RESEARCH AMERICA
DISCOVERY. INNOVATION. HEALTH.

ALBERT AND MARY LASKER FOUNDATION

If you think research is expensive, try disease.

INVESTMENT IN RESEARCH SAVES LIVES AND MONEY

Antimicrobial Resistance (AMR)

Antimicrobial resistance is one of today's most significant health challenges. Resistance occurs when microbes (germs such as bacteria, fungi, or parasites) defeat the drugs (antimicrobials) designed to kill them and instead continue to grow. Many types of antimicrobials exist. Failures of antibiotics (drugs used specifically against bacterial infections) are a particularly large source of the resistance cases we see today. While resistance can occur naturally over time, society also contributes to it through drugs being overprescribed and used incorrectly in people and animals. Resistant germs can be spread from person to person, as well as between people and animals.[1] No one is immune to antimicrobial resistance, making it one of the world's most urgent public health problems. The U.S. government and others are taking action to combat this threat, and research is ongoing to uncover how microbes develop resistance and to identify how we can effectively combat this public health threat.

TODAY

Almost

3 million

Americans get an antibiotic-resistant infection every year. Of those, more than

35,000

do not survive.[2]

The CDC's 2019 AMR Threats Report categorizes and places 18 antimicrobial-resistant bacteria and fungi into three categories -

urgent, serious, and concerning - based on their threat to human health. Three additional bacteria and fungi are on a "watch" list.[3]

In most cases, antibiotic-resistant infections require

longer hospital stays, more follow-up doctor visits, and costly alternative drugs.[2]

COST

$1,383:

The amount antibiotic resistance adds to the cost of treating a bacterial infection.[4]

$2.2 billion:

Annual direct health care costs associated with antibiotic resistance in the U.S.

$100 trillion:

Estimated global cost of AMR between now and 2050.[5]

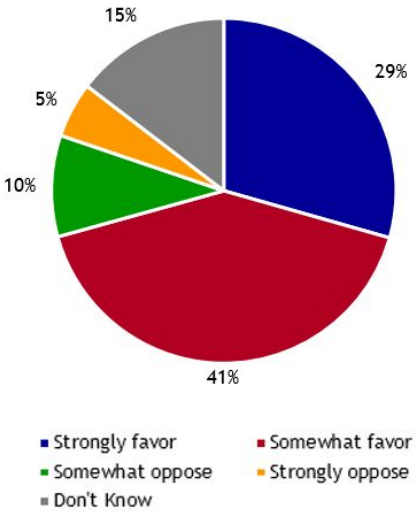
Research Delivers Solutions

In recent years, researchers have been attempting to find alternate therapies to antibiotics. While new antibiotics can and need to be developed, other treatments being explored may have certain advantages over antibiotics. One of these is called **phage therapy**, which involves the use of viruses or viral proteins to burst the cells of bacteria, killing the bacteria in the process.[6] A 2019 case study documented the successful use of phage therapy in a cystic fibrosis patient with a drug-resistant *Mycobacterium abscessus* infection. Additionally in 2019, the FDA approved the first U.S. clinical trial for intravenously administered phage therapy which will be starting soon.

Vaccines are another powerful tool against drug-resistant infections. Because they prevent rather than treat diseases, they decrease our use of antimicrobials and our need for new ones. Additionally, vaccines bolster the human immune system rather than kill the germs, so microbes cannot become resistant to them. The bacterium *Streptococcus pneumoniae* can cause serious illnesses like pneumonia and meningitis, and cases of drug-resistant infections have increased dramatically since the discovery of the bacterium. In 2000, however, the pneumococcal vaccine PCV7 was introduced in the U.S., and by 2004, cases of invasive pneumococcal disease (IPD) caused by resistant pneumococci had decreased by over 57%.[9]

Research has shown that interventions before treatment are also key to tackling AMR. **Rapid diagnostic tests**, which can quickly identify the exact nature of a patient's infection (e.g., what bacteria are present, and whether a bacterium is resistant to certain drugs) can be very beneficial in improving patient outcomes and decreasing the unnecessary use of antibiotics. For example, a 2014 study examining patients with a specific form of drug-resistant infection found that utilizing rapid diagnostics and responsible drug-prescription practices decreased hospital length of stay, costs, and mortality.[10]

Do you favor or oppose doubling federal spending on medical research over the next five years?



Source: A Research!America poll of U.S. adults conducted in partnership with Zogby Analytics in January 2019

Antimicrobial Resistance (AMR)

Then. Now. Imagine.

