Purification of SRB Growth Inhibitor from BP Bacterium

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The inhibition of sulfate reducing bacteria (SRB) is of academic and biotechnological interests due to their involvement in corrosion, hydrocarbon degradation and reservoir souring. Many approaches that have been used to limit SRB activities such as nanofiltration techniques, corrosion inhibitors, chemical biocides and biocompetitive exclusion strategies, have proved to be inefficient. The purification of SRB Growth Inhibitor (SGI) from BP bacterium is reported in this study. The SGI is a novel compound purified from BP bacterium that inhibits the growth and activities of SRB. Methods: The bacterial growth conditions for optimum SGI production was determined after incubating BP cultures in M9 minimal medium at 37 °C under aerobic, anaerobic and oxygen limiting conditions for 6 hrs, 12 hrs, 18 hrs, 24 hrs, 48 hrs, and 72 hrs. The preparative growth inhibitor was purified by ion exchange chromatography using Q Sepharose Fast Flow. Size exclusion chromatography was used to fractionate the cell free supernatants (CFS) in the range of 100-7000 Da. Vitamin B12 (1,355 Da) and Blue Dextran (2,000,000 Da) were used as molecular weight markers. The purified inhibitor was tested against Desulfovibrio indonesiensis NCIMB 13468, Desulfovibrio vulgaris, and Desulfovibrio alaskensis NCIMB 13491. Scanning electron microscopy (SEM) and confocal laser scanning microscopy (CLSM) were used to examine the effects of SGI on SRB growth as well as on their biofilms formation. Results: Growth in oxygen limiting condition produced the highest yield of SGI. The chromatograms obtained revealed the molecular weight of SGI to be in the range of 1800-2000 Da. The SGI revealed SRB growth prevention that was 100 times the order of magnitude compared to normal growth after 72 hours of incubation. The coupons with the inhibitor

showed a stunted growth compared with the control using SEM. The CLSM revealed dead cells with the SGI when coupons were treated with live/dead stains. Conclusions: An SRB growth inhibitor from BP bacterium has been isolated and purified. The activity of this inhibitor is comparable to that produced by other inhibitors, so that it can be developed as an alternative treatment in the control of SRB colonization.