^{-5}$  cm<sup>2</sup>/second,<sup>88</sup> which exponentially facilitates tissue absorption over previous versions of silver hydrosols.

(2) Time course of Distribution: "In rats, silver was unevenly distributed in organs and tissues following...intravenous injection

(wherein) the highest concentrations were found, in decreasing order, in the liver, pancreas, spleen, and plasma (Klaassen 1979a)."<sup>89</sup> It has been observed that IV silver administration will readily pass the so-called blood-brain barrier,<sup>90</sup> presumably allowing for interface and intervention with pathogens or prions associated with neuropathologies (i.e., ALS, MS, polio, spinal meningitis, viral encephalitis, and possibly BSE/hCJD – Mad Cow Disease).<sup>91-94</sup>

(3) Time course of Metabolism: At the cell level, Argyrophil I reduction reactions convert oligodynamic silver ions into colloidal grains of neutral silver now bound to the same tissue section.<sup>95</sup> This reaction is reversible. In 1979, Gallyas demonstrated that transformation of inactive silver back into bioactive silver takes place as the tissue itself becomes oxidized.<sup>96</sup> White blood cells (WBCs) are dedicated to such oxidizing mechanisms, and since WBCs are known to hoard silver particles out of the blood stream,<sup>97,98</sup> it is likely immunity is greatly enhanced with oligodynamic silver.

(4) Time course of Excretion: No matter how silver is administered, the predominant route of elimination is the feces.<sup>99,100</sup> Depending upon the type of silver-based drug used, the mammal studied, and the route of administration, the biologic half-life of silver is reported to range from days to months.<sup>101,102</sup> This provides an ample therapeutic window to recharge spent silver *in vivo* by way of H<sub>2</sub>O<sub>2</sub> administration.

## Body Pharmacodynamics

Pharmacodynamics relates to the biochemical and physiological effects of the drug upon the body or pathogen. Those effects include the following:

- WBC Upregulation: Oligodynamic silver appears to modulate and/or upregulate reactive oxygen species (ROS) generated by WBCs. ROS are the strategic hand grenades utilized by WBCs to destroy pathogens. It is now becoming clear

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that oligodynamic silver promotes the respiratory burst of WBCs.<sup>103,104</sup>

- Lymphocytic Migratory Modulation: The potential of oligodynamic silver to help support chemotaxis and tissue targeting by lymphocytes is self-evident because of its propensity to generate Jarisch-Herxheimer Effects (JHEs). JHEs modulate inflammatory cytokines which, in turn, can enhance lymphocytic migration.<sup>105-107</sup> More work needs to be done to confirm this action of silver during JHEs.

- Leucocytogenesis/leucocytosis Induction: As early as 1916, it was noted that oligodynamic/colloidal silver formulations induced leukocytosis.<sup>108</sup> Bechhold confirmed that preliminary evidence was documented for oligodynamic silver to increase both RBC and WBC counts, but only after an initial hemolytic action took place that was transitory and typically uneventful.<sup>109</sup> One recent pilot study reported that high (120 cc of 1500 ppm silver equaling 180 mg of silver) concentrations of mild silver protein (MSP) given *at one time* can induce severe pancytopenia. Nevertheless, a total recovery rapidly ensued.<sup>110,111</sup>

- Phagocytic Index: A comprehensive retrospective text provided by Bechhold in 1919 supported oligodynamic silver's ability to upregulate the phagocytic index.<sup>112</sup> Today's peer-reviewed literature has clarified these properties for oligodynamic silver as documented in the preceding three paragraphs.

- Jarisch-Herxheimer Events (JHEs): Rapidly self-resolving, uneventful hepatomegaly may be seen in beneficial outcomes when extremely large doses of oligodynamic silver are given at one time (i.e.,  $\geq 50$  mg silver). Such beneficial outcomes may undergo mid-process events that reveal interim transitory and self-resolving liver enzyme elevation due to fragmentation of pathogen loads from



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► infected host liver cells (i.e., classical Jarisch-Herxheimer, autolysis, or apoptotic induction events).<sup>113-115</sup> Likewise, self-limiting, self-resolving hemolysis, myalgia, rigors, fevers, malaise, headaches, nausea, and, rarely, a transitory immune system activation of coagulation (ISAC) may result from events associated with die-off.<sup>116</sup> To mitigate these events, see Post-JHEs Management below.

### Pathogen-Associated Pharmacodynamics

#### Particle Charge

Feng has noted, "It is revealed that bulk silver in an oxygen-charged aqueous media catalyzes the complete destructive oxidation of microorganisms. *Silver and hydrogen peroxide acted synergistically* on the viability of *E. coli* K-12. It appears that the combined toxic effect of silver and hydrogen peroxide may be related with damage to cellular proteins. However, the mechanism of antimicrobial effects of silver is still not fully understood. The effects of silver ions on bacteria may be complicated; however, direct observation of the morphological and structural changes may provide useful information for understanding the comprehensive antibacterial effects and the process of inhibition of silver ions."<sup>117</sup> [Italics added by authors.]

