THE SILVERINSTITUTE

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Silver News

Silver Gives New Life to Overprescribed and Ineffective Antibiotics

Drug-Resistant Bacteria Succumb to One-Two Punch of Silver and Drugs

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Silver enhances the ability of antibiotics to kill germs, even those drugs that have lost their potency due to overuse.

Low doses of silver can enhance the germ-fighting abilities of antibiotic drugs, even those drugs that have become less effective after decades of overprescribing has caused some microbes to become resistant, according to a team of researchers led by Jim Collins of the Wyss Institute for Biologically Inspired Engineering at Harvard University.

They showed that not only does the addition of silver make some antibiotic drugs up to 1,000 times more effective, but silver has also made at least one drug-resistant bacterium surrender to antibiotics once again.

In addition, silver has allowed the expansion of at least one drug, Vancomycin, an antibiotic that is usually only effective at killing Gram-positive bacteria such as Staph and Strep. With the addition of silver, it can also kill Gram-negative bacteria such as those that cause food poisoning (like E. coli) and hospital-acquired infections.

The researchers also learned that the addition of silver helps dispatch two kinds of microbes that are tough to knock down with antibiotics. The first are microbes caused by sticky biofilms, such as those that cling to catheters and other medical devices. This is why many catheters are coated by silver. The second are bacteria that initially seem to have been killed by antibiotics, only to resurface after discontinued use of the medicine. This is one reason why antibiotic labels warn patients to 'finish all drugs' and why some infections, like those in the urinary tract, can be especially tough to fight. In one test by Collins' team, a mouse with a urinary tract infection from E. coli was resistant to tetracycline until silver was added.

Although previous studies have shown the mechanism by which silver attacks germ cells – it destroys the cell walls – these researchers have gone a step further. By studying silver's

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interaction with E. coli they determined that the metal stimulated the target bacteria to produce more reactive oxygen species (ROS), which are chemicals produced by living cells during the process of metabolism.

ROS are beneficial to cells in the right amount but at higher levels they can damage proteins and DNA. They can also breach the cell's membrane, which is one line of defense that cells use against intruders like beneficial drugs.

In effect, silver can be thought of as a battering ram that punches a hole in a cell's wall, which then allows antibiotic drugs to enter and kill the bacteria cell itself. The Harvard research also showed that even small doses of widely-used antibiotics such as gentamycin, ofloxacin, and ampicillin were up to 1,000 times more effective when combined with silver to fight E. coli.

In still another test at Harvard, mice with peritonitis, an inflammation of tissues in the abdomen - a life- threatening condition seen in humans - were given silver in conjunction with vancomycin. Ninety percent of mice treated in this manner lived. In control tests, 90 percent of those treated *only* with the drug died.

The team also tested whether silver was toxic to subjects and found that the amounts necessary to enhance the antibiotics were so low as not to harm mice or human cells.

Collins noted: "We're keen to explore how smart drug-delivery nanotechnologies being developed at the Wyss could help deliver effective but nontoxic levels of silver to sites of infection." Added Don Ingber, M.D., Ph.D., Wyss Institute Founding Director: "Doctors desperately need new strategies to fight antibiotic-resistant infections, and Jim [Collins] and his team have uncovered one that's incredibly versatile, and that could be put to use quickly in humans."

The study, which appeared June 19th in the journal *Science Translational Medicine*, was supported by funds from the National Institutes of Health, Howard Hughes Medical Institute and the Wyss Institute.

Silver in the Spotlight at Las Vegas Jewelry Shows

By Michael Barlerin, Director, Silver Promotion Service (SPS)

Las Vegas is the venue for the largest and most important annual jewelry shows in the United States, the JCK show and the Couture Show. This year the JCK show alone had over 2,600 exhibitors representing 32 countries and was attended by 23,000 buyers. The other show in Vegas held during the same time is the Couture Show. The Silver Institute's SPS recently returned from these two events and reports that the shows were extremely successful on many levels.

