Given the foundational role that microbes play in natural ecosystems, there has been tremendous recent interest in the potential microbial toxicity of engineered nanoparticles. Most of this research considers bactericidal effects of nanoparticles on planktonic bacteria suspensions in defined growth media. There is evidence that the antimicrobial effect of certain engineered nanoparticles is greatly attenuated in more complex environments, particularly in bacterial biofilms or bacterial communities in aquifer solids. Two cases in point will be the effect of nanoscale zero valent iron on the diversity and overall abundance of bacteria in aquifer solids microcosms and the effect of silver nanoparticles on viability observed in vitro using model single-species bacterial biofilms. In both cases, nanoparticle suspensions that are highly toxic to planktonic bacteria have only a modest effect on bacteria in the more complex environments. Natural organic matter interactions with nanoparticles and/or dissolved metals released from the nanoparticles may play an important role in moderating toxicity in more complex environments that approximate natural ecosystems. Aspects of bacterial interactions with engineered nanoparticles observed in vitro that may influence their environmental fate and transport will be considered, including biological degradation of nanoparticle stabilizers and nanoparticle aggregation in the presence of biofilms and mucilage.

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