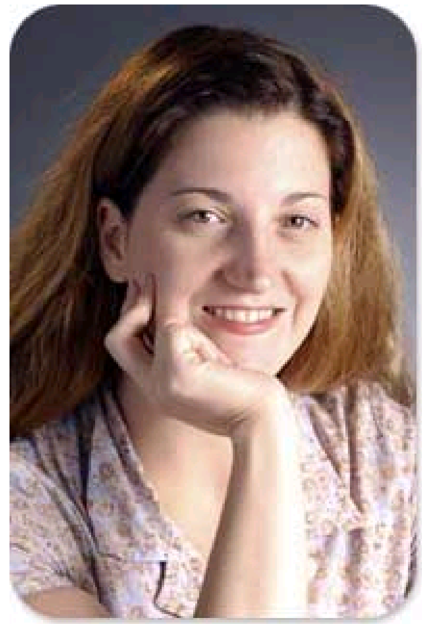
People

Terri Camesano

Associate Professor



Faculty Listing

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Related Information

- Personal Web Site

Educational Background

- B.S., University of Rochester, 1995
- M.S., University of Arizona, 1997
- Ph.D., Pennsylvania State University, 2000
- Post-Doct, University of Geneva - Switzerland, 2000

Research & Teaching Interests

Bacterial adhesion and interaction forces; biopolymers; bacterial-natural organic matter interactions; colloid-polymer interactions; DNA-polymer interactions; gene therapy

IQP Advising Interests

Water pollution; soil pollution; biotechnology issues; impact of new technologies; history of technology; literature; theatre

Research

All bacteria, whether good or bad, have something in common: they often stick where they're not supposed to. Terri Camesano, assistant professor of chemical engineering at WPI, is hoping to learn why--or at least how.

Bacterial adhesion can sometimes get in the way when scientists try to use bacteria as tools, for example, to clean up dirty groundwater. When bacteria known to degrade toxins are introduced into soil, they often latch onto soil particles, rather than travel with the groundwater. When disease-causing microorganisms stick to biomedical devices, like catheters or contact lenses, they can produce a pathogenic biofilm that can cause infections nearly impossible to treat with antibiotics.

Camesano says the key to bacterial stickiness may lie in the polysaccharides, or large sugars, found on a bacterium's outer membrane. To find out how these sugars behave on a molecular scale, she and her students place bacteria under an atomic force microscope (AFM). With an extraordinarily small stylus attached to a cantilevered arm, the AFM can detect individual molecules as the probe moves slowly across the surface

of a material. It can also be employed as a gauge to measure infinitesimally small forces--such as the force of a bacterium clinging to a surface. By measuring how difficult it is to pull the tip of the AFM stylus away from a bacterium, Camesano can determine the strength of the forces that individual polysaccharide molecules and other bacterial polymers exert on surfaces, as well as the size, shape, elasticity and flexibility of these molecules.

Camesano says the measurements suggest that bacterial surfaces have both flexible and rigid polymers, each with different adhesion qualities. "The rigid polymers stick out like straight rods," she says, "producing a repulsive force that prevents the bacterium from attaching. The flexible, coiled polymers can form a bridge that links the bacterium to a surface. We believe it is the ratio between these two kinds of molecules that determines whether or not a bacterium sticks."

By better understanding this critical ratio, Camesano says it should be possible to develop new materials that can either promote or reduce bacterial adhesion, depending on the application, or to engineer bacteria with the desired degree of stickiness. "Studying bacterial surfaces at the nanometer level has implications for other applications, as well," Camesano says. "For example, we are working to develop a food safety biosensor that could distinguish between E. coli and Salmonella, common food-borne pathogens. A sensor like this might also be useful in detecting the presence of biological agents intentionally released into the environment, for example, through an act of bioterrorism."

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Years of Service at WPI

- Assistant Professor, WPI, 2000 - 2006
- Associate Professor, WPI, 2006 - present

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