VP59: "Transport of human adenoviruses in water saturated laboratory columns"

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Groundwater may be contaminated with infective human enteric viruses from human and animal sewage through wastewater discharges, sanitary landfills, septic tanks, and agricultural practices or by artificial groundwater recharge. Coliphages (e.g. MS2 and ΦX174) have been widely used under well-controlled environmental conditions as valuable models or surrogates for enteric viruses because they share many fundamental properties and features such as structure, composition, morphology and size. Although a large number of studies focusing on various factors (i.e. pore water solution chemistry, fluid velocity, moisture content, temperature and grain size) that affect biocolloid (bacteria, viruses) transport have been published over the past two decades, little attention has been shown toward human adenoviruses (hAdVs). The main objective of this study was to evaluate the effect of pore water velocity on hAdVs transport in water saturated laboratory-scale columns packed with clean glass beads. Glass beads were used for the packing of the columns in order to eliminate possible experimental difficulties associated with real soil, which may provide numerous uncertainties that can considerably complicate the analysis of the experimental data. All flow-through experiments were conducted using a 30 cm long glass column with 2.5 cm diameter, which was packed with 2 mm diameter glass beads. The porosity of the glass beads column was determined by standard gravimetric procedures. Prior to each experiment, the packed column was equilibrated by pumping 10 pore volumes of the background solution through the column at a constant volumetric discharge rate of Q=2.5, and 1.5 mL/min, corresponding to specific discharge or approach velocities of q=0.51, and 0.31 cm/min and pore water velocities of $U=q/\theta=1.21$ and 0.75 cm/min, respectively. A suspension of each hAdV of the same background

solution was pumped for 3 pore volumes at the same Q followed by 3 pore volumes of hAdV-free solution. All experiments were carried out at room temperature (~25 ∘C). No obvious relationships between mass recoveries of the hAdVs, calculated based on hAdV concentration in the effluent and water velocity could be established from the experimental results. The collision efficiencies were quantified using the classical colloid filtration theory. No significant effect of U on the collision efficiency was observed.