

One Expert Takes a Deep Dive into the Problem of Antibiotic Resistance

In an in-depth Q&A, Ohio State University's Mark Mitton-Fry talks about the problem of antibiotic resistance and what the future holds for these life-saving drugs.

Why is the problem of antibiotic resistance increasing, and is the problem reversible?

At a basic level, it represents the natural consequence of selective evolutionary pressure. Bacteria with resistance to a certain drug survive in the presence of that drug, whereas those lacking resistance ("susceptible bacteria") do not. Consequently, there is enrichment of the drug-resistant bacterial population. Considering

the rapid rates at which bacteria replicate, their large numbers and their intrinsic diversity, resistance can escalate rapidly.

How is antibiotic resistance going to affect medicine?

Consider an individual who has a life-threatening infection from an antibiotic-resistant bacterium. If the infection cannot be treated with an effective antibiotic, the likelihood of mortality increases dramatically. Such deaths were commonplace before the advent of effective antibiotics in the 20th century and are once again highly relevant. One widely quoted estimate from the UK's Report on Antimicrobial Resistance places

the annual number of deaths from antimicrobial-resistant infections (including those from bacteria as well as HIV, a virus, and malaria, a parasite) at 700,000 globally.

What areas of medicine are going to be affected the soonest?

Naturally, one thinks first about the treatment of infections. Antibiotic resistance already plays an important role here. Indeed, physicians have turned increasingly in recent years to older, more toxic antibiotics like colistin/polymyxin due to resistance to other, safer, therapies. Unfortunately, there are also bacteria with resistance to the more toxic options as well. Some researchers and physicians

have expressed concern that we might enter a "post-antibiotic era," in which doctors will no longer have ready access to life-saving antibiotics due to resistance. The UK Report on Antimicrobial Resistance estimates that global deaths from resistant infections will rise to 10 million per year by 2050.

When do you think we're going to be "out of options" for many—or even most—infections?

That is a difficult question and I hope the answer is "never." It is obviously critical that we continue to invest in addressing this key threat to human health. I am proud to be at Ohio State

University, whose substantial investments in infectious disease research through the Discovery Themes Initiative and the recently launched Infectious Diseases Institute, epitomize our commitment to this area. My own medicinal chemistry lab is working diligently to develop new inhibitors of bacterial topoisomerases, in the hopes of advancing new therapies for a variety of bacterial pathogens. Ohio State has a superb culture of collaboration and I have been grateful for the many enthusiastic co-investigators with diverse expertise who have joined our efforts. We are one small piece of a much larger enterprise, but we hope to have an impact on the critical issue of antibiotic resistance. ■

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