# Detect and Protect Against Antibiotic Resistance

*CDC's Initiative to outsmart this threat*

## The problem

It's been called public health's ticking time bomb. Antibiotic resistance—when bacteria don't respond to the drugs designed to kill them—threatens to return us to the time when simple infections were often fatal. Today, antibiotic resistance annually causes more than 2 million illnesses and 23,000 deaths in the United States. Tomorrow, if it continues on its current course, could be even worse:

- A simple cut of the finger could lead to a life-threatening infection.
- Common surgical procedures, such as hip and knee replacements, would be far riskier because of the danger of infection.
- Dialysis patients could develop untreatable bloodstream infections.
- Life-saving treatments that suppress immune systems, such as chemotherapy and organ transplants, could potentially cause more harm than good.

## The solution

We need to outsmart antibiotic resistance—now. CDC identified four core actions to be addressed by all partners in AR:
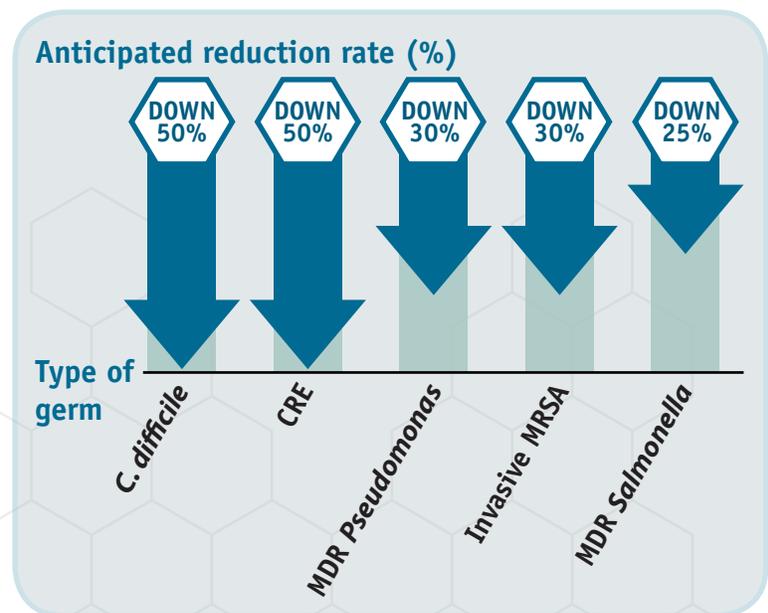
- **Detect** and track patterns of antibiotic resistance.
- **Respond** to outbreaks involving antibiotic-resistant bacteria.
- **Prevent** infections from occurring and resistant bacteria from spreading.
- **Discover** new antibiotics and new diagnostic tests for resistant bacteria.

CDC's **Detect and Protect Against Antibiotic Resistance Initiative** (known as the **AR Initiative**) is a part of the broader CDC strategy to target investment aimed at AR. The 2015 President's Budget requests $30 million annual funding for 5 years for the **AR Initiative** to achieve measurable results in the first three core actions and support the National Institutes of Health (NIH) and private industry in their discovery efforts.
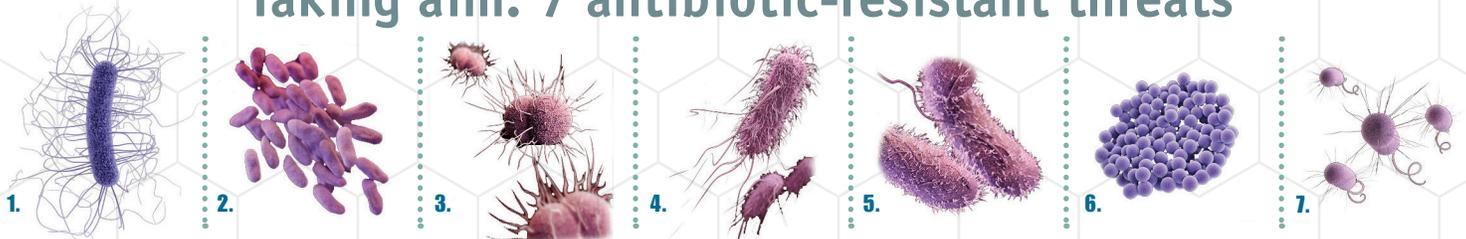
## The results

With a $30 million annual funding level over 5 years, CDC's **AR Initiative** could achieve a:

- 50% reduction in healthcare-associated *C. difficile*, which saves 20,000 lives, prevents 150,000 hospitalizations, and cuts more than $2 billion in healthcare costs
- 50% reduction in healthcare-associated CRE infections
- 30% reduction in healthcare-associated multidrug-resistant (MDR) *Pseudomonas*, a common cause of healthcare-associated infections
- 30% reduction in invasive MRSA
- 25% reduction in MDR *Salmonella* infections

**Anticipated reduction rate (%)**

| Type of germ | DOWN 50% | DOWN 50% | DOWN 30% | DOWN 30% | DOWN 25% |
|---|---|---|---|---|---|
| | C. difficile | CRE | MDR Pseudomonas | Invasive MRSA | MDR Salmonella |

## Taking aim: 7 antibiotic-resistant threats

1.  2.  3.  4.  5.  6.  7.

