



The Science Link

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Novel Plastics Kill Bacteria on Contact

By Richard Scott, Ph.D., Vice President of Research, PolyMedix

Most experts believe we are losing the war against disease-causing bacteria. Many are already resistant to antibiotics. At one time, extremely virulent bacteria only caused problems in hospitals, in patients with weak immune systems. Today, antibiotic-resistant "super-bugs" have become so virulent that they infect healthy people as well as hospital patients.

A related problem is food-borne bacteria, which according to the U.S. Centers for Disease Control and Prevention cause 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United States each year. A major cause of food contamination occurs during processing, for example when contaminated meat is processed on a butcher block. Bacteria thrive in such environments. Cross-contamination with other meats commonly occurs when food processing surfaces are improperly cleaned.

A new class of polymer under development by PolyMedix (Radnor, Pa.) has been shown to kill bacteria on contact. The anti-bacterial polymers can be intrinsically formulated into the plastic, so no dangerous chemicals leach out. According to researchers, plastics formulated with these polymers can be made into products of almost any shape, size and thickness.

The secret to this exciting new material is found in natural chemical defenses against bacteria. For millions of years, higher organisms such as mammals have used the chemical known as *host defense proteins* as the first line of defense against infection. Host defense proteins are large, complex chemical molecules and as such, unsuitable as ingredients of industrial materials. PolyMedix copied the critical bacteria-killing chemical attributes of host defense proteins and duplicated them in much smaller, artificial molecules that are easily incorporated into plastics.

Because the anti-microbial polymers can be formulated into the plastic and not simply applied to the surface, it does not wear off over time. Moreover, laboratory tests have shown that bacteria do not develop resistance to these polymers. Anti-microbial polymers exploit an ancient vulnerability in bacteria, a property shared with host defense proteins, which no amount of adaptation or evolution has thus far been able to overcome. Even the most resistant bacteria quickly succumb.

Any plastic product in "sensitive" industries can now benefit from this exciting technology. A partial list includes utensils, implements and work surfaces used in food processing; tables and surfaces in physicians' offices, hospitals and clinics; protective clothing, shoes, and eyewear; anti-microbial paints for medical or food processing environments; packaging for food, drugs and cosmetics; and medical devices such as catheters, intravenous tubes, and implants. Several anti-microbial polymers in development have shown potent

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activity against a range of problematic environmental molds as well as bacteria, and some formulations could conceivably find their way into personal care products such as soaps and anti-microbial creams and lotions.

No antimicrobial surface will completely eliminate harmful bacteria that come into contact with it. But the new plastics can prevent bacteria from surviving and multiplying, thus keeping bacterial counts low and reducing the opportunity for the bugs to grow and persist.

PolyMedix's anti-microbial polymers are still development-stage products. Applying these new materials to critical applications like food handling and medicine requires review and/or registration with appropriate regulatory agencies, and a good deal of scientific data supporting the materials' safety. PolyMedix is looking for partners to help commercialize the materials for materials, coatings, and food processing markets.

Richard Scott, Ph.D. is the Vice President of Research at Radnor, Pa.-based PolyMedix. Dr. Scott brings more than 20 years of biopharmaceutical industry experience to PolyMedix, in which he has led many aspects of the preclinical drug discovery and early clinical development process. He holds a Ph.D. in Microbiology from the University of Pennsylvania, and a B.S. in Biology from Muhlenberg College. He has authored more than 45 papers and book chapters, and is named on six patents. PolyMedix is a publicly traded biotechnology company focused on the development of novel drugs and biomaterials for the treatment of infectious diseases and acute cardiovascular disorders. PolyMedix's compounds are based on biomimetics: non-peptide small molecule drugs that mimic the activity of proteins. Dr. Scott oversees the development of PolyMedix's anti-microbial polymers and hopes to collaborate in commercializing the materials for materials, coatings and food processing markets. For more information, visit www.polymedix.com.

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