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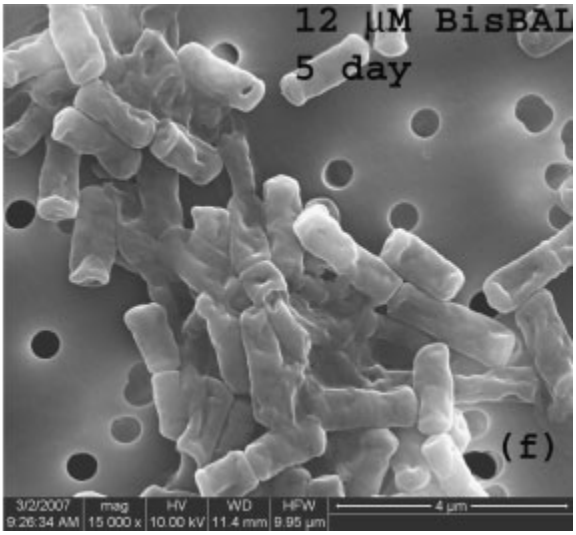
EMSL In Brief
Environmental Molecular Sciences Laboratory

Scientists Learn How to Halt Bacterial Secretion that Fouls Filters

A new technology, discovered by users of the Department of Energy's Environmental Molecular Sciences Laboratory, may halt water treatment filter plugs by preventing a bacterial slime that fouls the filter. Ninety-five percent fewer extracellular polymeric substances (EPS), or slime, were secreted when the bacteria *Brevundimonas diminuta* was treated with bismuth-3-dimercapto-1-propanol, known as BisBAL, over 5 days.

The EPS can plug the microscopic pores in water filters. Clearing or replacing the filters adds cost and creates waste. "If you could reduce cost, in theory you could produce more clean water," said EMSL user Kevin Rosso, a Pacific Northwest National Laboratory scientist on the team.

Scientists from the University of Houston and PNNL selected the chalk white *Brevundimonas diminuta* because it is commonly used to test water filter efficiency. The team then mixed the rod-shaped cells with 12 microMolar solution of BisBAL and examined the consequences over 5 days.



A scanning electron microscope shows the rod-shaped bacteria after the new approach stopped extracellular polymeric substance production. The background dots are holes in the filtration membrane. This image was chosen for the Biotechnology and Bioengineering cover.

Using EMSL's Fourier-transform infrared spectroscopy, the team gained detailed insights into production of the EPS polysaccharides and proteins with and without BisBAL. The FTIR results suggest that the BisBAL is inhibiting the addition of a specific group of atoms to a carbohydrate involved in the EPS production. Also, FTIR revealed that the structure of the cells does not vary substantially when BisBAL is added, but the amount of proteins, polysaccharides, and peptides expressed does.

Next, atomic force microscopy and scanning electron microscopy at EMSL were used to visualize EPS expression. Images from these instruments show changes consistent with the loss of the EPS, and one of the images was selected for the cover of the February 15, 2008, issue of *Biotechnology and Bioengineering*.

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