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Bacterial Interactions and Transport in Unsaturated Porous Media

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Abstract:

The convection-dispersion transport model, which can well define solute transport, has been introduced to describe bacterial transport. Due to different interaction natures within the porous media, bacterial transport in the subsurface, especially in the vadose zone is a complex scenario. When transported in the vadose zone, bacteria may be captured on the media surface, at the air-water interface, or at the media-air-water three-phase interface depending upon the predominant interactions of concerned bacteria within the pore system. In this study, transport of *E. coli*, *Pseudomonas fluorescens* and *Bacillus subtilis* in silica sand under water unsaturated conditions was investigated using column experiments. Bacterial interactions within the system were characterized based on bacterial and media surface thermodynamic properties, which were determined independently by means of contact angle measurements. These calculated interactions provided solid evidence of the bacterial retention mechanisms in the pore system, which served as the bases for suitable assumptions of bacterial transport modeling. The micro-scale interaction investigations helped eliminate uncertainties arising with bacterial transport modeling.

Impact Statement:

Two graduate students have been working on this projects. Part of the results has been presented at the 60th Annual Meeting of Southeastern Branch of American Society of Microbiology (Auburn, November, 2007) and 2008 USDA-CSREES National Water Conference (Nevada, February, 2008). Based on the discovery from this project, two papers have been published. We are collaborating with Dr. Bin Gao and Dr. Lena Ma at University of Florida on related topics. This project also led to a funded grant from Kinkley Center for Solid and Hazardous Waste Management. Most importantly, topics of this project have been incorporated into undergraduate teaching.

Category: Other Water Resource Topics
Type of Presentation: Oral Presentation