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# The Slow-Moving Antimicrobial Resistance Train is Picking-up Morbidity and Mortality Steam

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## Key Takeaways

- Public misunderstanding and misuse of antibiotics significantly contribute to antimicrobial resistance, despite awareness of its dangers.
- Dentists' overprescription of antibiotics is a critical issue, with educational efforts focusing on improving antimicrobial stewardship.

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*Resistance is expected to worsen significantly, but can a combination of both ground-level clinician stewardship actions as well as systemic reforms such as the Pasteur Act at least slow down the train?*

Antimicrobial resistance (AMR) is a slow-moving train that is picking up steam and in its path are all patients battling bacterial infections. AMR is a multifactorial problem that includes many aspects, and potentially chief among them is the missing communication and disconnect with the public, who do not understand the nature of how it happens nor the consequences of the misuse of antibiotics.



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The Slow-Moving Antimicrobial Resistance Train is Picking-up Morbidity and Mortality Steam to resistance. In a poll conducted by the Kaiser Family Foundation, it was found that 67% of respondents were aware of the negative implications when overusing antibiotics, which could lead to patients having to take stronger therapies, and about 6 in 10 saying it will lead to longer lasting and more dangerous bacterial infections (63%) and an increasing amount of bacteria resistance to antibiotics (62%). However, a larger number of people believe the responsibility of protecting people from resistance belongs with drug companies and health care providers.<sup>1</sup> In the same poll, 45% of respondents say they have not taken their antibiotics as prescribed by their clinician, which can, of course, lead to resistance.<sup>1</sup>

One of the issues on the clinicians' side has been in dentistry. Dentists have often prescribed antibiotics for prophylaxis purposes for patients undergoing surgical procedures. In the past, there were concerns over bacterial endocarditis in patients with heart issues who were given antibiotics to protect against this. However, newer studies around this topic have shifted the need for antibiotics in these patients. In a 2022 paper, Rutherford et al noted that "Guidance by the National Institute for Health and Care Excellence (NICE) in England and Wales states that antibiotic prophylaxis against infective endocarditis is not recommended routinely for people undergoing dental procedures."<sup>2</sup>

In trying to reduce issues associated with antibiotic prescribing practices, Debra Goff, PharmD, a professor of pharmacy practice at The Ohio State University Wexner Medical Center, has been studying the subject of dentistry and antimicrobial stewardship for several years. She has become an advocate for the field and teaches dentists to understand fully the nuances of stewardship and how antimicrobial prescribing practices have changed.

"The [Centers for Disease Control and Prevention] published a great study that said, '25 million prescriptions a year are prescribed by dentists.' But, when I looked into the details of that, that only represents general dentists working in the VA health care system," said Goff, in an interview with *Contagion*. "I'm working with private practice dentists, which represent 90% of dentists in the United States, and the specialists, the

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The Slow-Moving Antimicrobial Resistance Train is Picking-up Morbidity and Mortality Steam scores—10 and 14 days, and they can do better. There's no evidence to support those long durations."

She says dentists have largely been receptive to her presentations. "It's been so fun teaching them simple concepts of how they can be a steward, and they are helping me spread this message all across the United States," Goff said. She has educated 3000 private practice dentists to date and continues to do so.

To help the public better understand the importance of this issue, and providing clinicians with a call to arms, she wrote an [opinion piece](#) issue earlier this year, describing antibiotics as the sheep, the pharmacists and physician stewards as the dogs, and that the stewards needed to protect new antibiotics from the wolf, which is, of course, antimicrobial resistance. "We have to be that herding dog that rallies for our patients, protecting them from antibiotic resistance," Goff said.

### **The Potential Global Impact of AMR**

These shortcomings don't stop the AMR train's approach. In fact, it is expected that the problem of AMR will grow exponentially, and with it will come greater mortality. A few months back, a study published in *The Lancet* looked at mortality associated with AMR from the present day up to the year 2050, with an estimation of the number of deaths in the next 25 years. This modeling study predicted that more than 39 million people could die from AMR globally in that time.<sup>3</sup>

According to the investigators, more than 1 million people died each year because of AMR between 1990 and 2021. The study also estimates 1.91 million people could potentially die as a direct result of AMR in 2050, an increase of almost 70% per year compared with 2022. Over the same period, the number of deaths in which AMR bacteria play a role will increase by almost 75% from 4.71 million to 8.22 million per year.<sup>3</sup>

### **A Personal Tragedy Grows into a Professional Mission**

Diane Shader Smith is a publicist, and didn't realize the magnitude of AMR until after her daughter Mallory's death. Her daughter given a diagnosis of cystic fibrosis (CF) when she was 3 years old, explained Shader Smith, but it did not become problematic until the pathogen *Burkholderia cepacia* was found in her lungs when she was 12 years old.

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The Slow-Moving Antimicrobial Resistance Train is Picking-up Morbidity and Mortality Steam therapy. Unfortunately, antibiotic treatment can see diminishing returns as previously effective therapies are no longer working against the bacteria and a greater antimicrobial resistance is seen against a pathogen that never leaves the lungs.