As in prior years, the SPS trade show participation strategy relied on selective sponsorships at the two primary venues. During the Couture show, the SPS sponsored both the silver segment of the Couture Design Awards competition and the Cocktails at Sunset event. Invitations to the event were provided to all Savor Silver program participants exhibiting at Couture to pass on to their retail customers. During the Couture Design Awards, the SPS announced the three finalists in the silver jewelry category and presented the winner's trophy to Atelier Minyon, who also won the People's Choice Award.

At the JCK Show, the SPS also adopted a dual sponsorship strategy. In order to involve the many Savor Silver program participants exhibiting there, the SPS sponsored two fashion shows featuring silver jewelry provided by the SPS' Designers of Distinction and SilverMark Partners.

Also at JCK, the SPS sponsored the Press Lounge. The space provided a venue for multiple meetings with a wide range of international organizations wanting to develop relationships with the SPS. The Press Lounge enabled the SPS to distribute to attendees various SPS sponsored publications produced during the first-half of 2013.

Although the various SPS initiatives were well received, it was silver jewelry that was the star of the Vegas shows. The buzz around silver was exceptional. Initial results of a survey among Savor Silver program participants at both Couture and JCK quantified dramatic high double-digit percentage sales increase over 2012. Equally importantly, all of the SPS exhibitors reported that they had opened multiple new retail accounts.

The saying is that 'What happens in Vegas, stays in Vegas.' This year, the message that silver was center stage in the Vegas spotlight was heard far and wide.

JCK EVENTS

Cynthia Gale's silver jewelry modeled in the SPS Fashion Show at the JCK show.

Dillon Gage Named Exclusive Distributor for Rand Refinery's First Minted Silver Bullion Bars

Dallas-based Dillon Gage Metals has been appointed by Rand Refinery as the exclusive North American distributor for its 1-ounce Rand Silver bars, the company's first minted bullion silver product.

"We are thrilled to have formed this partnership with Rand Refinery, world renowned for their quality and integrity with regard to their precious metals products, most notably the gold Krugerrand coins," said Terence Hanlon, president of Dillon Gage Metals.

As a further commitment to this new product line, Rand Refinery, based in Germiston, South Africa, has introduced the RandPure trademark, which guarantees the traceability of metal from mine to consumer. In addition, many of the new products will be available in tamper-proof packaging with a serial number and Certificate of Authenticity.

The Rand Silver bars will be introduced later this year, and Dillon Gage will provide delivery details when they become available. The company also will have exclusive distributor rights to various sizes of gold minted bars as they become available.

Dillon Gage is a member of the Silver Institute.

"We couldn't be happier about this opportunity to partner with Rand Refinery and make their new gold and silver minted bars available to North American investors," Hanlon added. "It's an honor to be selected by a firm with Rand Refinery's reputation that is held in such high esteem."

Dillon Gage Metals is the exclusive North American distributor for Rand Refinery's 1-ounce Rand Silver bars, the company's first minted bullion silver product.

'Nanoscavengers' Purify Water

Stanford engineers have found a clever way to clean the residue left behind after water is disinfected by nanosilver or other metals like copper.

In water engineer parlance, these metals are known as 'nanoscavengers,' because they cling to particles in the water after they've done their purification job. In most cases, a filter is employed to keep this 'sludge' from floating around in the potable water.

Instead of using a filter, however, the engineers developed a new type of nanoscavenger with a synthetic core that is extremely responsive to magnets, which are then used to rid the water of the unwanted particles.

Shan Wang, the study's senior author and a professor of materials science and engineering and of electrical engineering, noted: "In contaminated water, nanoscavengers float around, randomly bumping into bacteria and killing them or attaching themselves to molecular pollutants. When the contaminants are either stuck to the nanoscavenger or dead, the magnet is turned on and the particles vanish."

Nanoscavengers are not a new idea, but previously they relied on a magnetic iron oxide core surrounded by the active purifying metal. As noted in the journal *Nature Communications*, iron oxide is not as attracted to magnets as the new synthetic core, and too many scavengers remained in the water for it to be drinkable.

By replacing iron oxide with a synthetic material core – which surrounds the active metal – many more of the scavengers can be removed with a magnet.

