Innovating to Slow the Spread:
CDC Combats Antibiotic Resistance (AR)

Each year in the United States, **more than 3 million people** are infected by an antibiotic-resistant germ or *C. difficile* (a bacterium associated with antibiotic use), and **nearly 50,000 people** die. Since 2016, **CDC has invested more than $160 million** in AR innovation to drive aggressive action and empower the United States and the world to comprehensively respond to AR. CDC continuously works to address threats from CDC's 2019 AR Threats Report through these projects. **More resources are needed to invest in this critical research addressing gaps across healthcare, the community, and the environment.**

Since 2016, CDC has only been able to invest roughly

$32 MILLION

a year on average in new ways to stop AR threats.

Nearly

80% of these investments

are cross-cutting to fight not only AR threats but other emerging, infectious disease threats in healthcare, community, and the environment.

CDC has invested in

60+ innovative AR projects

in more than 30 countries, since 2016.

CDC has worked with hundreds of partners around the world to begin to fill these gaps with innovative solutions that are scalable to address AR globally.

INVESTING IN INNOVATION, 2016-2020

- Nearly **20%** of all appropriated dollars for CDC's Antibiotic Resistance Solution Initiative has supported public health innovations
- Nearly **300** funded projects
- **100+** public/private institutions globally

MOVING THE NEEDLE: INNOVATING ON AR

Improving Detection in Vietnam

Experts at PATH are strengthening national Infection Prevention and Control (IPC) policies and enhancing AR data collection, analysis, and surveillance in healthcare facilities in Vietnam to better understand the spread of AR and more effectively respond to outbreaks.

Antibiotic Stewardship on the Farm

Researchers at the Ohio State University evaluated antibiotic use decision-making tools and training for dairy calf producers, finding improved antibiotic use on these farms. Researchers are also assessing changes in resistance genes where the calves live after the intervention.

Preventing Infections through WASH

Experts at Center for Disease Dynamics, Economics & Policy are helping CDC understand the impact waste disposal from healthcare facilities into the environment has on people. They are modeling the cost-effectiveness of water and sanitation interventions on key health outcomes in healthcare facilities in low- and middle-income countries.

Tracking Resistance in Kenya

Researchers from Washington State University are decreasing resistant infections in Kenya using a point prevalence survey, a tool to identify people who are receiving an antibiotic or had infection at a certain point in time, to learn more about antibiotic use and how infections are spread between the community and healthcare facilities.

Cleaning the Healthcare Environment

Researchers from Duke University and University of North Carolina investigated new methods for environmental disinfection and found UV light emitters as effective tools for intensely disinfecting rooms.

Modeling AR Infections in U.S. Healthcare

At the University of Utah, researchers are using models, tailored with patient and health economic data, to inform regional health policy decisions for hospital and nursing home interventions.

Sharing Expertise in Kenya and India

Microbiology experts at the American Society for Microbiology are improving detection and surveillance of resistant bacteria in Kenya and India through on-site mentorship programs with clinical lab staff to better understand the spread of AR in these communities and hospitals.

MOVING THE NEEDLE: INNOVATING ON AR

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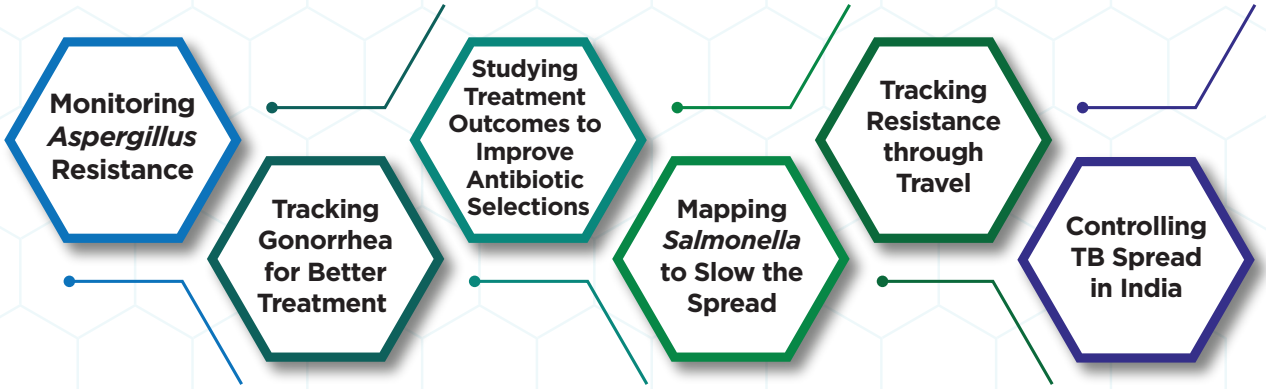

