

SELECTIVE INHIBITION FOR BACTERIAL ACID GENERATION IN AN UNDERGROUND COAL MINE: PRELIMINARY RESULTS¹

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Abstract: Acid mine drainage (AMD) can continue to be generated from underground coal and metal mines long after mining operations cease, and this drainage can have a negative environmental impact on receiving waters. Bacteria such as *Thiobacillus* are known to catalyze the reactions that generate acid from pyrite and other sulfide minerals, so one approach to the prevention of AMD is the inhibition of this bacterial activity. Many potentially useful inhibitory agents exist, such as surface chelating compounds, cationic surfacants, and organic acids, but questions remain regarding their effectiveness in the presence of coal and other materials, their biodegradability, and possible methods for their distribution in the underground environment.

In this study, coal, rock, and water samples were collected from acid and neutral pH seeps in an underground bituminous coal mine. Bacterial abundance and diversity were determined using surface spread-plate, MPN, and direct counting methods. Mechanisms of bacterial dispersal within the mine were evaluated by placing sterile bacterial "traps" at strategic locations and periodically sampling them for bacterial colonization. In the laboratory, six different chemical compounds were tested for the concentrations required to inhibit bacterial acid generation in the presence and absence of coal and other rock material. Preliminary studies on the effectiveness of inhibitor dispersal as aerosols were carried out, and a small test area of the coal mine was treated in this way with one inhibitor. The results suggest that the selective inhibition of areas of high bacterial activity within underground coal mines may provide a cost-effective means of reducing the generation of AMD in accessible abandoned coal mines.

Additional Key Words: acid mine drainage, bacterial inhibition, *Thiobacillus*

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