Further elucidation on the complicated effects of nanoscalar silver ions on bacteria now extends beyond its known (a) lethal oxidation of the pathogen. It also involves (b) an "intermolecular electron transfer," resulting in an electrocution of the pathogen;<sup>118</sup> (c) a binding and chelating to essential pathogen receptor sites, which defeats the pathogen's mechanisms of invasion into host cells;<sup>119</sup> (d) an ion non-dependent heightened catalytic action<sup>120</sup> and (e) cleavage, which fragments essential pathogen/proteinaceous structures.<sup>121</sup>

#### Particle Size

The size of each oligodynamic silver particle in colloidal dispersion creates a cumulative surface area. Such surface area is of utmost importance. (See Baker et al. below) The antimicrobial actions of biocatalysts like oligodynamic silver hydrosol are directly proportional to the adsorption power upon a pathogen.<sup>122</sup> Ostwald demonstrated there was a geometric progression related to the surface area of hydrosol silver particles by assuming a starting point of one cubic centimeter of silver. When silver is incrementally reduced into smaller and smaller cubes, the net silver particles produced will eventually approach *six square kilometer surface areas*.<sup>123,124</sup>

Uniform picoscalar oligodynamic silver hydrosol generates an adsorption power many magnitudes of order greater than any previous silver hydrosol product. A high nanoscalar silver product produced in a NASA-funded experiment produced the following observation in regards to adsorption power: "It had already been noted that at  $10^4$  cells  $\text{ml}^{-1}$  and 50 ppb of silver [ions], there are approximately  $2.8 \times 10^{10}$  silver ions per cell. This is a commentary on the use of the term 'oligodynamic.' In the most extreme situation ( $10^4$  cells  $\text{ml}^{-1}$  with 250 ppb of silver), if one estimates the dry weight of a bacterial cell at  $2.5 \times 10^{-13}$  g, *there should actually be more than one silver ion in the system for every atom in every bacterial cell*."<sup>125</sup> [Italics added by authors.]

#### Therapeutic Index and Particle Concentration

Fundamentally, the Therapeutic Index (TI) range falls specifically between silver concentration levels that will be toxic to the host versus non-toxic silver concentration levels that will reliably and consistently cure infection. The EPA has established one end of the TI by determining the lowest observed adverse event level (LOAEL) for both intravenous and oral intake. Comprehensive

retrospective analysis spanning over 56 years by EPA<sup>126</sup> and ATSDR<sup>127</sup> found *no* other adverse events associated with silver exposure. For a 70 kilogram patient, intravenous silver is limited to one (1) gram over any two-to nine-year period, and for oral intake, to twenty-five (25) grams over a 70-year period. These values reflect the best gauge to prevent argyric iatrogenesis.

To determine the other end of the TI, the following publications collectively provide compelling data regarding safe and effective dosage levels for oligodynamic silver hydrosol when treating a broad scope of human infections:

Zhao et al. provided an excellent retrospective review on the key 13 factors critical to the chief pharmacodynamic *in vitro* parameters establishing oligodynamic silver's therapeutics, including the complete inhibitory concentrations (CIC), the Minimum Bactericidal Concentration (MBC), as well as the log killing time (LKT).<sup>128</sup>

A comprehensive study commissioned by NASA reported that, "Three experiments were done with *E. coli*. The first two employed silver propionate (a silver salt). Cell populations were quite stable at room temperature in the absence of the added silver. The silver killed the cells. The process was not precisely exponential, but there was no indication that killing would not ultimately be complete. The extinction times ( $10^{-4}$  killing) might have ranged from < 2 hrs. to approximately 4 hrs. at 50 ppb of silver and from < 1 hr to approximately 2 hrs. at 250 ppb. Silver from the electrolytic ion generator was used in the third experiment, and the probable extinction times were approximately 4 hrs. and approximately 2 hrs. again at 50 and 250 ppb, respectively."<sup>129</sup>

Berger has shown that the minimal lethal dose (MLD) for both gram-positive and gram-negative pathogens with oligodynamic  $\text{Ag}^+$  is ten to 100 times greater than silver sulfadiazine (also a silver salt).<sup>130</sup>

More recently, an *in vitro* study by Baker et al. found that, "Nanometer-sized silver particles were found to exhibit antibacterial effects at low concentrations. The antibacterial properties were related to the total surface area of the nanoparticles. Smaller particles with a larger surface to volume ratio provided a more efficient means for antibacterial activity. The nanoparticles were found to be completely cytotoxic to *E. coli* for surface concentrations as low as 8 microg of Ag/cm<sup>2</sup>."<sup>131</sup>

These *in vitro* studies follow closely to the authoritative medical literature for *in vivo* applications. The key to *in vivo* dosing is saturating the foci (whether local or systemic) with approximately 1 ppm to approximately 10 ppm oligodynamic silver for acute infectious processes, and up to 27 ppm for chronic infectious with heavy pathogen loads.

For example, in acute local and systemic infectious processes, the older, authoritative medical literature reported on two popular silver hydrosol products used to treat humans, namely Collosol Argentum and Electrargol. Collosol Argentum, also known as Colsargen, was a 500 ppm concentration of silver in water, equivalent to 500 mcg/cc. For local infections, it was diluted to a 167 ppm concentration. "For injections in systemic infections the recommended dose is 30 drops (2 cc)."<sup>132</sup> Therefore, the typical IV dosage for systemic infections totaled 1 mg of silver as silver hydrosol.

Electrargol was a 400 ppm concentration of silver in water equivalent to 400 mcg/cc.<sup>133,134</sup> "The dose is 80 to 160 drops (5-10 cc), injected intramuscularly or directly into a vein."<sup>135</sup> This dose was given several times weekly when indicated.<sup>136,137</sup> Therefore, the typical single IV dosage totaled 2 mg to 4 mg silver as silver hydrosol.

