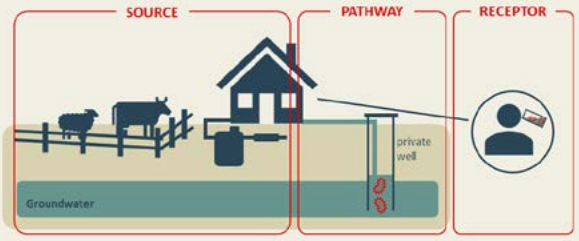

epa Research

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DESIGN – Detection of Environmental Sources of Infectious Disease in Groundwater Networks

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Identifying pressures

Infectious diseases associated with environmental change pose a significant challenge for public health, as their sources and transmission are frequently sporadic and associated mechanisms are not well understood. Ireland currently has the highest incidence of verotoxigenic *Escherichia coli* (VTEC) infection in the EU, with domestic private wells identified as a likely source of infection. Ireland also has a high incidence of the waterborne disease *cryptosporidiosis*; however, the role of groundwater in its transmission is unknown. This research provides the first quantitative assessment of VTEC and Cryptosporidium in domestic groundwater supplies in Ireland, identifying key risk factors associated with occurrence and providing recommendations to reduce the disease burden

Informing policy

This research project identified key challenges and recommendations related to waterborne disease exposure and transmission via domestic water wells, including immediate measures that could reduce the disease burden associated with these supplies. The Detection of Environmental Sources of Infectious Disease in Groundwater Networks (DESIGN) project will inform the development and implementation of policies such as the Healthy Ireland framework and the EU Drinking Water Directive by improving our understanding of pathogen sources, pathways and environmental fate in groundwater systems in Ireland. Moreover, the DESIGN project is facilitating the development of bespoke, spatio-temporal groundwater management policies, offering invaluable guidance for future planning and the remediation and mitigation of the microbiological contamination of Ireland's private water wells.

Developing solutions

Overall, the DESIGN project provided further insight into the prevalence, source and transport of VTEC and *Cryptosporidium* in groundwater supplies in Ireland. The research demonstrated a significantly higher burden of VTEC in (sampled) national groundwater resources than the global average. Moreover, a VTEC to generic E. coli ratio of 40% was calculated, which can be utilised by water service professionals, clinicians and hydrologists to estimate future risk and reduce the national disease burden. In this study, VTEC presence was significantly associated with decreasing well depth and increasing 30-day mean antecedent rainfall. The findings suggest a high risk of VTEC in *E. coli*-contaminated groundwater sources in Ireland, with multiple clinically relevant serogroups often present in heavily contaminated sources. Through geo-specific risk assessment of the heterogeneous nature of both aquifers and pathogen sources, areas of low, medium and high risk were identified. This will allow for spatio-temporal management strategies to be implemented in the context of changes in land use, climate and public infrastructure.

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