Preparing for the Next Public Health Emergency: Antimicrobial Resistance

The COVID-19 pandemic has demonstrated that we need to build a more resilient health care system that is well positioned to prevent and respond to infectious disease outbreaks and other public health crises and natural disasters. Achieving this goal will require preparing for the next public health emergency: the growing threat of antimicrobial resistance (AMR).

The discovery and introduction of antibiotics in the 1940s transformed modern medicine and enabled tremendous progress in health care and life expectancy. Today, this progress is threatened by the growing threat of AMR. AMR is a natural process that occurs when microorganisms such as bacteria, viruses, fungi and parasites change in ways that make the microorganisms resistant to the medications used to cure the infection. This means the more we use medicines to fight these infections, the more resistance we create. AMR affects at least 3 million Americans and results in 48,000 U.S. deaths annually.[1] The World Bank Group's 2017 report on drug-resistant infections estimates that unless action is taken, AMR globally could take 10 million lives annually by 2050, a higher toll than from cancer.[2]

Unfortunately, the problem of increasing AMR has been exacerbated during the pandemic as COVID-19 patients battling secondary bacterial and fungal infections must use large amounts of antimicrobial medicines, which in turn increases the risk that subsequent infections become resistant to our dwindling arsenal of antimicrobials, thereby potentially increasing resistance rates around the world. If we fail to address the crisis, many modern medical advances that depend on antimicrobials—such as routine surgery, cancer therapy and treatment of chronic disease—may be jeopardized.

To avoid turning back the progress made, biopharmaceutical researchers are working to develop new and effective treatments to combat AMR. A robust pipeline of new antimicrobial medicines is critical to ensure that treatments can keep pace with evolving pathogens and continue to fight infections. Today, there are nearly 90 medicines in development against drug-resistant infections.[3] These medicines represent more than antibiotics and include innovative, non-traditional antibacterial treatments such as bacteriophage products, live therapeutic products and monoclonal antibodies.

The Challenges Associated with Developing new Medicines to Combat the Growing Threat of AMR

Unfortunately, several obstacles, including the costs and risks associated with researching and developing new antimicrobials and other factors that limit the commercial viability for those that reach the market, stand in the way of needed innovation. Collectively, these challenges make it harder for biopharmaceutical research companies to recoup the substantial costs of R&D.

Developing new medicines is a long, complex and risky process taking anywhere from 10 to 15 years and costing on average $2.6 billion for a single medicine. Among all medicines, just 12% entering clinical trials are ultimately successful in obtaining U.S. Food and Drug Administration (FDA) approval.[4] Among antibiotics, this process is fraught by even more risk. Developing a single new antibiotic medicine can take anywhere from 10 to over 20 years and cost $568-$700 million. But success rates are far slimmer. Even among investigational antibiotics in existing classes of antibiotics in preclinical development, just 1 in 15 will ultimately be approved and reach patients. Among new classes of antibiotics, these odds decline to just 1 in 30 ultimately obtaining approval.[5]

The fundamental problem with establishing a robust pipeline for new medicines to target antimicrobial resistance is, unlike other medicines, the market is inherently limited by design which impacts its availability to attract sufficient investment. In order to prevent continued antimicrobial resistance, medicines should be used only in a limited set of circumstances and in only in the most necessary cases. This makes it challenging for biopharmaceutical companies to recoup research and development costs. Antibiotic stewardship programs are designed to restrict the use of antibiotics specifically for this reason and thus reduce the commercial viability of new antimicrobials.

Unfortunately, our current reimbursement system also reinforces misguided incentives which discourage appropriate use of new antimicrobials and instead favor older medicines that have been around for decades but may be less effective in meeting current AMR threats. That is because newer antimicrobial medicines are often more expensive than older medicines, and our bundled payment system creates financial disincentives for hospitals to prescribe these newer medicines, even when they may be more appropriate to treat drug-resistant infections. Ineffective or incomplete use of antimicrobials can also exacerbate AMR.

As a result of these challenges, in recent years a number of biotechnology companies have declared bankruptcy or exited this space, including those who have successfully developed new antimicrobials.[6] In fact, while 15 new antimicrobials were approved over the past decade, a third of the companies behind those medicines subsequently filed for bankruptcy and exited the field.[7] We need to urgently fix these dynamics if we want to ensure we have the medicines we will need for the next public health emergency.

A Unique Innovation Ecosystem Has Evolved to Address the Challenges of AMR

To address the challenges of early and late-stage clinical development and to overcome the market's failure to drive innovation for new antimicrobial medicines, innovative partnerships and initiatives within and between the public and private sectors have evolved.

The biopharmaceutical industry in particular is taking action through the AMR Action Fund.[8] This fund aims to bring two to four new antimicrobials to market by 2030 by investing more than $1 billion in smaller biotech companies and focusing on innovative medicines that address the highest priority public health needs. This industry-driven effort will also work to drive comprehensive policy reforms that are needed to advance new reimbursement methodologies and create incentives that enable appropriate patient access, creating a sustainable ecosystem for antimicrobial R&D and commercialization. The fund will also provide technical support to emerging companies, giving them access to the deep expertise and resources of large biopharmaceutical companies to strengthen and accelerate the development of novel antimicrobial medicines.

As we look to the future and the need to address the growing threat of AMR, public policies are needed to create a more sustainable environment for antimicrobial R&D and commercialization and ensure a robust pipeline for future treatments. These include policies to address the reimbursement barriers in the inpatient bundled payment system in Medicare, advance innovative payment mechanisms to maintain access while not driving overuse, and policies that aim to provide a competitive return on investment after marketing approval to encourage a diverse pipeline of new medicines.

The current challenges with the AMR pipeline illustrate what can happen when there are insufficient market dynamics to incentivize innovation. In order to prepare for the next public health crisis, it is crucial to create and strengthen an ecosystem where innovation can flourish.

1 CDC. Antibiotic Resistance Threats in the United States, 2019.
2 Jonas, Olga B. et al. Drug-resistant infections: a threat to our economic future (Vol. 2). 2017. World Bank Group.
3 PhRMA. Medicines in Development for Antimicrobial Resistance. 2021.
4 DiMasi JA, Grabowski HG, Hansen RW. Innovation in the pharmaceutical industry: new estimates of R&D costs. J Health Econ. 2016;47:20-33.
5 Welcome Trust. Why is it so hard to develop new antibiotics?
6 AMR Industry Alliance, 2020 Progress Report.
7 A. Jacobs, Drug Giants Create Fund to Bolster Struggling Antibiotic Start-ups, July 2020, NY Times.
8 The AMR Action Fund. https://www.amractionfund.com/