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DETERMINATION OF ANTIBACTERIAL EFFICACY OF COMMON CHEMICAL PRODUCTS AGAINST THIOSULFATE REDUCING BACTERIA IN SATURATED SALT CAVERN BRINE

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Abstract

Despite harsh environmental conditions, extreme halophilic thiosulfate reducing bacteria (TRB) were found to proliferate in saturated salt cavern brines. A major drawback of thiosulfate reduction is the production of toxic and corrosive hydrogen sulfide. Under these conditions, the use of suitable chemical products with antimicrobial properties is essential for limiting the activity and the spread of TRB. The aim of this study is to test the efficacy of common chemical products against TRB and determine their minimum inhibitory concentration (MIC). To do so, brine samples were collected and enriched at the laboratory. Then, the enriched culture composed of sulfidogenic wild strains from the brine sample was treated with eight commercial chemical products having different active substances. For each product, five concentrations and three contact durations (2, 9 and 30 days) were tested. Before treatment, the average concentration of TRB was higher than 10^5 cells/ml. After treatment, four chemical products showed no inhibitory activity against TRB while a pronounced inhibitory effect with a significant reduction in cell counts of TRB (> 4 log reduction) was observed using products containing one of the following active substances: 3,3'-methylenebis[5-methyloxazolidine] (MBO), 1,5-Pentanedial (Glutaraldehyde) and benzalkonium chloride (BAC). MBO containing product was found to be the most effective against the brine that was tested, containing extreme halophilic TRB. A MIC of 250 mg l^{-1} (0.421 $lb.yd^{-3}$) was found to be effective over 30 days. As the MIC depends on each environment and bacterial flora, these results could not be applied directly to another brine. The protocol described here below should be adapted to test each specific brine.

Key words: Antibacterial treatment, Brine Chemistry, Brine Microbiology, Caverns for Hydrocarbon Liquid Storage, Corrosion, Sulfide Producing Bacteria