THEN
Antibiotic-resistant bacteria were first identified in the mid-1940s.[11]

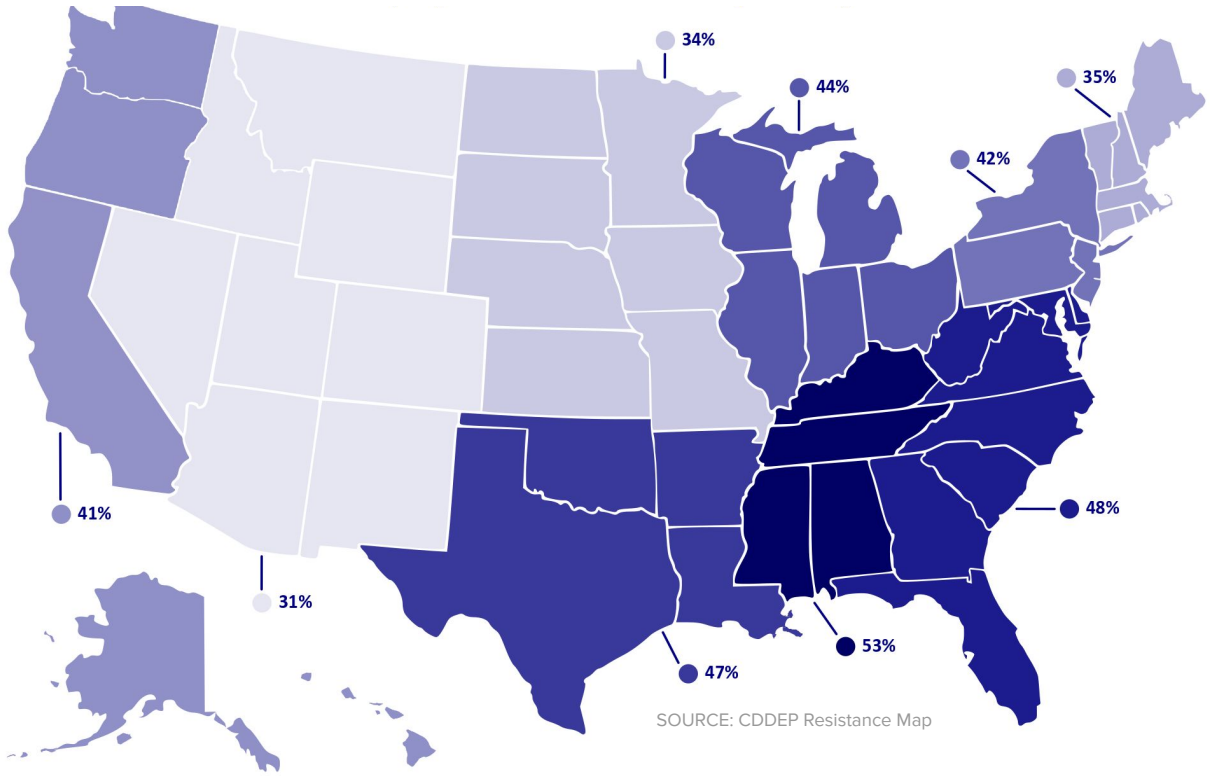
NOW
In 2018, the CDC launched the AMR Challenge, a year-long campaign to encourage governments, private companies, and non-governmental organizations around the world to make formal commitments that further the progress against resistance. More than 350 commitments were made.[12]

IMAGINE
Fewer drug-resistant infections.

AR Lab Network

The CDC's Antibiotic Resistance (AR) Lab Network, made up of 55 state and local labs, 7 regional labs, and 1 national surveillance center, helps bolster local capabilities and provide data needed to combat antimicrobial-resistance more effectively. When resistance threats are reported, state and regional labs work together to figure out how the threat is being transmitted and support any outbreak responses. Lab samples can be made available through the AR Isolate Bank, and researchers can use these samples in their quest for better diagnostics and treatment.[13]

Resistance Rate of *Staphylococcus aureus* (MRSA)*



SOURCE: CDDEP Resistance Map

1. "Antimicrobial Resistance and Infectious Disease." JHU. n.d.
2. "About Antibiotic Resistance." CDC. 2019.
3. "Biggest Threats and Data." CDC. 2019.
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11. Kirby, WM. "Extraction of a highly potent penicillin inactivator from penicillin resistant staphylococci." Science. 1944; 99(2579):452-3.
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