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# Transformation and sorption of the veterinary antibiotic sulfadiazine in two soils: a short-term batch study

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The worldwide use of veterinary antibiotics poses a continuous threat to the environment. There is, however, a lack of mechanistic studies on sorption and transformation processes for environmental assessment in soils. Two-weeks batch sorption experiments were performed with the antibiotic sulfadiazine (SDZ) in the plow layer and the subsoil of a loamy sand and a silty loam. The sorption and transformation parameters of SDZ and its main transformation products N1-2-(4-hydroxypyrimidinyl) benzenesulfanilamide (4-OH-SDZ) and 4-(2-iminopyrimidin-1(2H)-yl)-aniline (An-SDZ) were estimated using a global optimization algorithm. A two-stage, one-rate kinetic sorption model combined with a first-order transformation model adequately described the batch data. Sorption of SDZ was nonlinear (Freundlich), time-dependent, and affected by pH (speciation), with a higher sorption capacity for the loamy sand. Transformation of SDZ into 4-OH-SDZ occurred only in the liquid phase, with half-life values of about 1 month in the plow layers and about 6 months in the subsoils. Both the faster transformation rate in the plow layer compared to the subsoil and negligible transformation in the solid phase point to a microbial process for the formation of 4-OH-SDZ. Under the exclusion of light, An-SDZ was formed in substantial amounts in the silty loam only, with liquid phase half-life values of about 2 to 3 weeks. Despite the rather large parameter uncertainties, which may be reduced after the inclusion of additional information obtained from sequential solid phase extraction, the proposed method allows us to quantify and predict the fate of antibiotics in soils.