Factsheet

One Water-One Health: Building sustainable cities and combatting the superbug threat

Wastewater treatment plants are superbug hotspots, but they could also be some of our greatest weapons against the spread of antimicrobial resistance. Unlocking this potential is exciting, smart, could save millions of lives and help protect the health of every Australian.

An inevitable consequence of using antimicrobials to treat and prevent infectious disease in humans and animals is that pharmaceutical residues and antibiotic resistant microorganisms are present in human and animal wastes. They become part of the combined wastewater entering wastewater treatment plants (WWTPs), where a range of other contaminants such as metals and biocides also incidentally provide selection pressure for antimicrobial resistance (AMR). As a result, WWTPs are now recognised as AMR reservoirs and evolutionary hotspots.

This also makes wastewater one of the frontlines in the battle against superbugs. Defined as strains of bacteria, viruses, parasites and fungi resistant to most medications used to treat the infections they cause, the emerging threat of superbugs is a global health emergency. Without concerted action to mitigate the development and spread of AMR between humans, animals, and environments, resistant infections are predicted to kill 10 million people annually by 2050..

Wastewater data to arm public health professionals with new tool

In the same way as wastewater monitoring is being used to inform the public health response to the COVID-19 pandemic, wastewater-based AMR surveillance could be used in the future to help track and respond to the ongoing development and spread of AMR.

Wastewater has already been used to monitor other aspects of public health, such as illicit drug use and virus prevalence. Its application to AMR could be transformative: providing early warning of emerging outbreaks and changing AMR risk profiles in specific communities.

Because bacteria evolve, AMR can be unique to a specific community or location. Ongoing surveillance is thus a critical component of the national AMR action plan. Deploying wastewater-based epidemiology to understand the overall health of a community or population and the presence/prevalence of critical resistance genes and superbugs can provide vital information for healthcare professionals.

Optimising wastewater treatment plants to remove AMR from recycled water

Antimicrobial-resistant bacteria persist in wastewater and AMR genes are present even after tertiary wastewater treatment. This is an issue for utilities seeking to mitigate downstream impacts, and particularly in light of increasing drivers to increase wastewater reuse and recycling.

The opportunities to use recycled water in agriculture or for climate-independent drinking-water supply are key planning considerations as we look to a future of sustainable cities. If we optimise treatment trains to mitigate AMR, WWTPs can act as critical control points and play a vital role in the fight against superbugs whilst also supporting progress towards a circular economy.

CRC SAAFE

The Cooperative Research Centre for Solving Antimicrobial Resistance in Agribusiness, Food, and Environments (CRC SAAFE) will lead Australian Industry through the AMR challenge via a One Health approach. Through focused collaboration between industry and researchers, CRC SAAFE will coordinate the AMR response for the Australian agribusiness, food, and environmental sectors, providing the tools and knowledge to proactively monitor, manage and mitigate the spread of AMR. In so doing, CRC SAAFE will protect human and animal health, food security, and economic prosperity, and maintain our nation's reputation as a producer with low AMR risk. Through successful AMR management, CRC SAAFE presents a significant opportunity for Australia to consolidate its market access advantage for premium quality produce, and to secure the future growth of Australian agriculture.

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To find out more about how you can become part of the solution please contact:

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