Innovating to Slow the Spread:
CDC Combats Antimicrobial Resistance

Each year in the United States, **more than 3 million people** are infected by an antimicrobial-resistant germ or *Clostridioides difficile* (sometimes called *C. diff*, a germ associated with antibiotic use), and **nearly 50,000 people die** as a result. Since 2016, CDC has invested in research and innovation to drive aggressive action and empower the United States to comprehensively respond to antimicrobial resistance (AR). While some investments focus on a specific AR threat, most of these investments are cross-cutting, building broad capacity that can be applied to combat AR as well as other infectious disease threats. CDC continuously works to address AR threats and **invests in critical innovation to address gaps across health care, the community, and the environment.**

Investing in Innovation, 2016-2024

$35M	**20%**	**200+**
CDC invested roughly **$35 million** a year of annual appropriations in new ways to stop AR threats.	Nearly **20%** of all appropriated dollars for CDC's AR Solutions Initiative supported public health innovations.	CDC has supported **200+** public and private institutions to find scalable, innovative solutions to protect Americans from AR.

Leveraging CDC'S Innovative Programs for Impact

CDC leverages various programs to invest in innovative solutions to address AR research gaps across health care, the community, and the environment.

» **CDC's Prevention Epicenters Program** works with 11 leading academic medical institutions and networks to conduct innovative research focused on preventing healthcare-associated infections (HAIs), other healthcare-associated adverse events, and the emergence and spread of AR, and translate this research into clinical best practices. **https://bit.ly/PreventionEpicenters**

» CDC's **Safety and Healthcare Epidemiology Research Development (SHEPheRD) Program** supports partners researching innovative approaches to prevent HAIs and the emergence and spread of AR across the healthcare spectrum. **https://bit.ly/SHEPheRD**

» Through **Broad Agency Announcements (BAAs)**, CDC supports investigators identifying and implementing innovations to combat antimicrobial-resistant infections and slow the spread of dangerous pathogens (germs). More than $51 million has been awarded through the BAAs for domestic projects to fight AR. **https://bit.ly/BAAs**

» The **Modeling Infectious Diseases in Healthcare Network (MInD - Healthcare)** is a virtual laboratory where researchers investigate factors that drive the spread of HAIs and simulate multiple prevention strategies to estimate their benefits in a timely and cost-effective manner. **https://bit.ly/MInD-Healthcare**

» The **Small Business Innovation Research (SBIR) program** provides "seed funds" for small business concerns (SBCs) to explore their technological potential and the incentive for SBCs to profit from commercialization of their innovations, including diagnostics, data science, and more. **https://bit.ly/SBIR_Program**

Moving the Needle: Innovation to Combat AR

Supporting New AR Treatments and Tests

The Antimicrobial Resistance Isolate Bank (AR Isolate Bank), a collaboration between CDC and FDA, maintains one of the largest collections of isolates gathered from national reference labs and tracking activities, provided at no cost to approved institutions to improve patient care and build solutions against AR threats. For example, the bacteria that cause gonorrhea have developed resistance to nearly all the antibiotics used for treatment. To help researchers develop new drugs to treat drug-resistant gonorrhea, the AR Isolate Bank now includes panels with isolates of drug-resistant *Neisseria gonorrhoeae.*

Advances in Tuberculosis (TB) Treatment and Testing

CDC researchers are testing new therapies for TB that boost the immune system and new drug combinations to fight both drug-susceptible and drug-resistant TB. A 3D model of a TB lesion is being used to test treatments in new research and leading to pathways to help develop better TB drugs.

Evaluating Healthcare Wastewater Surveillance for Emerging AR Threats

CDC's Healthcare-Wastewater Antimicrobial Resistance Network (H-WARN) and academic partners in Utah, Illinois, and Arizona are working together to demonstrate the feasibility of detecting AR in wastewater from healthcare facilities. This work has shown promise for AR detection at the healthcare facility-level and has successfully integrated testing without disrupting routine facility operations.

New Methods for Decolonization

People can carry and spread resistant bacteria and fungi without having an infection, also known as colonization. This can lead to difficult-to-treat infections, especially in those with other health conditions. The CDC Prevention Epicenters are studying whether new methods, like fecal microbiota transplantation, can help reduce resistant germs and prevent infections in various patient groups.

Assessing the Impact of New Pneumococcal Vaccines

Researchers at University of California Berkeley's School of Public Health are developing new statistical methods to estimate the burden of antimicrobial-susceptible pneumococcal infections in adults to gauge the potential impact of new higher-valency pneumococcal conjugate vaccines (PCVs) on reducing antimicrobial-resistant *Streptococcus pneumoniae* infections.

New and Faster Diagnostics to Fight Fungal Disease

CDC supports efforts to slow antifungal resistance through surveillance, lab capacity, and new data and testing. For example, CDC's AR Lab Network can now test how responsive fungal infections are to the novel antifungal ibrexafungerp, expanding our ability to identify emerging antifungal resistance across the United States and guiding treatment options for patients with resistant fungal infections caused by *Candida* and *Aspergillus*. Additionally, CDC and public health lab partners are collaborating with industry partners to develop a *Candida auris* colonization screening assay, which will allow labs to process hundreds of molecular diagnostic tests in hours.

Unique Nursing Home Network Provides Data for Public Health Action

CDC established the Nursing Home Public Health Response Network to inform interventions that protect nursing home residents. This network collects information on how care is provided in nursing homes, including assessing staffing and visitation, which is critical for understanding how different interventions may help stop the spread of dangerous pathogens and AR.

New and Improved Tools to Address AR in People, Pets, Farm Animals, and Food
The Integrated Food Safety Centers of Excellence (Food Safety COEs) use a One Health approach to provide peer assistance and training to track, investigate, and prevent enteric disease illnesses and outbreaks. For example, the New York Food Safety COE created an online dashboard to help visualize and compare 16 indicators of antimicrobial use on U.S. dairy farms, making it easier for farmers and veterinarians to interpret data and make informed decisions about antimicrobial use. Additionally, the Colorado Food Safety COE improved tools to identify recent companion animal contact among people with carbapenem-resistant Enterobacterales (CRE) infections and to compare human and animal isolates, aiming to better understand the potential transmission of CRE between people and their pets.

EIP supports expansion of infection tracking efforts for invasive *E. coli*
CRE and extended-spectrum beta-lactamase (ESBL)-producing Enterobacterales are two of CDC's top AR threats. Extraintestinal pathogenic *Escherichia coli* (*E. coli*) is one of the most common types of CRE and ESBL-producing bacteria and a leading cause of infections and sepsis in the United States. Through CDC's Emerging Infections Program (EIP) Healthcare-Associated Infections - Community Interface Activity (HAIC), CDC expanded tracking for invasive *Escherichia coli* (*E. coli*) infections across 11 sites. The new data will provide information on associated risks and drivers of infections and on AR that can be used to inform future prevention efforts.

Using Machine Learning to Guide Healthcare Facility Interventions
Through CDC's MInD-Healthcare, researchers with the One Health Trust are using machine learning to predict which hospital patients are at risk of colonization and infection with resistant bacteria and fungi to help healthcare facilities decide which infection prevention and control measures will be most effective.

Learn more about CDC's AR Solutions Initiative:
https://bit.ly/ARInvestments