COVID-19 Impacts on

Environment (e.g., water, soil) and Sanitation:

Addressing antimicrobials and antimicrobial-resistant threats in the environment

Antimicrobial resistance is a One Health issue, impacting the health of humans, animals, plants, and the environment. Efforts to identify antimicrobial-resistant germs, track the spread of resistance, and measure the effect of antibiotic or antifungal use require a One Health approach to surveillance.

While more research is needed to better understand how resistance develops and spreads in the environment, we do know that people can contaminate it through fecal waste. In 2018, CDC funded the University of South Carolina (U of SC) to measure resistance genes in wastewater and in treatment plant workers at municipal wastewater treatment plants.[15]

When the pandemic started, CDC recognized that the research platform to look for resistance in wastewater could also look for SARS-CoV-2 RNA (which carries genetic information) as a marker of COVID-19 in communities. Through supplementary funding to support the COVID-19 response, CDC and U of SC built upon the initial surveillance project. This work confirmed appropriateness of existing safety precautions and informed guidance drafted by partners.

CDC is looking at ways to expand surveillance through existing systems to monitor antimicrobial resistance from multiple sources across One Health. CDC is also helping to strengthen the national infrastructure for antimicrobial resistance surveillance data by improving capacity, utility, timeliness, and the use of harmonized terminology.

Exploring New Public Health Tools to Slow Resistance

Community level wastewater surveillance can help public health detect antimicrobial resistance, including new threats, before they are detected in clinical samples.[16] Wastewater from healthcare facilities could also be a key source of resistant germs, resistant genes, and antibiotic or antifungal residues. Hospital patients can have some of the most resistant infections and are commonly prescribed antibiotics or antifungals.

Monitoring healthcare facility wastewater could provide a non-invasive approach to identifying resistance in a facility and aid in decision making, like performing screening to identify cases early and implement appropriate interventions to prevent spread. Researchers could look for genes that confer resistance, especially to last-line drugs like carbapenems and colistin, to identify resistance that might be present but not yet detected in the healthcare setting.

In 2020, researchers leveraged an existing project funded by CDC's AR Solutions Initiative focused on antimicrobial resistance to better understand the burden of COVID-19 in communities—using wastewater, also called sewage.

5 Benefits of Wastewater Surveillance for Antimicrobial Resistance[17]

1. **Captures silently spreading germs.** People infected with antimicrobial-resistant germs will shed these germs in their stool or wash water, whether they have symptoms or not.
2. **Operates independent of healthcare and clinical capacity.** Antimicrobial-resistant pathogens that are causing illness are still detected even if a person does not go to a healthcare professional or have access to testing.
3. **Is efficient.** One sample of wastewater can represent millions of people in a large wastewater system.
4. **Moves fast—from toilet to data in a week or less.** This allows more time to prepare a public health response compared to clinical data.
5. **Provides an early warning system.** Potentially less costly and more effective as an early warning alert system for emerging threats compared to clinical surveillance. This makes it a suitable option to provide a broad snapshot, especially for places with limited existing surveillance and resources.

AR Pathogens Cause Infections Across the One Health Spectrum

In September 2020, CDC established the National Wastewater Surveillance System (NWSS) to provide community-level data on COVID-19 infection trends by looking for markers in wastewater that tell scientists when SARS-CoV-2 is present.[18] CDC currently funds 43 public health jurisdictions to support wastewater activities across 37 states, 4 cities, and 2 territories. By May 2022, NWSS had received data from more than 59,000 wastewater samples from more than 900 sites nationwide.

The United States has been building a solid foundation for public health preparedness to address antimicrobial resistance. The CARB National Action Plan includes a One Health approach, with an expanded effort to understand antimicrobial resistance in the environment. A main challenge to implementing a One Health approach includes the need to better understand the scale and risk to human health associated with antimicrobial resistance in the environment. In addition to efforts related to wastewater surveillance, CDC is also supporting other environmental projects to better understand how antibiotics, antifungals, and antimicrobial-resistant pathogens can spread in water and soil.

Antimicrobial resistance is a One Health issue, impacting humans, animals, plants, and the environment.

What's Next: CDC is exploring investments in the U.S. public health infrastructure to better respond to the challenges of antimicrobial resistance and emerging threats simultaneously.

- Expanding the capacity of NWSS to collect antimicrobial resistance data from wastewater treatment plants and healthcare facilities to continue infectious disease surveillance.
- Studying antimicrobial resistance in community and healthcare wastewater, domestically and globally.
- Expanding global capacities to fight antimicrobial resistance in the environment, as part of the CARB National Action Plan.
- Mapping existing antimicrobial resistance ecology across One Health and monitoring shifts over time, as part of the CARB National Action Plan.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Learn more: www.cdc.gov/drugresistance/covid19.html