Colloidal Silver and Natural Antimicrobials

Long before the advent of pharmaceutical antimicrobials, people all over the globe treated themselves and their animals, when afflicted by infectious disease, with substances derived from plants and minerals. Nowadays, as the public becomes more cognizant of problems stemming from antibiotic over-prescription and misuse, they want suitable alternatives from natural sources.

Putative antimicrobial alternatives span the alphabet from alfalfa to zinc, comprising everything from aromatherapy oils to common food agents to colloidal silver products. In a review of antimicrobial plant products, Marjorie Murphy Cowan states, “Laboratories of the world have found literally thousands of phytochemicals which have inhibitory effects on all types of microorganisms in vitro. More of these compounds should be subjected to animal and human studies to determine their effectiveness in whole-organism systems, including in particular toxicity studies as well as an examination of their effects on beneficial normal microbiota [*Clinical Microbiology Reviews,* Oct 1999, pp. 564-582].”

How can veterinarians properly counsel clients on the judicious use of antibiotic alternatives when so little is known about their safety for animal healthcare? Furthermore, are the claims proffered by product manufacturers indicating that their natural products equal the effectiveness of conventional options in any way substantiated? Is it naïve to believe that bacteria are incapable of developing resistance to products on the sole basis that they are “natural”? In addition to all these issues, medical professionals must continuously remain alert to the industry-wide bugaboo of nutraceuticals: the lack of enforced manufacturing standards and documented evidence of safety.

A new twist on natural antimicrobials advocated for animals resurrects treatments that hearken back centuries – the use of silver to treat infections. While not as dangerous, perhaps, as the mercury baths of the 1800s for cases of tuberculosis and syphilis, treatments of silver dissolved in protein – “colloidal silver” – have a long and dubious history. As far back as 1960, *The Dispensary of the United States of America* states that, “there is no justification for this [internal] use either theoretically or practically.” The case for colloidal silver is no stronger today, forty-four years later.

However, enthusiasm for CSP has undergone a revival, and makers appear to have no qualms marketing their products for human and veterinary applications alike, with dosages (safe or unsafe) included. Colloidal silver hawkers abound on the Internet, claiming that it is an essential mineral supplement and will cure cancer, diabetes, AIDS, and herpes. Do-it-yourself kits provide a cheap, easy, and possibly dangerous method for people to provide an endless supply of the substance for their animals. CSP consists of a mixture of silver nitrate, sodium hydroxide, and gelatin. This mixture undergoes dilution to the desired

concentration, which varies from product to product. CSPs with higher silver concentrations are less ionizable and are bacteriostatic. CSPs with lower silver concentrations are more ionizable, more irritating, and supposedly are bactericidal.

CSP suppliers suggest that people and their animals ingest the product on a daily basis in order to protect against "dangerous pathogens" and that CSP has "no known adverse effects." [http://www.iwr.com/liquidvitamins/procolloidalsilver.html] However, animal research demonstrates that silver accumulates throughout the body, even in the central nervous system. Silver absorption increases in the presence of inflamed or damaged mucous membranes. Tissue deposition of silver is often highest in the skin, liver, spleen, and adrenals, with lesser deposits in brain and muscle. Especially large amounts of silver can accumulate in the subepithelial portion of the skin causing argyria, typified by a permanent and irreversible bluish-gray discoloration. Following brain deposition, colloidal silver has caused myoclonic status epilepticus and coma after daily ingestion of colloidal silver for 4 months [*Neurology 2004;62:1408-1410].* Reports such as these are likely to increase in frequency with the resurging interest in CSP.

CSP manufacturers and proponents deny that bacteria are unable to become resistant to silver products. However, Simon Silver, in the a paper addressing bacterial silver resistance [*Federation of European Microbiological Societies Microbiology Reviews; 2003;27:341-353]* reports, "Silver-resistant bacteria have been found repeatedly in environments where silver toxicity might be expected to select for resistance."… "Conditions for distinguishing silver-resistant from silver-sensitive bacteria are not well-known and even the existence of silver-resistant bacteria that cause a clinical problem is repeatedly challenged." Molecular genetics have revealed the genes related to the development of resistance to silver compounds as determined by bacterial plasmids. Silver states, "[W]herever such human uses [i.e., colloidal silver ingestion] occur, there is a real potential for selection of silver-resistant microbes."

Some nutraceuticals favor the selection of resistant bacterial strains more than others, as seen in a study by Ward et al. on the "Inhibition, resistance development, and increased antibiotic and antimicrobial resistance caused by nutraceuticals" in the *Journal of Food Protection* [2002;65(3):528-533]. The following quote by the authors exemplifies the heretofore unexamined consequences of antibiotic nutraceuticals: "These antibacterial properties [of nutraceuticals], if they exist outside in vitro studies, might be very transitory with resistance to the active ingredient in the nutraceutical building quickly. Hence, effectiveness is best short term and at worse not effective. This leaves the consumer with a potentially worse situation for using the nutraceutical. The development of resistance to antibiotics can pose even greater long-term problems. If an infection occurs from bacteria exposed to the nutraceuticals, it could be more refractory to treatment. This could pose significant physical

hardship on any individual so afflicted an increased financial burden. There is no doubt that these implications must be investigated further."