Biotechnological Process for Achieving Very Low Phosphate Concentrations

In several cases it is desired to achieve very low phosphate concentrations. This can be the case for wastewater discharges to oligotrophic natural systems, but also to prevent biofouling in engineered systems (e.g., reversed osmosis). Achieving low concentrations usually requires a large overdosing of chemicals. The current offering from Jacobs and coworkers shows that a recently discovered thermostable protein can selectively sequester phosphate at very low concentrations. The extreme stability of the enzyme, in combination with its ease of production and purification, makes it possible and economically feasible to use it on a technical scale. The authors discuss the binding characteristics of phosphate and a potential full-scale application. In view of the chemical similarity between phosphate and arsenate it can be expected that the protein can also serve a role in arsenate removal from drinking water systems. *Page 918*

DOI: 10.1002/bit.22685

How Strong Are Bacterial Biofilms?

Bacterial biofilms pose serious problems in industry, medicine, and dentistry. Unfortunately, attempts to control biofilms with biocides often prove ineffective. An alternate approach, weakening the biofilm to promote detachment, is limited by our lack of understanding of how to measure and manipulate biofilm mechanical properties. Poppele and Hozalski (2003. J Microbiol Methods 55:607–615) developed a novel micro-cantilever method for the tensile testing of biofilms, but the method required that the biofilm be detached and broken into fragments for testing. Herein, Aggarwal, Poppele, and Hozalski present a modification of that method for the testing of intact biofilm and provide cohesive strength results for *Pseudomonas aeruginosa* and *Staphyloccus epidermidis* biofilms. The method currently is being used to determine the mechanical properties (elastic modulus, strength, and failure strain) of a variety of biofilms and to explore the roles of specific biofilm constituents (e.g., proteins and divalent cations) in cohesion. The ultimate goal of this work is to develop improved approaches for biofilm control. *Page 924*

DOI: 10.1002/bit.22684

Published online in Wiley InterScience (www.interscience.wiley.com).

A New Look at Bacterial Adhesion and Its Effects on Metabolic Activity

While researchers have known that bacterial adhesion to a surface can affect cellular activity, an adequate theory relating surface properties and activity has been elusive. Hong and Brown have examined this phenomenon from a new perspective by focusing on the adhesion process itself. Their working hypothesis suggests a link between cellular bioenergetics and changes in both the electrostatic potential and pH of a cell surface as it approaches another surface. Hong and Brown have demonstrated that when bacteria adhere to a clean (negatively charged) glass surface, the cell's adenosine triphosphate (ATP) level can increase dramatically. The authors have correlated these results to the working hypothesis through electrostatic and bioenergetic modeling. Their hypothesis also indicates that positively charged surfaces should deplete cellular ATP and results from recent studies with amine-coated surfaces support this thesis. If the hypothesis is ultimately validated, it may enhance our ability to engineer surfaces that enhance or inhibit bacterial activity. *Page 965*

DOI: 10.1002/bit.22687

Increasing the Speed and Throughput of Recombinant Molecular Probe Development

The generation of molecular probes (usually antibodies) remains a critical bottleneck in biomedical research, biomarker discovery, and diagnostic test development. A potential solution is the use of yeast-display libraries that express recombinant single chain fragment variable (scFv) antibodies on the surface of yeast. Using magnetic enrichment and fluorescence-activated cell sorting, yeast clones that bind specifically to antigens can be selected in 2–3 weeks. However, selected scFv that perform well on yeast cell surfaces often perform poorly in solution. To address this problem, Gray and coworkers describe new assay formats that significantly increase the speed and throughput of soluble scFv assessment. In addition, they describe a novel competitive inhibition flow cytometry assay that bypasses entirely the need for soluble scFv expression by using yeast-bound scFv directly as reagents to detect unlabeled antigens in biological samples. These methods will facilitate the practical implementation of recombinant antibody probes derived from yeast-display libraries. *Page 973*

DOI: 10.1002/bit.22686

© 2010 Wiley Periodicals, Inc.