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病原菌在红壤胶体上的吸附机制研究

Mechanisms of Bacterial Pathogens Adsorption on Red Soil Colloids

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中文摘要:

研究了pH和KCl离子强度对猪链球菌和大肠杆菌在红壤胶体表面吸附的影响，结合表面物化性质和Derjaguin-Landau-Verwey-Overbeek（DLVO）理论分析互作机制。结果表明，细菌在红壤胶体表面的吸附等温线能较好拟合Freundlich方程（ R^2> 0.97），猪链球菌在红壤胶体表面吸附的分配系数（K_f）是大肠杆菌的4.5倍~6.1倍，细菌在去有机质胶体表面吸附的K_f值为含有机质胶体的2.4倍~3.2倍。比表面积越大或zeta电位绝对值越小，细菌吸附能力越强，吸附态细菌位于距红壤胶体表面90~100 nm处的次级小能位置。随着体系pH降低（9.0~4.0）或离子强度增大（1~10 mmol L^{-1}），细菌与红壤胶体互作能障降低，细菌吸附量增大，吸附机制符合DLVO理论；而在高离子强度下（50~100 mmol L^{-1}），猪链球菌吸附量降低了3.4%~5.6%，表明除DLVO作用力外，非DLVO作用力如空间位阻排斥和疏水作用对吸附也有贡献。

Abstract:

Effects of soil pH and ionic strength (KCl) on adsorption of *Streptococcus suis* and *Escherichia coli* on Red soil colloids were stud and mechanisms of their interactions analyzed from the aspects of surface physicochemical properties of the bacteria and soil colloids Derjaguin-Landau-Verwey-Overbeek (DLVO) theory. Results show that the adsorption isotherms of bacteria on Red soil colloids fitte well to the Freundlich equation (R^2> 0.97). The partition coefficients (K_f) of *S. suis* adsorption on soil colloids were 4.5~6.1 times as as those of *E. coli*. The K_f values of organic-matter-depleted colloids were 2.4~3.2 times as high as those of organic-matter-containi colloids. The bigger the specific surface areas or the lower the absolute zeta potential values, the higher the bacteria adsorption capa and the adsorbed bacteria were found at the secondary minimum, 90~100 nm apart from the colloids surface. With decreasing soluti pH (9.0~4.0) or increasing IS (1~10 mmol L^{-1}), the interaction energy barrier between the Red soil colloids and the bacteria decrease and as a result more and more bacteria got adsorbed. This trend was in full agreement with the DLVO theory. The adsorption of *S. s* on colloids decreased by 3.4%~5.6% under high IS (50~100 mmol L^{-1}), which, besides the DLVO effect, was also ascribed to some DLVO effects, like steric repulsion and hydrophobic interaction.

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