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Old Curative Gets New Life at Tiny Scale

By BARNABY J. FEDER

Silver, one of humankind's first weapons against bacteria, is receiving new respect for its antiseptic powers, thanks to the growing ability of researchers to tinker with its molecular structure.

Doctors prescribed silver to fight infections at least as far back as the days of ancient Greece and Egypt. Their knowledge was absorbed by Rome, where historians like Pliny the Elder reported that silver plasters caused wounds to close rapidly. More recently, in 1884, a German doctor named C. S. F. Crede demonstrated that a putting a few drops of silver nitrate into the eyes of babies born to women with venereal disease virtually eliminated the high rates of blindness among such infants.

But silver's time-tested - if poorly understood - versatility as a disinfectant was overshadowed in the latter half of the 20th century by the rise of antibiotics.

Now, with more and more bacteria developing resistance to antibiotic drugs, some researchers and health care entrepreneurs have returned to silver for another look. This time around, they are armed with nanotechnology, a fast-developing collection of products and skills that helps researchers deploy silver compounds in ways that maximize the availability of silver ions - the element's most potent form. Scientists also now have a better understanding of the weaknesses of their microbial adversaries.

One of the urgent goals is to prevent bacterial infections that each year strike 2 million hospital

patients and kill 90,000, according to the Centers for Disease Control and Prevention. Such infections are usually treated with large doses of antibiotics and sometimes with repeat surgeries. They cost the health care system roughly $4.5 billion annually, and the challenge is growing with the spread of drug-resistant microbes.

The latest advance for silver therapy comes from AcryMed, a small company in Portland, Ore., that has invented a process to deposit silver particles averaging about 10 nanometers - less than a thousandth the diameter of a human a hair - on medical devices. AcryMed's first customer, I-Flow, makes a silver-coated catheter that pumps painkillers into the wounds created by surgery.

I-Flow got federal regulatory clearance on Dec. 2 to sell the device and has already begun shipping them to customers. The nanoscale particles have so much surface area to react with the microbes, in relation to their volume, that small concentrations are effective antiseptics.

"The equivalent of a teaspoon of silver in a seven-lane Olympic-size swimming pool is enough to do the job," said Bruce Gibbons, the microbiologist who is AcryMed's founder and chief executive.

AcryMed hopes to reach agreements with catheter companies larger than I-Flow, including the makers of urinary catheters, the most common breeding ground for hospital infections. Nano-scale silver could also eventually make its way onto permanently implanted devices like silicone breasts, artificial hips and knees and pacemakers.

The term nanotechnology is derived from the nanometer, one-billionth of a meter. Nanoscale materials often exhibit unusual structures and behaviors compared with bulkier quantities of the same material.

AcryMed began developing wound dressings with large-scale silver particles in the 1990's. It adapted its process to make smaller and smaller particles when medical-device makers asked it for silver coatings. As the particles shrank to nanoscale dimensions, they became so highly reactive that AcryMed was able to bind them to virtually every glass and plastic material it tested.

As has often been the case in nanotechnology, AcryMed is rushing to get products into the market long before the nano-scale phenomena it is exploiting are fully understood. It is not entirely clear, for example, how silver kills many bacteria at the diluted concentrations considered safe for medical use.

AcryMed also admits that it cannot fully explain the forces that produce the surface-binding performance of its particles. It is a crucial trait, though, because surface coverage that is even and thorough blocks the formation of a thick carpet of bacteria known as biofilm.

Preventing the build up of biofilms, which eventually release large masses of free-floating bacteria, is in turn a key to avoiding infections, according to Dr. Dennis Maki, a professor of medicine and the head of infectious diseases at the University of Wisconsin Medical School and Pubic Health.

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