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Removal of biocolloids suspended in reclaimed wastewater by injection in a fractured aquifer model

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Two pilot-scale fractured aquifer models (FAMs) consisting of horizontal limestone slabs were employed to investigate the removal of biocolloids suspended in reclaimed wastewater. To better understand the behavior of real fractured aquifers, these FAMs intentionally were not "clean." The fracture apertures were randomly spread with soil deposits and both FAMs were pre-flooded with reclaimed wastewater to simulate the field conditions of the Nardò fractured aquifer in the Salento area, Italy, where fractures are not clean due to artificial groundwater recharge. One of the FAMs was injected with secondary effluent from a wastewater treatment plant collected prior to the chlorination step, and the other with exactly the same effluent, which was further treated in a commercial membrane reactor. Consequently, the organic and pathogen concentrations were considerably higher in the secondary effluent than in the membrane reactor effluent. Injected wastewater was continuously recirculated. Pathogen removal was greater for the secondary wastewater than the cleaner membrane reactor effluent. A simple mathematical model was developed to describe fracture clogging. The results suggest that the hydraulic conductivity of FAMs can be significantly degraded due to retention of viable and inactivated biocolloids suspended in reclaimed wastewater.