So, what would be the modern dose equivalents when treating for acute local or systemic infections for a picoscalar silver hydrosol containing a pure oligodynamic

content of 20 ppm to 25 ppm? Answer: IV dosages given once or several times weekly for an average 70 kilo patient, as either a 50 cc to 75 cc slow push or 150 cc to 200 cc isotonic drip, as indicated. When exceeding 150 cc in a single IV drip, it is important to diligently monitor for hemolysis with urine dip sticks. Limit dosage on subsequent treatments to 150 cc if significant hemolysis warrants. Insignificant levels of hemolysis need not alter dosage levels.

For chronic infections with heavy loads and co-infections, what are the *in vivo* guidelines for utilizing IV oligodynamic silver hydrosol in humans? Research conducted at Lucha Contra el Sida, Comayaguela hospital (discussed above) appears to have determined this guideline, as well as the other end of the TI for oligodynamic silver. The study's conclusion found that the equivalent<sup>138</sup> of 27 ppm oligodynamic silver (as the target saturation point for the blood plasma) was sufficient to completely convert to seronegative *all* advanced AIDS patients presenting with frank candidiasis, when provided as a single treatment dose!<sup>139</sup> To approach a 27 ppm blood plasma concentration with a 20 ppm to 25 ppm oligodynamic silver hydrosol formulation, see the following section on Protocol Proposal.

### Protocol Proposal & Call for Clinical Investigators

In cases of acute URTIs, *per os*, nebulized, and intravenous administration may prove to be the best infectious control method yet discovered. What follows is a call for clinical investigators to discover its fullest potential.

*Per os* dosage ranges are from one teaspoon to one tablespoon taken on an empty stomach every 20 to 60 minutes during initial stages (first week) of acute URTI, reducing dosages accordingly with symptom alleviation. If symptoms do not show clear improvement within 24 to 36

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hours, or if symptoms should worsen, then in addition to continuing the upper *p.o.* dosage schedule, incorporating investigational nebulized dosages of 5 cc given once or twice daily or even hourly may be required. Follow up immediately with standard respiratory therapy, when indicated. Reduce dosage amount and frequency accordingly as symptoms improve. (Also, see below the section on jurisprudence.)

In severe cases that are stable or *slowly deteriorating* (acute respiratory distress), or in cases where rapid improvement is deemed medically necessary, investigational use of slow IV push given over 15 minutes of 50 cc to 75 cc once daily may bring about a rapid recovery within the following 24 to 36 hours. IV push contents should be prepared by a compounding pharmacy or an equivalent in-clinic "clean-field" processing system that meets applicable state regulations. By rendering the silver hydrosol suspension isotonic with sorbitol, doses above 50 cc may be frequently given safely and comfortably. 75 cc of isotonic silver hydrosol may be administered daily as a slow push over three consecutive days, if the case warrants. Reduce dosage amount and frequency accordingly as symptoms improve.

In acute, critical cases with *rapid deterioration* (severe respiratory distress), investigational use of isotonic IV drips administered to attain a cumulative 1 ppm to 10 ppm oligodynamic silver blood plasma concentration from all sources (*p.o.*, nebulizer, and intravenous) should bring about a swift efficacious response. To bring under control a rapidly deteriorating case, providing an IV drip over three hours of 150 cc isotonic silver hydrosol may be given daily for three or more consecutive days, in conjunction with *p.o.* and nebulizer treatments. Close monitoring for uneventful



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➤ hepatomegaly or hemolysis is required. Run a liver panel and/or a complete CBC if symptoms indicate. Otherwise, simple monitoring for hemolysis via urine dip sticks should suffice. If non-significant hemolysis or hepatomegaly develops, dosage schedule may continue at the higher levels. In the rare event that significant hemolysis or hepatomegaly arises, if possible discontinue dosage for 24 to 72 hours, except for nebulized administration, then resume dosage schedule as indicated above. Reduce dosage amount and frequency accordingly as symptoms improve.

In chronic non-URTI viral cases involving heavy pathogen loads, with or without significant URTI co-infections such as bacterial pneumonia or fungal pneumocystis carinii or even tuberculosis, administering a cycle of 150 cc to 200 cc isotonic silver hydrosol as an IV drip over three hours daily for four consecutive days, followed by a rest period of three days, can be repeated (when deemed necessary) for a total of three more cycles (16 isotonic silver hydrosol drips in all over 30 days). *P.o.* dosages should be six tablespoons daily, only taken on an empty stomach. Nebulized dosages remain the same as described above.

To further approach the "equivalent" of the 27 ppm silver concentration mark in plasma, administer 125 cc of 0.0375% H<sub>2</sub>O<sub>2</sub> over 60 minutes, one hour after completion of each 150 cc to 200 cc isotonic silver hydrosol drip. Doing so may recharge inactive silver back into oligodynamic silver and thereby greatly extend the therapeutics of the silver without adding in additional quantities of silver hydrosol. (See Gallyas F, and Feng QL, et al., references.) If non-significant hemolysis or hepatomegaly develops, dosage schedule may continue at the higher levels. As RNA copies/ml plummet and symptoms

improve, reduce dosages accordingly.

All dosages are for an average 70 to 75+ kilo adult patient, with *per os*, investigational nebulized, or investigational IV dosages being cut by one-half for patients approximately 37 kilos in size. For toddlers less than 20 kilos, the dosages are further reduced to just one-quarter of the adult amounts.

### JHE Pre- And Post-Management

**Pre-JHE Management:** Prevention or lessening of expected JHEs or hepatomegaly and hemolysis is a new concept. By giving the antioxidants selenium, glutathione + anthocyanins, vitamin E, lipoic acid, milk thistle (silymarin), and phosphatidylcholine in "loading" doses, a rapid upregulation of the seleno-enzyme glutathione peroxidase system will ensue. Tolerance to silver may go up by several orders of magnitude with such loading doses.<sup>140</sup> The key either is to take such loading doses a month or two prior to undergoing high amounts of IV treatment or, at the very least, take these loading dosages daily, but always separated by a six-hour period post-IV administration. If taken together, each will tend to cancel out the other's benefits by binding to one another, as opposed to their intended targets.