1. **Clostridium difficile (C. difficile)** causes deadly diarrhea mostly in people who've recently had medical care and antibiotics.
2. **Carbapenem-resistant Enterobacteriaceae (CRE)** are nightmare bacteria that are resistant to nearly all antibiotics and spread easily.
3. **MDR *Neisseria gonorrhoeae*** causes gonorrhea and is showing resistance to antibiotics usually used to treat it.
4. **Extended-spectrum β-lactamase-producing Enterobacteriaceae (ESBL)** are bacteria one step away from becoming CRE.
5. **MDR *Salmonella*** causes about 100,000 illnesses in the US each year; resistant infections are more severe.
6. **Methicillin-resistant *Staphylococcus aureus* (MRSA)** causes skin and wound infections, pneumonia, and bloodstream infections.
7. **MDR *Pseudomonas*** causes healthcare-associated pneumonia and bloodstream infections; some strains are resistant to nearly all antibiotics.
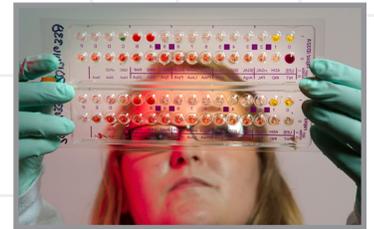
# The details

In 2013, CDC identified the four core actions needed to stay one step ahead of antibiotic resistance—detect and track patterns of antibiotic resistance, respond to outbreaks involving antibiotic-resistant bacteria, prevent infections from occurring and resistant bacteria from spreading, and provide a tool to aid development of new antibiotics and new diagnostic tests for resistant bacteria. CDC's **AR Initiative** lays out a roadmap for fighting resistance on two fronts:

## Improve detection through regional labs
*A new regional lab network and resistant-bacteria bank will speed up outbreak detection and provide a tool to aid development of new antibiotics and diagnostics.*



▶ A new 5-region **AR Regional Lab Network** improves our response to outbreaks of infectious disease by **speeding up** the identification of the most concerning resistant threats. The Network helps in other ways—in **increasing susceptibility testing** (to see which antibiotics stop bacteria from growing) for high-priority bacteria like CRE and in **keeping pace with rapidly mutating bacteria** so labs are ready to respond to new threats. The Lab Network will identify drug-resistant threats that are candidates for **new diagnostics and antibiotics**. And because of innovations made possible by Advanced Molecular Detection (AMD), the Lab Network provides a **cutting-edge testing platform** that not only increases the amount of testing but also ensures that all labs in the network can easily share new discoveries.

▶ A new **Resistant-Bacteria Bank** (called AR Isolate Library), a unique centralized collection of samples of resistant bacteria that are made available to:

- **Pharmaceutical companies** testing new antibiotic agents.
- **Biotech and diagnostic companies** designing next-generation clinical tests.
- **Researchers** evaluating the effectiveness of interventions to reduce antibiotic resistance.

▶ A new **public data portal** will show national trends as well as variations in antibiotic prescribing and resistance among states and regions.

## Prevent infections and improve antibiotic prescribing practices—in healthcare facilities and in the community
*Closer collaboration with healthcare facilities and large health systems will strengthen stewardship programs and reduce antibiotic resistance.*

▶ **Establish the AR Prevention Collaboratives**—Groups of healthcare facilities in communities around the country that work together to implement best practices for **inpatient antibiotic prescribing and preventing infections**. The Collaboratives will **scale up, or extend the reach of interventions** that have been reducing or stopping antibiotic-resistant threats. The AR Prevention Collaboratives will also encourage **involvement of large health systems**, which will help bridge interventions between hospitals and long-term care facilities.



▶ **Target concerning community threats**, like MDR *Salmonella* and MDR *N. gonorrhoeae* infections.

▶ **Improve antibiotic stewardship** (meaning good antibiotic prescribing practices) by evaluating state-to-state variations in antibiotic use to improve outpatient prescribing nationwide.

▶ **Launch Antibiotic Adverse Event Study,** to see what effect antibiotics given to infants and young children have on future health problems, such as obesity, asthma, eczema, allergies, and *C. difficile* infections.

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