Monitoring *Aspergillus* Resistance

University of Georgia researchers studied azole-resistant *Aspergillus fumigatus* collected from select agricultural sites, helping CDC better understand the effects of antifungal-resistant isolates in the environment and how that might affect AR in humans.

Tracking Gonorrhea for Better Treatment

At the University of Oxford, researchers are improving laboratory methods to detect antibiotic-resistant gonorrhea directly from patient samples and create publicly available tools to analyze genetic AR data to better detect and treat the disease, potentially informing future standards or guidelines.

Studying Treatment Outcomes to Improve Antibiotic Selections

Researchers at the University of Virginia studied outcomes for patients with *Shigella* infections who were treated in Bangladesh. These results were presented to the Clinical Laboratory Standards Institute to support establishment of azithromycin clinical breakpoints for *Shigella*, allowing U.S. and global laboratories to screen isolates and report resistance findings to clinicians improving treatment decisions.

Mapping *Salmonella* to Slow the Spread

At the Instituto de Biomedicina y Biotecnología de Cantabria in Spain, researchers are identifying and evaluating the different structures and dynamics of *Salmonella* plasmids and how they spread AR, adding to knowledge on how resistance emerges and spreads.

Tracking Resistance through Travel

Experts at Massachusetts General Hospital and Harvard University are characterizing how often healthy travelers become infected and/or colonized— carrying and potentially spreading the germ—with certain drug-resistant germs. The study will also investigate risk factors, how long people are colonized, and how often it is spread within households.

Controlling TB Spread in India

In India, experts at the National Institute for Research in TB are closing knowledge gaps about treatment of drug-resistant TB, using innovative platforms like ECHO (a virtual clinic model to serve remote areas of the world) to inform practice recommendations and control spread across the country.

LEVERAGING CDC'S INNOVATIVE PROGRAMS FOR IMPACT

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

CDC PREVENTION EPICENTERS
innovative research to protect patients

› **CDC's Prevention Epicenters Program** is a unique research program in which CDC collaborates with academic investigators to conduct innovative IPC research. These Prevention Epicenters encompass over 254 healthcare facilities, 3M admissions to hospitals, and 17M patient days in the hospital.

BAAs
BROAD AGENCY ANNOUNCEMENTS

› Through **Broad Agency Announcements (BAAs)**, CDC supports innovations and collaborations with investigators to identify and implement new ways to prevent antibiotic-resistant infections and their spread. In fiscal years 2016 through 2020, more than $46M was awarded through the BAAs to fight AR.

SHEPheRD
SAFETY AND HEALTHCARE EPIDEMIOLOGY RESEARCH DEVELOPMENT PROGRAM

› Through the **Safety and Healthcare Epidemiology Research Development (SHEPheRD) Program**, CDC has awarded 35 organizations across the United States the opportunity to develop and conduct research and innovative prevention projects related to safety in healthcare settings. This significant opportunity allows CDC to request research and other collaborative proposals from these organizations over a 5-year cycle to find innovative approaches to preventing HAIs and AR across the healthcare spectrum.

MInD
THE MODELING INFECTIOUS DISEASES IN HEALTHCARE NETWORK

› **The Modeling Infectious Diseases in Healthcare Network (MInD – Healthcare)** develops a virtual laboratory where researchers can investigate factors that drive the spread of HAIs and simulate multiple prevention strategies to estimate their benefits in a timely and cost-effective manner.

SBIR
America's Seed Fund

› The **Small Business Innovation Research (SBIR)** 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. CDC's SBIR Program targets innovations in diagnostics, data science (e.g., artificial intelligence, machine learning, etc.), surveillance, occupational safety and health, and public health.

Learn more about CDC's AR Solutions Initiative:
www.cdc.gov/DrugResistance

Scan with your smartphone camera to watch an animated video on Antibiotic Resistance.

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