**Post-JHE Management:** To rapidly control and eliminate post-JHE symptoms, drinking an abundance of purified water (up to one quart t.i.d.), along with including one cup strong organic coffee or double-strength green tea rectal implants, should bring about instantaneous results.<sup>141</sup> Retain the rectal implant for 20 minutes or longer. Performing a purified water enema prior to the rectal implant will better insure retention compliance and best results. In rarer situations, careful screening for immune system activation of coagulation (ISAC)<sup>142</sup> must be treated with heparin and/or lumbokinase or nattokinase.

### CAM Adjunctive Support

In addition to the recharging effects of administering H<sub>2</sub>O<sub>2</sub> post-IV silver hydrosol, garlic capsules rich in Alliin, as opposed to Allicin, such as Pharmax's Garlic Freeze-Dried,<sup>143-146</sup> and probiotics, such as Pharmax's HLC Intensive Capsules containing over 20 billion viable organisms per capsule,<sup>147</sup> prove very important in the management of URTIs, as well as any associated gut dysbiosis.

Olive leaf extract rich in d-lenolate<sup>148-151</sup> can serve as an excellent means to more slowly reduce viral loads. When given one to two months in advance of IV silver hydrosol administration, this ability of d-lenolate also will serve indirectly as an "adaptogen," wherein low-levels of die-off will induce tolerance for more significant die-offs expected in the near future from silver administration.

### Jurisprudence

Four steps are required for proper jurisprudence concerning silver hydrosol administration when used off-label: (1) A well written Informed Consent form should be read and signed by any patients undergoing nebulized or IV silver hydrosol treatment. (2) Clinical progress notes must be complete and thorough. (3) Careful regular monitoring with urine dip sticks for hemolysis and, if warranted, follow-up CBC counts and liver panel screens may be advisable. (4) Utilizing a compounding pharmacy or "in-clinic equivalent" according to all state regulations when processing silver hydrosol off-label into an injectible format is required.

### Conclusion

Oligodynamic silver hydrosol is the most promising and safe global pathogen solution of this era.

### Correspondence

The two authors have extensive clinical experience using picoscalar oligodynamic silver hydrosol. Neither author has any financial ties to commercial or proprietary silver hydrosol products. Eric Gordon, MD,

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## Correction

In Part I of "A Promising Cure for URTI Pandemics, Including H5N1 and SARS," a typographical error altered an important number. Under the last section in the article, covering IV drips, an incorrect range was provided for the amount of silver hydrosol administration. The correct range is between 150cc and 1500cc, not 750cc and 1500cc, as erroneously printed.

## References

1. See: <http://www.clevelandclinicmeded.com/disease/management/infectiousdisease/urti/urti.htm>
2. See: <http://www.dartmouth.edu/~health/resources/uri.html>
3. United States Patents: 5,017,295; 5,073,382; 5,078,902; 5,089,275; 5,098,582; 5,211,855; 5,223,149; 5,336,416; 5,336,499; 5,772,896.
4. Antelman, M. Multivalent silver bacteriocides. *Precious Metals*. 1992;16:151-63.
5. Antelman, M. Anti-pathogenic multivalent silver molecular semiconductors. *Precious Metals*. 1992;16:141-9.
6. Dean, W, et al. Reduction of viral load in aids patients with intravenous mild silver protein – three case reports. *Clinical Practice of Alternative Medicine*. Spring, 2001.
7. Oka, H, et al. Inactivation of enveloped viruses by a silver-thiosulfate complex. *Metal Based Drugs*. 1994;1(5-6):511.
8. Antelman, M. Silver. (II, III) Disinfectants. *Soap/Cosmetics/Chemical Specialties*. March, 1994; p. 52-9.
9. Hussain, S, et al. Cystine protects na, k-atpase and isolated human lymphocytes from silver toxicity. *Biochem Biophys. Res. Comm*. 1992;189:1444-1449.
10. Aiken, C, Dec 16, 1997; *In vitro* MIC Test Against HIV-1, published account via email, AA-90 Results. Vanderbilt University, School of Medicine.
11. Zhong-Yin, Z, et al. Zinc inhibition of renin and the protease from human immunodeficiency virus type 1. *Biochemistry*. 1991;Sept 10; 30(36):8717-21.
12. Grier, N. Silver and its compounds. In: *Disinfection, Sterilization and Preservation*, S. Block, ed. Philadelphia, PA: Lea & Febiger;1983; p. 380.
13. Shimizu, F, Shimizu, Y, Kumagai, K. Specific inactivation of herpes simplex virus by silver nitrate at low concentrations and biological activities of the inactivated virus. *Antimicrobial Agents and Chemotherapy*. July 1976;10(1):57-63.
14. Thurman, RB, CP Gerba. The molecular mechanisms of copper and silver ion disinfection of bacteria and viruses. *CRC Critical Reviews in Environmental Control*. 1989; 301.
15. Coleman, VR, J Wilkie, WE Levinson, T Stevens, E Javetz. Inactivation of herpesvirus hominis types 1 and 2 by silver nitrate in vitro and in vivo. *Antimicrob. Agents & Chemother.* 1973; 4:259.
16. Russell, AD, Hugo, WB. Antimicrobial activity and action of silver. *Prog Med Chem*. 1994; 31:354.
17. Chang, TW, Weinstein, L. *In vitro* activity of silver sulfadiazine against herpesvirus hominis. *J Infect Dis*. July 1975; 132(1):79-81.
18. Tokumaru, T, Shimizu, Y, Fox, CL. Antiviral activities of silver sulfadiazine in ocular infection. *Res Commun Chem Pathol Pharmacol*. May 1974; 8:151-8.

