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Dissemination of antibiotic resistance genes and resistant bacteria in a small rural watershed in relation to pedology, land use, and hydrological functioning

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The multidisciplinary BACTRESIST project aimed to assess the specific nature of rural basins in terms of antibiotic resistance prevalence and dissemination (greater diversity of land use and occupation, but also of human activities and therefore a greater mix of diffuse and point sources), in comparison with highly urbanized basins (mainly point sources). Innovative results, particularly in relation to the rural context and specific climate, were obtained and are reported here. In particular, they highlight the validation of the interdisciplinary and transferable approach that we have implemented and optimized thanks to valuable feedback from the various partners and farmers and veterinary interviews. The results obtained in both water and soil show the systematic presence of resistance genes at all monitored sites, with concentrations varying according to the sites and gene markers analyzed. For example, certain genes such as sul genes are detected at all sites in the watershed, while blaCTX-M is never detected. Surface waters are clearly affected by domestic discharges (livestock farms and sites downstream of the wastewater treatment plant, campsite, and Villeneuve de Berg Hospital), particularly during low water periods. The detection of ARG is therefore very often linked to high geochemical concentrations (electrical conductivity, major ions, trace elements, etc.), which are themselves specific to certain sites and activities, in particular intensive livestock farming (pigs, goats, cattle, etc.), camping, and domestic or hospital wastewater treatment. A more in-depth analysis of all the results obtained to date in the BactResist project will be presented with special focus on the dynamics of antibiotic resistance during flooding periods.