Chromium Responses and Biofilm Formation in *Desulfovibrio vulgaris* RCH-1, a Sulfate-Reducing Bacterium Isolated from 100H Chromium-Contaminated Groundwater, are Temperature-Dependent

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Desulfovibrio vulgaris RCH-1 is a sulfate-reducing bacterium that was isolated from chromium-contaminated groundwater at the 100H Hanford Site. Reduction of chromium(VI) to the insoluble and less toxic chromium(III) could help prevent migration of chromium-contaminated groundwater to the Colombia River, a valuable drinking water source. Biostimulation of chromium-reducing organisms by injecting electron donors into the subsurface can create unbalanced ratios of electron donor to acceptor and here we show that these ratios affect *D. vulgaris* RCH-1 ability to reduce Cr(VI). Additionally, growing *D. vulgaris* RCH-1 at a temperature that is relevant to the *in situ* subsurface temperature affects chromium tolerance, reduction rates, and presence of extracellular filaments. Growth experiments were initiated in batch growth mode with electron donor-limited, electron acceptor-limited, and electron donor/acceptor balanced ratios. Washed *D. vulgaris* RCH-1 cells were exposed to 0, 20, 50, and 100 μM K_2CrO_4 and chromium(VI) levels were monitored during growth. Growth in electron acceptor-limited and electron donor-limited cultures was effected and had increased lag-times compared to cultures with electron donor/acceptor balanced ratios. *D. vulgaris* RCH-1 grows optimally at 30°C, but to understand if the chromium response is different at *in situ* temperatures, experiments were also carried out at 20°C. *D. vulgaris* RCH-1 was more susceptible to chromium at 20°C than at 30°C and cells could only tolerate 50 μM as opposed to 100 μM K_2CrO_4. *D. vulgaris* RCH-1 was also grown as a biofilm under electron acceptor-limited conditions at 30°C and 20°C and extracellular filaments were observed at 20°C, but not at 30°C. The presence of extracellular filaments at a field-relevant temperature suggests that the filaments play a role *in situ*. Current studies are focused on the determination of function and composition for extracellular structures. Studies of recent field isolates provide valuable insights into the metabolic potential of organisms that are present in the environment of interest as opposed to a model organism. Assessing chromium reduction at *in situ* temperatures rather than optimal growth temperatures and under electron donor- and acceptor-limitation provides field relevant insight into chromium toxicity and reduction for respective field sites.