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# Evaluating Rotavirus and Norovirus transport processes in standardised and natural soil-water columns experiments

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In Uruguay, as in many developed and developing countries, rotavirus and norovirus are major causes of diarrhea and others symptoms of acute gastroenteritis. In some areas of Uruguay, groundwater is the only source of water for human consumption. In the rural area of the Salto district, virus contamination has been detected in several groundwater wells. Because sewer coverage is low, the most probable sources of contamination are nearby septic systems.

This work aims to evaluate the transport of rotavirus and norovirus from clinic samples in two sets of column experiments under saturated conditions: 6.7-cm columns with quartz sand (ionic strength 1mM, pH 7.0) and with sand from the Salto aquifer (Uruguay) (9,2% coarse sand, 47,8% medium sand, 40,5% fine sand, magnesium/calcium bicarbonate water, Ionic strength 15.1 mM, pH 7.2). Both viruses were seeded for 2 pore volumes onto the columns. Samples were collected at the column outlet and viruses were enumerated by Q-PRCR. Breakthrough curves were constructed and fitted to a two-site kinetic attachment/detachment model, including blocking using Hydrus-1D.

In the quartz sand column, both rotavirus and norovirus were removed two orders in magnitude. In the Salto sand column, rotavirus was removed 2 log10 as well, but norovirus was removed 4 log10. The fitting of the breakthrough curves indicated that blocking played a role for rotavirus in the Salto sand column.

These results are consistent with the field observation where only rotavirus was detected in the Salto aquifer, while similar concentrations in Salto sewer effluent were measured for both viruses.

This work, besides reporting actual parameters values for human virus transport modelling, shows the significant differences in transport that human viruses can have in standardised and natural soil-water systems.