Just dive in: Natural product hybrid provides antimicrobial and cell-resistant surfaces

August 1 2008

(PhysOrg.com) -- Infections following treatment in clinics, retirement homes, and long-term care facilities are a grave problem for patients, and resistant germs can be particularly devastating.

“High infection rates are in particular observed related to implants, catheters, and stents,” reports Karl Gademann, “those for urinary catheters mounting up to 30 % per week!” In cooperation with his team at the Swiss Federal Institute of Technology in Lausanne, he has developed a process for coating surfaces with an antimicrobial layer. As reported in the journal *Angewandte Chemie*, their system is based on hybrid molecules derived from various natural products.

For a patient, the results are particularly grave if an infection occurs in an implant. Usually, replacement of the affected part is the only possible treatment. “One particularly attractive approach is the application of antibiotics directly on the material,” says Gademann. To test their idea, the team from Lausanne chose to use natural product hybrids: biologically active fragments of various natural products are coupled to combine two different modes of action.

The hybrid produced by Gademann’s team is made of three parts: two natural products are coupled by means of a polymer bridge. The first substance is anachelin, an iron transporter (siderophore) from cyanobacteria. Anachelin strongly and selectively binds metal oxides.

The majority of implants are made from a metal oxide: highly

biocompatible titanium dioxide. Anachelin fixes the hybrid firmly to the surface of the implant. The second natural product is the antibiotic vancomycin, which disrupts the biosynthesis of cell walls and thus stops bacterial growth. The coupling component is polyethylene glycol, a chemically inert, nontoxic polymer. It also assures that dead bacteria and cell components cannot bind to the surface.

The hybrid can be applied to titanium dioxide components in a simple dunking procedure. “We were able to demonstrate that our hybrid firmly attaches to titanium dioxide surfaces and effectively hinders infection with Bacillus subtilis as well as the attachment of cellular material,” says Gademann.

Citation: Karl Gademann, Antimicrobial Surfaces through Natural Product Hybrids, *Angewandte Chemie International Edition*, doi: 10.1002/anie.200801570

Provided by Wiley