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Widespread Attenuation of Antibiotics by Soil Bacteria Promotes Intermixed Microbial Diversity KALIN VETSIGIN, UW Madison, ERIC KELSIC, JEFFREY ZHAO, ROY KISHONY, Harvard — In natural soil environments, antibiotic sensitive bacteria coexist with antibiotic producers, even in close proximities. Efforts to understand diversity in microbial communities have focused on pairwise interactions between species, yet mathematical models of such interactions lead to distinct spatial domains of individual species, rather than to intermixed multi-species communities. In this work, we measured interactions between triplets of species and asked and how the presence of these higher-order interactions affects community structure and diversity. We developed a 3-species diffusion-based assay in which a modulator species either intensifies or attenuates the toxicity of compounds made by a producer species against a fluorescently labeled indicator species. We found that intensifying interactions were quite rare among soil bacteria, while attenuating interactions that protected nearby sensitive species from the antibiotic producer were abundant. Furthermore, many soil bacteria attenuated multiple classes of antibiotics with widely varying mechanisms of action. Computer simulations showed that such cross-species protection, when abundant, promoted the spontaneous formation and expansion of intermixed multi-species communities that overtook or assimilated single species domains. These findings suggest that drug attenuation is a widespread phenomenon that can be key to the coexistence of antibiotic producing and sensitive microbes in close proximity and thereby to the overall species diversity within soil microenvironments.

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