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Presence of antibiotic resistant bacteria in drinking water sources from Accra, Ghana: a need for additional water treatment

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e-mail: hawaahmed@csir.org.gh

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Water is vital for the survival of humans, animals and plants

Key messages

- In Ghana, antimicrobial resistance (AMR) surveillance is focused on people at the clinical level, with few reports from the environment or drinking water sources.
- This preliminary study assessed the presence of antibiotic resistant bacteria in drinking water sources from the Greater Accra region, and showed that 58% of the *Escherichia coli* and 4.5% of the *Pseudomonas aeruginosa* isolates from contaminated water samples were resistant to three or more antibiotic classes.
- Residents using these contaminated water sources for human and animal consumption as well as for irrigation are at risk of getting infections that are difficult to treat or have a high risk of treatment failure.
- These findings call for immediate action to inform residents about the urgency of treating their drinking water, for further research throughout Ghana, and to implement water surveillance in order to bridge the gap in knowledge and mitigate risks to reverse the growing trend of AMR.

What is the problem and why is it important?

According to a 2018 national survey, about 80% of the population in Ghana do not have access to safely-managed drinking water. About 50% of water tested at the household level in the Greater Accra Region contained *E. coli.*

Current AMR surveillance of bacteria in Ghana focuses on clinical isolates with very few documented reports from environmental or drinking water sources. This leaves a knowledge gap.

To better understand the extent to which humans, animals and the environment are exposed and infected with antibiotic resistant bacteria, the Council for Scientific and Industrial Research-Water Research Institute, assessed for the first time both bacterial contamination and the antibiotic resistant profiles of *E. coli* and *P. aeruginosa* in drinking water samples from the Greater Accra Region.

How did we measure it?

In a cross-sectional study over a four-month period (December 2021 to March 2022), we analysed a total of 524 drinking water samples. Samples included sachet, bottled, borehole, well and tap water from the Greater Accra Region routinely submitted for analysis by both water companies and individuals. We tested bacterial isolates recovered from these samples against different classes of antibiotics. All tests were done using quality-controlled laboratory procedures.

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100% of well water samples were contaminated with *Escherichia coli*

What did we find?

- About 50% of tap and borehole water samples and 100% of well water samples were contaminated with *E. coli.*
- Regardless of source (tap, borehole and well water), *E. coli* isolates were most resistant to cefuroxime (88.7%), trimethoprim–sulfamethoxazole (62.6%) and amoxicillin–clavulanate (52.2%), while *P. aeruginosa* isolates were most resistant to aztreonam (48%).
- 58% of the *E. coli* and 4.5% of the *P. aeruginosa* isolates from contaminated water samples were also multidrug resistant (resistant to three or more antibiotic classes).

Implications

- The presence of antibiotic resistant *E. coli* and *P. aeruginosa* in borehole, well and tap water implies that there is contamination in the water-distribution lines and seepage of inadequately treated sewage into groundwater.
- Residents using water from these contaminated sources are therefore at risk of getting infections that are difficult to treat or have a high risk of treatment failure.
- Additionally, using these contaminated water sources for animal husbandry or irrigation of crops further promotes the spread of AMR bacteria in the environment and the foodchain.

Recommendations

The AMR committee, WHO, Ministry of Water Resources and Sanitation, the Community Water and Sanitation Agency and CSIR-Water Research Institute should jointly:

- *organise* awareness programs to alert residents about the need for additional water-treatment methods such as boiling water before drinking as an immediate control measure;
- *inform* health care workers about the risk that patients can present with multi-drug resistant bacterial infections;
- *expand* environmental AMR surveillance to include drinking water sources in the national AMR action plan;
- *conduct* and/or commission further research that a) investigates a larger geographical area and over a longer period of time, b) identifies sources of contamination, c) assesses AMR risk and transmission levels.