When wastewater infiltrates into the soil, groundwater may be contaminated. If the distance from source of pollution to point of groundwater abstraction is small, there is a real chance of abstracting pathogenic microorganisms.

In this research, the transport of *Escherichia coli* in aquifers under saturated conditions is studied. This organism was chosen, because *E. coli* is an important representative of the group of fecal indicator organisms. The research builds on the well known colloid filtration theory, and aims at extending this theory by incorporating straining, geochemical heterogeneity, variable deposition rate coefficients as a result of population heterogeneity, and preferential flow mechanisms. The case of Sana’a, the capital of Yemen, served to evaluate the importance of bacteria transport processes in a field situation.

Laboratory experiments with saturated columns, die-off experiments, and experiments aimed at characterizing microorganisms were conducted, as well as extensive fieldwork programs in the Sana’a area to collect data on water balance components, microbiology, and hydrochemistry, including physical and geochemical parameters of the sediments underlying Sana’a.

This book offers new insights to biocolloidal retention processes, including quantitative approaches, and is intended for professionals and scientists in the water sciences concerned with microbiological contamination of aquifers.