Through the years, Mallory had been hospitalized to treat infections and, eventually, she became a candidate for a double-lung transplant. She had a successful surgery, but even with new lungs, the pathogen was back and sadly, Mallory succumbed to AMR at the age of 25.

Despite a growing spotlight around AMR, Shader Smith says it is hard for everyone to see this as one major issue. She launched the [Global AMR Diary website](#), which allows people to tell their individual medical stories about AMR.

"We're trying to push the global AMR diary as a way to get people to engage with the stories—to connect. But it's challenging because it's an amorphous problem that people don't really understand," Diane Shader Smith said in an interview with *Contagion*.

Since getting involved in advocacy, she has given hundreds of presentations to different walks of life to everyone—from high school kids to grandparents—to let them know the scope and severity of the problem. Along with her talks, she has been involved in getting Mallory's memoir, *Salt in Soul*, published after her death, and a documentary with the same name about her daughter's experience.

And while some people are more vulnerable to infections that can lead to resistance including those who are immunocompromised and seniors, Shader Smith makes the point everyone is vulnerable.

"It can strike anyone, anywhere," Shader Smith said. It isn't just a problem for people like Mallory who had CF or someone with cancer, although those who have health conditions with compromised immune systems might be more at risk, and those in underserved communities are at higher risk, but the average person walking down the street could take a fall, cut their knee, and bacteria that's either in the hospital or in the community, can get into their system and cause them to be septic. I've met many people who have lost their lives or lost their limbs because of resistant bacteria, and they were

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Despite the daunting prognostications, large systemic changes may reduce resistance. One of the major issue of antibiotics is the supply side and the need for more therapies; however, the development of them has inherent challenges such as costs, time to develop them, smaller biopharmaceutical companies involvement—as opposed to larger companies—and quick resistance to newer antibiotics, as typically, they become resistant to evolving pathogens just a few years after introduction of them into the market. In trying to combat the development issue, there is a prospective bill in Congress called the Pasteur Act. The bill has been in Congress for a few years now, and it authorizes the Department of Health and Human Services (HHS) to enter into subscription contracts for critical-need antimicrobial drugs, provides \$6 billion over 10 years in appropriations for activities under the bill, and contains other related provisions.<sup>4</sup> Last year, Senators Michael Bennet (D-CO) and Todd Young (R-IN) and Representatives Drew Ferguson (R-GA) and Scott Peters (D-CA), [reintroduced the Pasteur Act in Congress](#). The bill was initially introduced in Congress by Bennet and Young in September 2020; the pair, along with Representatives Mike Doyle (D-PA) and Ferguson, then reintroduced the bill in June 2021.

After the bill's reintroduction last year, 5 national organizations—the Biotechnology Innovation Organization, the Cystic Fibrosis Foundation, the Infectious Diseases Society of America (IDSA), the Partnership to Fight Infectious Disease, and The Pew Charitable Trusts—issued a statement on the topic. "Antimicrobial resistance is not a partisan issue. It is an increasingly challenging public health emergency that reverberates far beyond just healthcare settings. Every 15 minutes, a person in the United States dies from an infection resistant to treatment with existing antimicrobial drugs. This means that since PASTEUR's last introduction on June 16, 2021, more than 64,000 Americans have died because they did not have adequate medications to treat their infections," part of the statement read.

Amanda Jezek, senior vice president for Public Policy and Government Relations at IDSA does believe the Pasteur Act will pass and says it is better to do so now than deal with the consequences of increased mortality rates and the inability to perform procedures due to concerns over AMR. "I think it has to; the stakes are too high," said Jezek, in an interview with

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Jezek says that along with being a major supporter of the Congressional bill, IDSA is involved in other AMR-related activities, including the US national plan to address AMR. They were also involved in the United Nations meeting last summer, which looked at AMR and a One Health approach. The United Nations and its member nations met back in August to address AMR.

Lori Russell, senior vice president for Public and Government Affairs and Compliance, [bioMérieux](#), attended the UN and believes there were productive talks around reducing AMR. Her role within her diagnostics company is to lead initiatives to promote the value of diagnostics and work with stakeholders, including policy makers and industry leaders, focusing on advancing public health through diagnostics.

"I had the privilege of attending the [United Nations] high level meeting where we were able to provide an intervention highlighting the critical role of diagnostics in addressing the AMR crisis and the need for national action plans to include diagnostics as a pillar of their stewardship strategies," she said in an interview with *Contagion*.

As with any big world problem with complexities associated with it, it is going to take consensus building and various approaches at the ground level up to systemic changes to slow down the AMR train or look to derail it. From the frontline clinicians to patients, to infectious disease organizations, up to country members of the UN—everyone is an interested stakeholder in this fight. The question remains: will enough be done to reduce resistance and stop or slow down a train that will affect millions of people in the coming years?

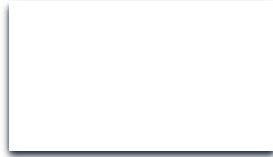
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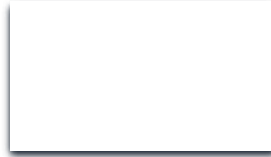
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<https://www.congress.gov/bill/118th-congress/senate-bill/1355>

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