In live tests using synthetic-core, silver-capped nanoscavengers immersed in water tainted with E. coli bacteria, using a silver dosage of just 17 parts per million, the Stanford team was able to kill 99.9 percent of the bacteria in just 20 minutes. In addition, they removed virtually all of the nanoscavengers in just five minutes of exposure to a permanent magnet.

"Our hope is to one day create a 'one-pot solution' that tackles water afflicted by a diverse mixture of contaminants. A purification technology like that could be very useful in recycling water in developing nations, or in arid climates like the American West, where water quality and quantity are of critical importance," added Xing Xie, a doctoral candidate in civil and environmental engineering and co-first author of the paper.

Products Containing Silver on Display at Infection Control Exposition

By Jeffrey Ellis, Senior Technical Consultant to the Silver Institute

Efforts to control the occurrence of hospital acquired infections (HAIs) have resulted in more products that contain antimicrobial substances. Many of these new products use silver for preventing the build-up of bacteria, fungi, and viruses on the surfaces of medical textiles, surgical instruments, and on ordinary items such as pens and clipboards that are used in patient treatment areas. Even before the Center for Medicare and Medicaid Services (the federal agency responsible for administering Medicare, Medicaid, and the State's Children's Health Insurance Program) announced in 2008 that it would phase out payment for HAIs, the Silver Institute in 2007 had made a presentation at the annual conference of APIC (the Association of Professionals in Infection Control and Epidemiology) on silver's ability to prevent the occurrence of pathogenic bacteria on surfaces and to kill within minutes those pathogens already present. In subsequent years, companies making silver- based preparations such as sprays and coatings and treated fibers exhibited their product lines. During the past few years, displays mostly featured silver-treated end products for use in hospitals and other patient treatment facilities.

At the latest APIC exposition and conference held at Fort Lauderdale, Florida, in June, exhibitors featured silver-based products. Of considerable interest were silver-based systems to control waterborne diseases such as Legionella. Although these are widely known for contaminating water towers they are also a pervasive nuisance in hospitals. Also of importance was a water sterilization control system from Liquitech Environmental Solutions that makes use of a copper- silver alloy that releases ions of both metals into hospital water systems to kill ambient pathogenic waterborne organisms.

Wound-care products containing silver, from DeRoyal, ConvaTec and others, were also on display. What has also received much publicity in the medical device trade literature is the use of silver, particularly in gels, to reduce the risk of infection in serious limb injuries and thus lowering the number of amputations that are needed. In addition, medical textiles for bedding, curtains, gowns and the like, which include silver, were also available for attendee inspection.

Table, sink, and bench surfaces containing silver and other antimicrobial materials are already widely used and it is likely that these will soon be marketed beyond hospitals and commercial buildings to private homes. These surfaces have pleasing aesthetics to both the eye and to touch as well as providing added safety in kitchens and bathrooms.

Concerns remain among some researchers that microorganisms can develop resistance to silver as they do to some pharmaceutical antibiotics. However, because silver breaks down cell walls and impedes both respiration and reproduction, pathogenic organisms have great difficulty in developing resistance to the metal. Medical uses of silver will continue to grow and projected uses of the antimicrobial features will cause expansion into homes and commercial installations.

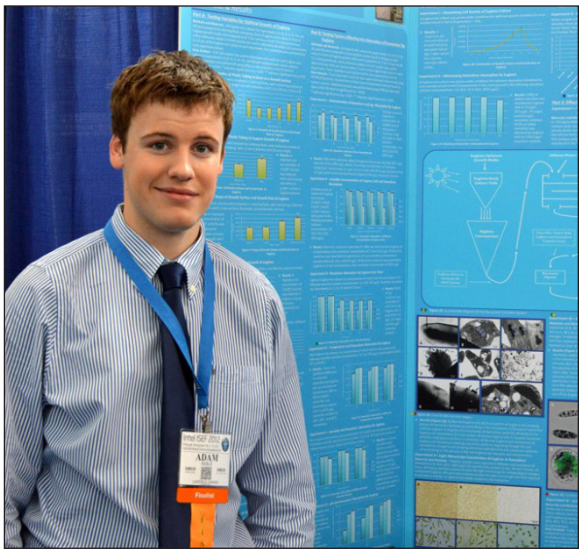
Canadian Youth Receives Science Award for Work with Nanosilver

Eighteen-year old Adam Noble of Lakefield, Ontario, Canada, has been awarded the 2013 Weston Youth Innovation Award for his work in detecting and retrieving nanosilver from wastewater.

