



Conference Abstract

Quantitative microbial risk assessment as a tool for groundwater monitoring. A case study in the rural communities of Romania

Zamfira Stupar[‡], Erika Levei[‡], Emilia Neag[‡], Oana Teodora Moldovan^{§,I}

[‡] INCDO-INOE 2000, Research Institute for Analytical Instrumentation, Cluj-Napoca, Romania

[§] Emil Racovitza Institute of Speleology, Cluj-Napoca, Romania

^I Romanian Institute of Science and Technology, Cluj-Napoca, Romania

Corresponding author: Zamfira Stupar (zamfira.dinca@icia.ro), Emilia Neag (emilia.neag@icia.ro)

Received: 30 Jun 2022 | Published: 14 Jul 2022

Citation: Stupar Z, Levei E, Neag E, Moldovan OT (2022) Quantitative microbial risk assessment as a tool for groundwater monitoring. A case study in the rural communities of Romania. ARPHA Conference Abstracts 5: e89699. <https://doi.org/10.3897/aca.5.e89699>

Abstract

Karst springs are an essential source of drinking water in rural communities in North-Western Romania. Due to the fractured dolomite aquifers, dolines, or blind valleys, these springs are vulnerable to contamination by human and zoonotic pathogens. In this study, we assessed the human health risk associated with the contamination of six springs' water with gastrointestinal pathogens. The data on the occurrence of *E. coli* and estimated *Campylobacter* and *Rotavirus* for a year of monitoring from twenty-four samples were inputted into a Quantitative Microbial Risk Assessment (QMRA) model (Machdar et al. 2013). The QMRA was conducted following steps: hazard identification, dose-response assessment, exposure assessment, and risk characterization (Haas C N et al. 2014; World Health Organization 2016). In order to predict the total cases of illnesses for the spring water consumers, the probability of infection and illness was calculated for adults and children. Results have shown that the estimated probability of infection for enteropathogenic *E. coli*, *Campylobacter*, and *Rotavirus* ranged between 1.1×10^{-3} and 1.0×10^0 , values much higher than the acceptable limit of 10^{-4} infections/person/year established by WHO (2016). The estimated probability of illness due to the pathogenic *E. coli* and *Campylobacter* infection was high, with values between 8.8×10^{-2} and 3.5×10^{-1} for five out of six groundwater sources. The estimated probability of illness due to the

Rotavirus infection ranged between 4.0×10^{-4} and 6.4×10^{-2} for both adults and children. The finding suggests that consuming contaminated spring water could lead to severe acute, chronic, or sometimes fatal health consequences for the locals. This study provides valuable QMRA information on the contaminated karst groundwater, with important implications for human health and groundwater resources management.

Keywords

karst springs, Quantitative Microbial Risk Assessment (QMRA), *E. coli*, *Campylobacter*, *Rotavirus*, rural communities, drinking water

Presenting author

Zamfira Stupar

Presented at

25th International Conference on Subterranean Biology (Cluj-Napoca, 18-22 July 2022)

Funding program

EEA Financial Mechanism 2014–2021 and

Core Research Programme 2020-2024

Grant title

Project GROUNDWATERISK “Monitoring and risk assessment for groundwater sources in rural communities of Romania (project number EEA-RO-NO-2018-0138 contract No. 4/2019)

Project “Research in optoelectronics and related fields regarding the creation and dissemination of new knowledge, technologies, infrastructures for the promotion of open science and contributions to solve the global challenges” (project number PN 19-18.01.01 contract No. 18N/08.02.2019)

Conflicts of interest

None declared.

References

- Haas C N, Rose J B, Gerba C P (2014) Quantitative microbial risk assessment. John Wiley & Sons
- Machdar E, van der Steen NP, Raschid-Sally L, Lens PN (2013) Application of Quantitative Microbial Risk Assessment to analyze the public health risk from poor drinking water quality in a low income area in Accra, Ghana. Science of The Total Environment 449: 134-142. <https://doi.org/10.1016/j.scitotenv.2013.01.048>
- World Health Organization (2016) Quantitative microbial risk assessment: application for water safety management. Available on-line: <https://apps.who.int/iris/handle/10665/246195>.