19. Searle, AB. The use of colloids in health and disease. (Quoting from the *British Medical Journal*. Jan. 15, 1919; 1s(17):83.
20. Thurman, RB, CP Gerba. The molecular mechanisms of copper and silver ion disinfection of bacteria and viruses. *CRC Critical Reviews in Environmental Control*. 1989; 301.
21. Cliver, DO, Sarles, WB, Foell, WK, Goepfert, JM. Biocidal Effects of Silver: Contract NAS 9-9300 Final Technical Report. University of Wisconsin, Accession Number – N70 23888, NASA CR Number – CR-108338, February 1970; p. 4-4 through 4-6.
22. Searle, AB. "The Use of Colloids in Health and Disease." (Quoting J. MacMunn in the *British Medical Journal*, 1917, 1, 685). New York: E. P. Dutton and Company;1919; p. 86.
23. Mahnel, H, M Schmidt. Effect of silver compounds on viruses in water. *Zentralbl. Baktenol. Parasitenk. Infektionskr. Hyg. Abt. Orig. Reihe B*. 1986; 182:381.
24. "Septacrol." Merck's Index, fourth edition. Rahway, NJ: Merck & Co., Inc.;1930; p. 456.
25. Thurman, RB, CP Gerba. The molecular mechanisms of copper and silver ion disinfection of bacteria and viruses. *CRC Critical Reviews in Environmental Control*. 1989; 301.
26. Cliver, DO, Sarles, WB, Foell, WK, Goepfert, JM. Biocidal Effects of Silver: Contract NAS 9-9300 Final Technical Report. University of Wisconsin, Accession Number – N70 23888, NASA CR Number – CR-108338, February 1970; p. 4-2 through 4-4.
27. Brigham Young University, Microbiology Department, May 13th, 1999; Ron W. Leavitt, PhD, Prof. Microbiology; ref: ASAP – 1.25 ppm to 10 ppm concentrate of Ag+.
28. Cliver, DO, Sarles, WB, Foell, WK, Goepfert, JM. Biocidal Effects of Silver: Contract NAS 9-9300 Final Technical Report, University of Wisconsin. Accession Number – N70 23888, NASA CR Number – CR-108338, February 1970; p. 4-4 through 4-6.
29. Moyers, CA, et al. Treatment of large human burns with 0.5% silver nitrate solution. *Arch Surg*. June 1965; 90:825.
30. Larry C. Ford, MD, Department of Obstetrics and Gynecology, UCLA School of Medicine, Center for the Health Sciences, November 1, 1988.
31. Grier, N. "Silver and Its Compounds." In: *Disinfection, Sterilization and Preservation*, S. Block, ed. Philadelphia, PA:Lea & Febiger;1983; p. 379.
32. Carr, HS, Wlodkowski, TJ, Rosenkranz, HS. Silver sulfadiazine: *in vitro* antibacterial activity. *Antimicrobial Agents and Chemotherapy*. Nov 1973; 4(5):585-6.
33. Hamilton-Miller, Shah, S, Shah, C. Silver sulphadiazine: a comprehensive *in vitro* reassessment. *Chemotherapy*. 1993; 39:406.
34. Searle, AB. "The Use of Colloids in Health and Disease." (quoting Sir James Cantlie in the *British Medical Journal*, Nov. 15, 1913). New York: E.P. Dutton and Company;1919; p. 83.
35. Searle, AB. "The Use of Colloids in Health and Disease." (quoting C.E. A. MacLeod in *Lancet*, Feb. 3, 1912). New York: E.P. Dutton and Company, 1919; p. 83.
36. "Neo-Protilol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 350.
37. "Silver Floride, Silver Iodate, Silver Iodide, Silver Lactate, Silver Nitrate" Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 460.
38. "Neo-Protilol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 350.
39. Searle, AB. The Use of Colloids in Health and Disease. (quoting C.E. A. MacLeod in *Lancet*, Feb. 3, 1912). New York:E.P. Dutton and Company;1919; p. 83.
40. Searle, AB."The Use of Colloids in Health and Disease." (quoting J. Mark Hovell in the *British Medical Journal*, Dec. 15, 1917), E. P. Dutton and Co.; 1919; p. 86.
41. "Collargol," Merck's Index, fourth edition, Merck & Co., Inc., Rahway, NJ, 1930; p. 178.
42. Searle, AB, "The Use of Colloids in Health and Disease." (Quoting C.E. A. MacLeod in *Lancet*, Feb. 3, 1912). New York:E. P. Dutton and Company;1919; p. 83.
43. "Silver Floride, Silver Iodate, Silver Iodide, Silver Lactate, Silver Nitrate" Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 460.
44. See: <http://www.emedicine.com/med/topic2184.htm>
45. Searle, AB. "The Use of Colloids in Health and Disease," (quoting from the *British Medical Journal*, Jan. 15, 1917). New York:E. P. Dutton and Co.;1919; p. 83.
46. "Argenol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 91.
47. See: <http://www.clevelandclinicmeded.com/disease/management/infectiousdisease/urti/urti.htm#definition>
48. "Collargol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 178.

