

Effects of pH and organic matter content on the sorption behaviors of sulfamethoxazole in two different vadose soils

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Sulfamethoxazole belonging to sulfonamide class of antibiotics is a widely used veterinary medicine that has high potential to enter the vadose zone and groundwater environment, especially the soil compartment by the application of manure on agricultural land and grass land or by the deposition of dung pats on pasture. Once it reaches the vadose zone, it may enter into surface and ground water.

Natural silt loam and sandy loam in the vadose zone, which is widely distributed in China, is regarded as the natural barrier of preventing and controlling contaminant transportation. The interception capacity of natural silt loam and sandy loam to Sulfamethoxazole is really to be expected. Ascertaining sorption characteristics is the key to evaluate and control potential pollution of Sulfamethoxazole to groundwater.

We performed this study to investigate the influences of soil pH and soil organic matter content on the sorption behaviors of sulfamethoxazole in two different vadose soil types (silt loam and sandy loam) in northern China. We evaluated both the Langmuir and Freundlich sorption isotherms and found that the Freundlich sorption isotherm fit the data better than did the Langmuir sorption isotherm because the coefficient of Freundlich sorption isotherm (> 0.8) was considerably greater than those of the Langmuir sorption isotherm. The sorption capacities of sulfamethoxazole increased with decreasing soil pH and increasing soil organic matter content. The sorption capacities of the sulfamethoxazole in silt loam soil were greater than those in sandy loam soil. Furthermore, our results indicated that sulfathiazole was highly mobile in soils and could therefore be rapidly transported to field drains and ultimately entered surface waters. Together, our results indicated that the sorption of sulfamethoxazole by soil was influenced by environmental factors such as soil pH, soil organic matter content.