

Silver: New Study Explores Antimicrobial Mechanisms

Summary, courtesy of Boulder Ayurveda, Inc

In Ayurveda, various metals have been used for various purposes for thousands of years. Specifically there is a known ability of Gold, Silver and Copper to help with Vata, Pitta and Kapha. Silver's ability to antidote in particular the infectious aspect of Pitta has been well known, and its cooling and calming properties have been exploited, for instance milk can be kept for a long time in a silver bowl, while it will curdle quickly in a copper vessel. In making whipped cream, however, when one is wanting to add 'body' to the froth, then chefs cherish the copper bowl for this purpose.

In the west, we have had 'silver' ware for a long time, and there is some understanding that eating utensils made with silver conveyed some health benefits, and in more modern times there has been an explosion in the use of various 'colloidal' silver preparations, with significant technical advances in the particle size and structuring of the particle solution, with advances in shelf life and efficacy. Indeed, among alternative doctors and within allopathy in Europe and India, silver has been used for its powerful antimicrobial properties. However, within western science the particular mechanisms of Silver's remarkable anti-infective agency was essentially unknown, until 2013.

A paper originally published in the AAAS journal, Science Translational Medicine, titled "Silver Enhances Antibiotic Activity Against Gram-Negative Bacteria" [1] has now been published by the NIH; the implications of this preliminary research are quite profound. From the Integrative Ayurvedic perspective, we get a glimpse into underlying mechanisms, and although these researchers were studying the significant effect of silver in conjunction with antibiotics, there are some other important take-aways. One is that since this research was using basic silver salt, not the powerful nano-particle non-clustering forms of colloidal silver currently available to anyone, so we could expect even more significant effects with the higher quality silvers available today. Another is expectation that Silver in conjunction with any other antibiotic may result in significant potency of that antibiotic, including herbs like turmeric or vidanga, etc. Interestingly one mechanism the researchers identified was an interaction of silver with Iron-Sulfur clusters inside the bacterial cell – the result was leakage of Fe⁺⁺ from the bacteria. Additionally wild bacterial strains appeared particularly susceptible to other metabolic disruptions caused by the silver, specifically superoxide formation (OH•) which causes cell death.

The blockbuster result of the paper is the demonstrated synergy of antibiotics with silver, specifically on thicker walled gram negative bacteria. Silver appears to have a powerful effect on biofilms and bacteria in general. In a mouse study with urinary tract infection with E. coli, results were significant:

"Treatment with gentamicin or Ag⁺ [silver] alone resulted in no effect on bladder E. coli cell counts 24 hours after treatment related to the control, whereas treatment with gentamicin plus Ag⁺ reduced cell counts by fourfold. These results demonstrate that Ag⁺ is capable of potentiating antibiotic activity in vitro."

The researchers went on to study Ag⁺ and its assistance with 'bacterial persisters' a key issue with antibiotics, since surviving bacteria will be those resistant to antibiotics – being able reliably kill these sub-strains would represent a significant medical development, and sure enough, adding silver into the mix accomplished this result. Perhaps the most exciting results came in study of peritoneal infection, again with mice, which demonstrated over a 100 times benefit when silver was combined with the antibiotic, compared to the antibiotic alone. Note that in this case silver alone performed almost ten times better than the antibiotic alone, in a biofilm study. In another mouse peritoneal infection study, this time with Vancomycin and WT [wild type] E. Coli, the results could be summarized in terms of survival rates:

No treatment or Vancomycin alone :	10% survival after 60 hours
Silver alone :	50% survival after after 36 hours
Silver plus Vancomycin :	90% survival after 36 hours

[1] Silver Enhances Antibiotic Activity Against Gram-Negative Bacteria, Jose Ruben Mononez-Ramirez et al, Sci Transl Med 5, 190ra81 (2013); DOI: 10.1126/scitranslmed.3006276