## Promising Cures

49. Brigham Young University, Microbiology Department, May 13th, 1999; Ron W. Leavitt, PhD, Prof. Microbiology; ref: ASAP – 1.25 ppm to 10 ppm concentrate of Ag+.
50. Bechhold, H, *Colloids in Biology and Medicine*, translated by J. G. M. Bullock, D. New York:Van Nostrand Company;1919; p. 376.
51. Grier, N, "Silver and Its Compounds." In: *Disinfection, Sterilization and Preservation*, S. Block, ed. Philadelphia, PA:Lea & Febiger;1983; p. 380.
52. "Collargol," Merck's Index, fourth edition. Rahway, NJ: Merck & Co., Inc.;1930; p. 178.
53. Carr, HS, Wlodkowski, TJ, Rosenkranz, HS. Silver sulfadiazine: *in vitro* antibacterial activity. *Antimicrobial Agents and Chemotherapy* Nov 1973; 4(5):585-6.
54. Larry C. Ford, MD, Department of Obstetrics and Gynecology, UCLA School of Medicine, Center for the Health Sciences, November 1, 1988.
55. Searle, AB. The Use of Colloids in Health and Disease, (quoting C.E. A. MacLeod in *Lancet*, Feb. 3, 1912). New York:E. P. Dutton and Company;1919; p. 83.
56. Searle, AB. The Use of Colloids in Health and Disease, (quoting Henry Crookes). New York:E. P. Dutton and Company;1919; p. 70.
57. "Collargol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 178.
58. "Proganol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 422.
59. "Protargol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 424.
60. "Silver Nitrite, Silver Nucleinate, Silver Oxalate, Silver Oxide, Silver Permanganate, Silver Phenolsulphonate" Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 461.
61. Grier, N, "Silver and Its Compounds." In: *Disinfection, Sterilization and Preservation*, S. Block, ed. Philadelphia, PA:Lea & Febiger;1983; p. 380.
62. Shimizu, F, Shimizu, Y, Kumagai, K. Specific inactivation of herpes simplex virus by silver nitrate at low concentrations and biological activities of the inactivated virus. *Antimicrobial Agents and Chemotherapy*. July 1976; 10(1):57-63.
63. Thurman, RB, CP Gerba. The molecular mechanisms of copper and silver ion disinfection of bacteria and viruses. *CRC Critical Reviews in Environmental Control*, 1989; 301.
64. Coleman, VR, J Wilkie, WE Levinson, T Stevens, E Javetz. Inactivation of herpesvirus hominis types 1 and 2 by silver nitrate *in vitro* and *in vivo*. *Antimicrob. Agents & Chemother.* 1973; 4:259.
65. Russell, AD, Hugo, WB. Antimicrobial activity and action of silver. *Prog Med Chem*, 1994; 31:354.
66. Chang, TW, Weinstein, L. *In vitro* activity of silver sulfadiazine against herpesvirus hominis," *J Infect Dis*. July 1975; 132(1):79-81.
67. Oka, H, et al. "Inactivation of Enveloped Viruses by a Silver-Thiosulfate Complex," *Metal-Based Drugs*, edited by Frank Shaw, III, 1994; 1(5-6):511.
68. Tokumaru, T, Shimizu, Y, Fox, CL. Antiviral activities of silver sulfadiazine in ocular infection. *Res Commun Chem Pathol Pharmacol*, May 1974; 8(1):151-8.
69. Johns Hopkins University, Department of Pathology, Division of Microbiology, Feb 14th, 1997, James D. Dick, PhD, Director of Bacteriology; Ref: Aqua Argentinica.
70. Hamilton-Miller, Shah, S, Shah, C, Silver sulphadiazine: a comprehensive *in vitro* reassessment. *Chemotherapy*. 1993; 39:406.
71. Brigham Young University, Microbiology Department, May 13th, 1999; Ron W. Leavitt, PhD, Prof. Microbiology; ref: ASAP – 1.25 ppm to 10 ppm concentrate of Ag+.
72. Brigham Young University, Microbiology Department, May 13th, 1999; Ron W. Leavitt, PhD, Prof. Microbiology; ref: ASAP – 1.25 ppm to 10 ppm concentrate of Ag+.
73. Searle, AB, The Use of Colloids in Health and Disease, (Quoting J. Mark Hovell in the *British Medical Journal*, Dec. 15, 1917). New York:E. P. Dutton and Company;1919; p. 86.
74. "Silver Floride, Silver Iodate, Silver Iodide, Silver Lactate, Silver Nitrate" Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 460.
75. "Neo-Protilol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 350.
76. "Neo-Silvol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 350.
77. "Proganol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 422.
78. "Protargol," Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 424.

