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Influence of Bentonite Particles on the Transport and Deposition Behavior of Bacteria in Porous Media

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The influence of clay particles on the transport and deposition behavior of bacteria in irregular quartz sand was examined by direct comparison of both breakthrough curves and retained profiles with clay particles in bacteria suspension versus those without clay particles. Two representative cell types, Gram-negative strain *E.coli* DH5α and Gram-positive strain *Bacillus subtilis* were utilized to systematically determine the influence of clay particles (bentonite) on cell transport behavior. Packed column experiments for both cell types were conducted in both NaCl (5 and 25 mM ionic strengths) and $CaCl_2$ (5 mM ionic strength) solutions at pH 6.0. The breakthrough plateaus with bentonite in solutions (30 mg L^{-1} and 50 mg L^{-1}) were lower than those without bentonite for both cell types under all examined conditions, indicating that bentonite in solutions decreased cell transport in porous media regardless of cell types (Gram-negative or Gram-positive) and solution chemistry (ionic strength and ion valence). The enhanced cell deposition with bentonite particles was mainly observed at segments near to column inlet, retained profiles for both cell types with bentonite particles therefore were steeper relative to those without bentonite. The increased cell deposition with bentonite observed in NaCl solutions was mainly attributed to the co-deposition of bacteria with bentonite particles whereas, in addition to co-deposition of bacteria with bentonite, the bacteria-bentonite-bacteria cluster formed in suspensions also contributed to the increased deposition of bacteria with bentonite in $CaCl_2$ solution.