

# Prevention and Treatment of Fouled Medical Device Surfaces

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## Technology Summary

To prevent infection due to contamination on medical devices inserted into the body, ORNL researchers developed a method to inhibit bacteria growth and formation of biofilm. The technology could be applied to catheters, drug delivery devices, shunts, and long-term implants such as joint replacements. Because all of these devices have a tendency to become contaminated by bacteria or other microbial species, this invention is relevant for enhancing a wide range of medical treatments.

When a device is placed in the body, the potential for infection exists, due to fouling from infectious bacteria forming biofilms on the device. Relying on antibiotics to treat infection is increasingly problematic, as antibiotic-resistant strains are now common. In addition, treating biofilms with antibiotics is generally ineffective due to the inability of the antibiotic to penetrate the biofilm.

In this technology, fouling is avoided by applying stimuli to the material structure in order to yield an increase or decrease in the temperature of the energetically activated nanostructure. The invention works by modifying the chemical and/or mechanical properties of the base material so that bacterial fouling is obstructed. It is also possible to provide a coated structure with an activated nanostructure.

## Advantages

- Helps avoid costly removal and reinsertion of medical implants and antibiotic therapy
- Disrupts the formation of biofilms, which are resistant to antibiotic therapy
- Minimizes damage to tissue adjacent to the implant while destroying microbes and pathogens

## Potential Applications

- Devices inserted into individuals for medical tests, drug treatments, cosmetic applications, and long-term corrective measures
- Vascular catheters in kidney dialysis
- Catheters to introduce medications, nourishment, and drugs over an extended time
- Shunts to move liquid from one part of the body to another, such as the ventriculoperitoneal shunt used to relieve intracranial pressure

## Patent

Mitchel J. Doktycz, David P. Allison, Charles F. Barnett, and Scott T. Retterer. *Active Materials for Prevention and Treatment of Fouled Surfaces*, U. S. Patent Application No. 61/483,133, filed May 6, 2011.

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