# Promising Cures

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79. "Silver Floride, Silver Iodate, Silver Iodide, Silver Lactate, Silver Nitrate" Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 460.
  80. "Silver Protein, Silver Calcuate, Silver Sulphate, Silver Sulphide, Silver & Potassium Cyanide, Silver & Sodium Chloride, Silver & Sodium Thiosulphate, Silver & Thallium Nitrate, Silvol" Merck's Index, fourth edition. Rahway, NJ:Merck & Co., Inc.;1930; p. 462.
  81. Searle, A.B, The Use of Colloids in Health and Disease, (Quoting C.E.A. MacLeod in Lancet, Feb. 3, 1912). New York:E.P. Dutton and Company;1919; p. 83.
  82. Bechhold, H, Colloids in Biology and Medicine, translated by J. G. M. Bullow. D. New York:Van Nostrand Company;1919; p. 368.
  83. "Septacrol," Merck's Index, fourth edition, Merck & Co., Inc., Rahway, NJ, 1930; p. 456.
  84. Antelman; Marvin S. "Method of curing AIDS with tetrasilver tetroxide molecular crystal devices," USPTO #5,676,977, October 14, 1997
  85. See: EPA/IRIS CASRN 7440-22-4, 1996. The EPA has provided dosage ranges that indicate not to: (1) exceed 1 gram of silver IV exposure over a 2 to 9 year time period for an average adult weighing 70 kg, or (2) not to exceed 25 grams orally over a lifetime for an average adult weighing 70 kg.
  86. *CRC Handbook of Chemistry and Physics*, 80th Edition, ed. by David R. Lide. Boca Ratan, FL: CRC Press. 1999-2000, Section 15.
  87. Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Silver – CAS# 7440-22-4, Dec. 1990, Section: 2.3.2.4 -OTHER ROUTES OF EXPOSURE.
  88. Fung, MC, DL Bowen. Silver products for medical indication: risk-benefit assessment. *Clinical Toxicology*. 1996; 34(1):121.
  89. Rungby, J, G Danscher. Localization of exogenous silver in brain and spinal cord of silver exposed rats. *Acta Pharmacol Toxicol*. 1984; 60:92-8.
  90. Duhamel, BG. Electric metallic colloids and their therapeutic applications. *Lancet* Jan. 13, 1912.
  91. Fuller, AW. Severe epidemic encephalitis. *Lancet*. July 24, 1926; 2: 172. Also see *JAMA*. Sept. 25, 1926; p. 1071.
  92. Thurman, RB, CP Gerba, "The Molecular Mechanisms of Copper and Silver ion Disinfection of Bacteria and Viruses." A paper presented in the First International Conference on Gold and Silver in Medicine, The Silver Institute, Washington, DC, 1989; 18(4):301.
  93. Gallyas, F. Physico-chemical mechanism of the argyrophil I reaction. *Histochemistry*. 1982; 74:393.
  94. Gallyas, F. Simultaneous determination of the amounts of metallic and reducible silver in histologic specimens. *Histochemistry* 1979; 64:77-86.
  95. Padlewska, KK, RA Schwartz. *eMedicine Journal*. Nov. 2, 2001; 2(11):(see under Histologic Findngs). [www.emedicine.com/derm/topic595.htm](http://www.emedicine.com/derm/topic595.htm)
  96. Jansson, G, M Harms-Ringdahl. Stimulating effects of mercuric- and silver ions on the superoxide anion in human polymorphonuclear leukocytes. *Free Radic Res Commun*. 1993; 18(2):87-98.
  97. Clayton, GD, FE Clayton. *Patty's Industrial Hygiene and Toxicology*, 3rd revised edition. New York:John Wiley & Sons; 1981; 1881-94.
  98. Fowler, BA, GF Nordberg, "Silver," In: *Handbook on the Toxicology of Metals*, 1st edition., Friberg, L., Norbderg, GF, VB Vouk, eds. New York: Elsevier/North-Holland Biomedical Press;1979; 579-86.
  99. Clayton, GD, FE Clayton. *Patty's Industrial Hygiene and Toxicology*, 3rd revised edition. New York:John Wiley & Sons;1981; p. 1881-94.
  100. Fowler, BA, GF Nordberg, "Silver," In: *Handbook on the Toxicology of Metals*, 1st edition, Friberg, L., Norbderg, GF, Vouk, VB, eds. New York: Elsevier/North-Holland Biomedical Press;1979; p. 579-86.
  101. Samuni, A, et al. On the cytotoxicity of vitamin c and metal ions. *Eur J Biochem*.1983; 99:562.
  102. Jansson, G, Harms-Ringdahl, M. Stimulating effects of mercuris- and silver ions on the superoxide anion production in human polymorphonuclear leukocytes. *Free Radic Res commun*. 1993; 18(2):87-98.
  103. Horsmanheimo, M. Lack of proliferation of circulating white blood cells in patients with syphilis before and after a jarisch-herxheimer reaction. *Br J Vener Dis* Aug 1978; 54:225-8.
  104. Loveday, C, JS Bingham. Changes in circulating immune complexes during the jarisch herxheimer reaction in secondary syphilis. *Eur J Clin Microbiol Infect Dis* Mar 1993; 12:185-91.
  105. Jansson, G, Harms-Ringdahl, M. Stimulation effects of mercuric- and silver ions on the superoxide anion production in human polymorphonuclear leukocytes. *Free Radic Res Commun*. 1993; 18(2):87-98.
  106. Brown, G. Colloidal silver in sepsis. *Journal of the American Association of Obstetricians and Gynecologists*. Jan, 1916.
  107. Bechhold, H, Bullowa, JGM. *Colloids in Biology and Medicine*. New York:D. Van Nostrand Co.;1919; p. 371-4.
  108. Brown, G. "Colloidal silver in sepsis. *Journal of the American Association of Obstetricians and Gynecologists*. Jan, 1916.
  109. Dean, W, et al.. Reduction of viral load in aids patients with intravenous mild silver protein – three case reports. *Clinical Practice of Alternative Medicine* Spring, 2001.
  110. Bechhold, H, Bullowa, JGM. *Colloids in Biology and Medicine*. New York: D. Van Nostrand Co.;1919; p. 371-2.