Nanosilver is often left over after it has been used to disinfect water. Through repeated tests, Noble discovered that Euglena, a single-celled organism, not only detects nanosilver but can retrieve it as well. Using this knowledge, he built a filtering device using Euglena cells.

"We are very impressed by Adam's imagination and dedication to his work," said Dr. Hooley McLaughlin, Vice President of Science Experience and Chief Science Officer at the Ontario Science Centre. "We are sure that we will be seeing much more from Adam in the future as he continues to pursue his career as an engaged scientist."

Noble was awarded the $2,000 prize at the Ontario Science Centre. An animation of his project is being displayed in the Weston Family Innovation Centre and shared through the Science Centre's social media channels.



SOCIETY FOR SCIENCE & THE PUBLIC

Adam Noble won an award for his work in using a single-cell organism to detect and retrieve nanosilver from wastewater.

CME's First 1,000-Ounce Silver Futures Contracts Traded

The first of CME Group's physically-delivered Silver 1,000-oz. futures contracts traded in mid-June, according to Harriet Hunnable, Managing Director of Global Metals. Five hundred and seventy-four lots were traded during the week of June 17, with trading taking place every day that week.

"As our benchmark Silver 5,000-oz. contract celebrates its 50th anniversary of continuous trading, this new 1,000-oz. fungible contract offers a cost-effective way to manage risk in our deeply liquid silver futures and options marketplace," she said. "With strong demand for precious metals in China, India, and the U.S., we expect to see growing interest in this product, which offers additional flexibility for individual investors and other market participants looking to hedge against economic uncertainty."

This launch comes at a time when CME Group's Silver futures and options average daily trading volumes through June 24, 2013 are up to 69,878, which is an increase of 17 percent over the comparable period in 2012. Open Interest is at 378,589 contracts.

CME Group is a member of the Silver Institute.

At one-fifth the size of the existing 5,000-oz Silver futures contract, this new contract is sized for market participants seeking to trade physical silver in smaller increments. It is fully fungible with the full-sized silver futures contract, which means that customers who accumulate five warehouse depository receipts of the 1,000-oz. contract can convert them into one 5,000-oz. Silver futures contract. These contracts are listed by and subject to the rules of COMEX.

Industrias Peñoles' Alanis Elected Silver Institute President

Fernando Alanis, CEO of Industrias Peñoles, S.A.B. de C.V., the world's largest producer of refined silver, based in Mexico, was elected President of the Silver Institute by its membership.

Mitchell Krebs, President, CEO and a Director of Coeur Mining, was elected Vice President of the Institute, succeeding Alanis in this role. Both men will serve a two-year term.

Coeur Mining, Inc., is one of the world's largest primary silver producers, with assets in the United States, Mexico, Bolivia, Argentina and Australia.

Alanis succeeds Geoff Burns, President and CEO of Pan American Silver Corp., whose term as the Silver Institute's President ended on May 31.

"Fernando and Mitchell are recognized silver industry leaders and the Institute is fortunate to have them at the helm guiding our work," said Michael DiRienzo, Executive Director of the Silver Institute. He added: "We are grateful for the dedicated service of Geoff Burns as the Institute's President during the past two years. Geoff's vision and dedication made a considerable difference to the Institute, and we are indebted to him for his service."

Upcoming Events

Silver Institute To Host Autumn Industrial Silver Conference

The Silver Institute's inaugural Industrial Silver Conference will be held October 22-23 at the Capital Hilton in downtown Washington, D.C. The conference will examine important factors affecting silver industrial demand.

The event will commence with a cocktail party on the evening of October 22, and the conference will be on October 23.

Key market players from across the silver supply chain, including miners, industrial fabricators, refiners, bullion bankers and representatives from principal trade and government associations should attend this conference.

Online registration information, as well as other materials on the conference, will be available soon at the Silver Institute website.

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