Under pressure: dissimilatory sulfate reduction by *Desulfovibrio alaskensis* G20

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Biosouring is the production of H_2S by sulfate reducing microorganisms (SRM) in-situ or in the produced fluids of oil reservoirs. Sulfide is explosive, toxic and corrosive which can trigger equipment and transportation failure, leading to environmental catastrophe. As oil exploration and reservoir development continue, subsequent enhanced recovery is occurring in progressively deeper formations and typical oil reservoir pressures range from 10-50 MPa. Therefore, an understanding of souring control effects will require an accurate understanding of the influence of pressure on SRM metabolism and the efficacy of souring control treatments at high pressure. To explore the impact of pressure on SRM, wild type *Desulfovibrio alaskensis* G20 was grown under a range of pressures (0.1-14 MPa) at 30 °C. Complete sulfate reduction occurred in all pressures tested within 3 days, but microbial growth was inhibited with increasing pressure. Bar-seq identified several genes associated with flagella biosynthesis (including FlhB) and assembly as important for survival at elevated pressure and fitness was confirmed using individual transposon mutants. Flagellar genes have previously been implicated with biofilm formation and confocal microscopy on glass slides incubated with wild type *D. alaskensis* G20 showed more biomass associated with surfaces under pressure, highlighting the link between pressure, flagellar and biofilm formation. To determine the effect of pressure on the efficacy of SRM inhibitors, IC_{50} experiments were conducted and *D. alaskensis* G20 showed a greater resistance to nitrate and the antibiotic chloramphenicol, but a lower resistance to perchlorate. Overall, this work furthers our understanding of oil reservoir biogeochemistry and highlights the impact of pressure on biofilm formation and biosouring strategies.