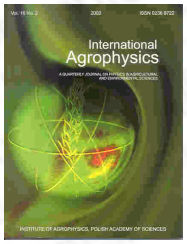


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# Limited entrapment model to simulate the breakthrough of *Arthrobacter* and *Aquaspirillum* in soil columns

(get PDF)

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abstract Bacterial transport through soils is attracting more attention because soil serves as an environmental bacterial filter, thereby reducing microbial contamination of ground water. We conducted a series of transport experiments, using Aquaspirillum and Arthrobacter, with the objectives of developing an adequate model to simulate bacterial transport and to improve our understanding of the mechanisms controlling bacteria transport through soils. Disturbed samples from an Alfisol topsoil and subsoil were used to fill 15 cm long soil columns. A pulse of bacterial suspension (initial concentration of 1011 cells ml-1) was applied to the top of each soil column followed by the application of sterile water. Bacteria were counted in effluent portions and in soil using microscopy. Large variations were observed in the shape of breakthrough curves; effluent bacterial concentrations were occasionally larger than influent concentrations. We developed the 'limited entrapment model' to simulate the observed bacterial transport. The model assumes that (a) the capacity of soil pore space to trap bacteria is limited, (b) the bacteria entrapment rate depends on the amount of trapped bacteria and that the entrapment accelerates as the amount of trapped bacteria approaches the soil trapping capacity, and (c) the trapped bacteria form cell clusters that may be released back to the soil solution but travel slowly and may become re-trapped because of their size. The new model provided a satisfactory fit to data and underscored the importance of cell cluster formation for bacterial transport through soil.

keywords limited entrapment model, simulation, bacterial transport, soil columns