



Numerical modeling of colloid facilitated virus transport in porous media

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A conceptual mathematical model was developed to describe the simultaneous transport (cotransport) of viruses and colloids in three-dimensional, water saturated, homogeneous porous media with uniform flow. The model accounts for the migration of individual virus and colloid particles as well as viruses attached onto colloids. Viruses can be suspended in the aqueous phase, attached onto suspended colloids and the solid matrix, and attached onto colloids previously attached on the solid matrix. Colloids can be suspended in the aqueous phase or attached on the solid matrix. Viruses in all four phases (suspended in the aqueous phase, attached onto suspended colloid particles, attached onto the solid matrix, and attached onto colloids previously attached on the solid matrix) may undergo inactivation with different inactivation coefficients. The governing coupled partial differential equations were solved numerically by employing finite difference methods, which were implemented explicitly or implicitly so that both stability and accuracy factors were satisfied. Furthermore, available experimental data were used to test the newly developed cotransport model. The model was shown to simulate quite accurately the available experimental data.