Geophysical Research Abstracts
Vol. 20, EGU2018-4086, 2018
EGU General Assembly 2018


# Effects of Organic Compounds and Monovalent and Divalent Salt Solutions on the Transport and Retention of Toxoplasma gondii in Saturated Sandy Porous Media

Christian Pullano (1), Tim Mutty (1), Coralie L'Ollivier (2,3), Jitender Dubey (4), Aurélien Dumetre (2), and Christophe Darnault (1)

(1) Clemson University, Department of Environmental Engineering and Earth Sciences, Laboratory of Hydrogeoscience and Biological Engineering, L.G. Rich Environmental Laboratory, 342 Computer Court, Anderson, SC 29625, United States (cdarnau@clemson.edu), (2) Aix-Marseille University, UMR MD3 IP-TPT, Marseille, France, (3) AP-HM, Parasitology Laboratory, Timone Hospital, Marseille, France, (4) United States Department of Agriculture, Agricultural Research Service, Animal Parasitic Diseases Laboratory, Beltsville Agricultural Research Center, Building 1001, Beltsville, MD, 20705, United States

Toxoplasma gondii is a pathogenic microorganism that is currently a threat to public health. Understanding the fate and transport of T. gondii through the soil and groundwater is vital in determining the risk it poses to water resources and human health. The physico-chemical interactions between the groundwater and the biocolloid within an aquifer will dictate its mobility and its ability to infect humans. This research examines how various naturally occurring groundwater chemistries containing organic compounds and monovalent and divalent salt solutions will alter the fate and transport of T. gondii. Solutions containing various concentrations of humic acid, fulvic acid, sodium chloride, calcium chloride, and magnesium chloride we created to test the transport of T. gondii. These tests were performed in a saturated silica sand column with continuous flow in order to simulate the movement of groundwater through an aquifer. Organic solutions and salt solutions were pumped through the columns followed by a pulse of T. gondii oocysts. The pulse of T. gondii was followed by seven pore volumes of organic and salt solution in order to flush the oocyst through the simulated aquifer. The effluent exiting the columns was collected in tenth of pore volume increments in order to determine the factors associated with the transport of T. gondii. The effluent samples were then processed using qPCR in order to quantify the oocysts present in the solution. Contact angle and surface tension measurements were made in order to establish surface properties of the solutions as they coat the oocysts and aquifer material. A non-reactive bromide tracer test was also performed. Breakthrough curve results from the qPCR analysis were then compared to the non-reactive tracer tests in order to determine the parameters that dictate the transport of T. gondii in saturated porous media. Lastly, a model of the flow and transport experiments was developed in order to simulate the observed breakthrough curves of T. gondii that were generated in the experiments and characterize their mobility, transport, and retention behavior in the subsurface environment.