  111. Rikimaru, T, et al. Three cases of localized pleural tuberculosis which looked exacerbated during antituberculous chemotherapy. *Kekkaku* Feb 1991; 66:101-7.
  112. Karachunskii, MA. Exacerbation of pulmonary tuberculosis during chemotherapy *Probl Tuberk*. 1996; p. 23-5.
  113. Lawrence, C, et al. Seronegative chronic relapsing neuroborreliosis. *Eur Neurol*. 1995; 35:113-7.
  114. Feng, QL, et al. A mechanistic study of the antibacterial effect of silver ions on escherichia coli and staphylococcus aureus. *J Biomed Mater Res*. March 2000; 52:662.
  115. Antelman; Marvin S. Method of curing AIDS with tetrasilver tetroxide molecular crystal devices. USPTO # 5,676,977, October 14, 1997
  116. Antelman; Marvin S. Method of curing AIDS with tetrasilver tetroxide molecular crystal devices. USPTO # 5,676,977, October 14, 1997
  117. Eichorn, GL, et al. "Interaction of metal ions with biological systems, with special reference to silver and gold. Proceedings of the First International Conference on Gold and Silver In Medicine, Bethesda, MD, May 13-14, published by The Silver Institute, Washington, D.C., 1987; p. 4.
  118. Bodansky, M. *Introduction to Physiological Chemistry*. New York: John Wiley & Sons, Inc.;1934; p. 22-3.
  119. Bechhold, H. *Colloids in Biology and Medicine*, translated by Bullowa, JGM. New York:D. Van Nostrand Co.;1919; p. 13, 366 & 368.
  120. Hartman, RJ. *Colloid Chemistry*. Cambridge, MA: Houghton Mifflin Co., The Riverside Press;1939; p. 13.
  121. Cliver, DO, et al. Biocidal Effects of Silver: Contract NAS 9-9300 Final Technical Report. University of Wisconsin, Accession No. N71-24436, NASA CR-114978, Code G3, Category 04, February 1971; p. 5-2.
  122. EPA/IRIS CASRN 7440-22-4, 1996.
  123. Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Silver – CAS# 7440-22-4, Dec. 1990.
  124. Zhao, G, SE Stevens. Multiple parameters for the comprehensive evaluation of the susceptibility of escherichia coli to the silver ion. *Bio Metals*. 1998; 11:28.
  125. Cliver, DO, et al., "Biocidal Effects of Silver: Contract NAS 9-9300 Final Technical Report." University of Wisconsin, Accession No. N71-24436, NASA CR-114978, Code G3, Category 04, February 1971; p. 3-1.
  126. Simonetti, N, Simonetti, G, Bougoni, F, Scalzo, M. Electrochemical Ag+ for preservative use. *Applied and Environmental Microbiology*. Dec 1992; 58(12):3834.
  127. Baker C, et al. Synthesis and antibacterial properties of silver nanoparticles. 2005 Feb;5(2):244-9.
  128. Woods, HC, et al. *The Dispensatory of The United States of America*, Centennial (22nd) Edition. Philadelphia, PA: J.B. Lippincott Co.;1937; p. 1578.
  129. (E. Fougera & Co.) Reports Council on Pharmacy and Chemistry Reports, 1920; p. 58.
  130. Council on Pharmacy and Chemistry of the American Medical Association, In: Hill, WR, Pillsbury, DM. *Argyria: The Pharmacology of Silver*. Baltimore, MD:The Williams & Wilkins Co.;1939; p. 170.
  131. Woods, HC, et al. *The Dispensatory of The United States of America*, Centennial (22nd) Edition. Philadelphia, PA:J.B. Lippincott Co.;1937; p. 1578.
  132. Searle, A.B. *The Use of Colloids in Health and Disease*. (Quoting J. MacMunn in the *British Medical Journal*, 1917, I, 685). New York: E. P. Dutton and Company;1919; p. 86.
  133. Duhamel, BG. Electric metallic colloids and their therapeutic applications. *Lancet*. Jan. 13, 1912.
  134. The study used 40 ppm concentrations of tetrasilver tetroxide. By deducting the oxygen amount, this leaves the equivalent of 27 ppm pure silver concentration.
  135. Antelman; Marvin S. Method of curing AIDS with tetrasilver tetroxide molecular crystal devices. USPTO # 5,676,977, October 14, 1997
  136. Fung, M.C., Bowen, D.L.Silver products for medical indications: risk-benefit assessment. *Clinical Toxicology*. 34(1), 119-126, 1996.
  137. Phamax: Nutriceutical & Biophysical Systems, product catalogue, WA, page PA 03. See [www.pharmaxllc.com](http://www.pharmaxllc.com).
  138. Yakovlev AI, Zvyagin SG. Influence of phytoncides on virus influenza A. Action of the volatile components from garlic and onion on virus influenza A. *Bull Biol Med (Bull Biol Med)*. 29:384-387, 1950 (Russian).
  139. Cai Y. Anticytotoxic and antiviral properties of garlic. *Cardiol Pract*, 9:11, 1991.
  140. Tsai Y, Cole LL, Davis LE, Lockwood SJ, Simmons V, Wild GC. Antiviral properties of garlic: in vitro effects on influenza B, herpes simplex, and coxsackie viruses. *Planta Med* 51:460-461, 1985.
  141. Phamax: Nutriceutical & Biophysical Systems, product catalogue, WA, page PB 12. See [www.pharmaxllc.com](http://www.pharmaxllc.com).
  142. De Whalley, CV, et al. *Biochem Pharmacology*. 1990; 39:1743-50.
  143. Renis, HE. In-vitro antiviral activity of calcium elenolate. *Antimicrobial Agents and Chemotherapy*.1969; 167-72.
  144. Renis, HE. Inactivation of myxoviruses by calcium elenolate. *Antimicrobial Agents and Chemotherapy*. August 1975; 194-9.
  145. Renis, HE. Influenza virus infection of hamsters. A model for evaluating antiviral drugs. *Archives of Virology*. 1977; 54:85-93.

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