



## **How Silver Can Bring a New Element to Green Chemistry**

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There are a number of innovative bio-technologies on the market today that offer highly effective alternatives to traditional chemical formulas, proving that products don't need to be toxic to be effective. Case in point: silver-based technologies are emerging as an effective antimicrobial in the fight against such pathogens as Staph, E. coli, H1N1, Norovirus and other threats to public health.

Silver, long known for its beneficial healing and anti-disease properties, has gotten a bad rap from direct response marketers who have touted it as the miracle ingredient in various "snake-oil" products; however silver has been used successfully for centuries to control microorganisms. Hippocrates, the father of modern medicine, wrote about silver's properties and ancient cultures stored food, water and other liquids in silver vessels to prevent spoilage.

There is little clinical evidence that indicates silver will cause the development of resistant strains of bacteria. That is not true for the many chemicals on the antimicrobial market today.

For decades, several industries have embraced silver as a natural and effective antimicrobial solution, with a host of silver-based formulas and technologies now emerging in medical devices, in particular, and showing tremendous promise in many other markets.

One of the newest forms of silver is a molecule called silver dihydrogen citrate (SDC) -- the only electrolytically generated source of stabilized ionic silver available on the market, and the first new disinfectant active to be approved by the EPA in more than 30 years.

This compound, generated through a proprietary process, combines silver with one or more organic acids to form a stable, efficacious new antimicrobial active or preservative. SDC is non-toxic, non-caustic, colorless, odorless, tasteless and does not produce toxic fumes.

Until recently, ionic silver-based antimicrobials typically required constant electric current and/or had very short shelf lives ranging from hours to days. However, SDC is a stabilized silver ion complex with a shelf life of several years. The unique bond of the silver ion in SDC allows it to remain in solution while at the same time making it more bio-available for antimicrobial action which makes it particularly attractive to the specialty chemicals industry who are pressed to develop more effective, yet environmentally safe formulas for broad application and marketing in such areas as food sanitization, pharmaceuticals, medical treatments, household and personal care.

SDC is highly toxic to bacteria, fungi and viruses, but non-toxic to humans and animals. Food borne illnesses today creates significant health and economic problems in the U.S. and internationally, and new technologies offer more environmentally friendly opportunities to help stop the spread of these dangerous pathogens that cause millions of illnesses each year. Silver-based food contact surface sanitizers have the ability to offer the same benefits as existing harsh chemicals on the market.

An SDC-based formula was registered by the EPA in August for food contact sanitization, opening the door for use in meat and poultry processing plants. This introduces the first truly responsible solution to an industry that has faced the threat of these deadly illnesses on numerous occasions.

The CDC estimates that food borne pathogens cause 76 million illnesses per year in the U.S. resulting in 325,000 hospitalizations and 5,200 deaths. And although Americans have come to expect such risks associated with meat products like raw hamburger, the proportion of outbreaks caused by seemingly innocuous fruits and vegetables is increasing. *E. coli* alone causes approximately 70,000 infections each year, and 5 to 10 percent of those infected develop a potentially fatal kidney complication called hemolytic uremic syndrome.

Food borne illnesses create not only health, but fear issues for consumers. Food recalls can cause a significantly negative economic impact on businesses. For example, Salmonellosis or any of a group of infectious diseases caused by intestinal bacteria of the genus *Salmonella*, is estimated by the CDC to cost more than \$1 billion in medical costs and lost wages annually.

The recall of more than 5 million pounds of beef in 2008 because of suspected *E. coli* contamination is just one example of a string of recent recalls in the U.S., including the well-publicized cookie dough recall and the wide-reaching recalls of peanut and dried milk products this year.

As adoption of silver-based technologies accelerates and industry acceptance follows suit, SDC can become a widespread application in industries such as agriculture, water treatment, textiles, construction products, and HVAC systems, where health concerns are also prevalent.

More importantly, the EPA's category IV toxicity classification of SDC combined with the effectiveness of its patented ionic silver formula as an antimicrobial make for a highly compelling and solution while satisfying a distinct niche for accountability and effectiveness never before seen in an antimicrobial.