

Decreasing antibiotic use can reduce transmission of multidrug-resistant organisms

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Reducing antibiotic use in intensive care units by even small amounts can significantly decrease transmission of dangerous multidrug-resistant organisms (MDROs), according to new research published online today in *Infection Control & Hospital Epidemiology*, the journal of the Society for Healthcare Epidemiology of America. Researchers developed models to demonstrate the impact of reducing antibiotics by 10% and by 25%, and found corresponding reductions in spread of the deadly bacteria of 11.2 percent and 28.3 percent, respectively.

"Antibiotic exposure is the most significant driver of resistance. In the hospital setting, nearly 50 percent of all patients receive an antibiotic, including up to 75 percent of all critically ill patients," said Sean Barnes, Ph.D., Assistant Professor of Operations Management in the Robert H. Smith School of Business at the University of Maryland, and lead author of the study. "But what is really troubling is that nearly half of all [antibiotics](#) prescribed may be inappropriate. Even moderate reductions in antibiotic use can reduce transmission of MDROs."

Many hospitals and health systems in the U.S. are making efforts to reduce unnecessary antibiotic use through antimicrobial stewardship programs and various interventions to help ensure that patients get the right antibiotics at the right time for the right duration. Research has demonstrated the benefits of these measures on patient care and costs, but the impact on the rate of MDROs has been difficult to assess. To do

so, researchers used a mathematical model, known as agent-based modeling to simulate the interactions between patients and healthcare workers. In the model, some patients were designated as colonized with an MDRO and a portion of patients received antibiotics (75 percent). The model assumed that transmission among patients occurred primarily via contaminated hands of healthcare workers.

The team modeled the effect of [antibiotic usage](#) in two ways: a microbiome effect, which reduces bacteria in the system with the use of antibiotics and increases MDRO transmission probability; and a mutation effect, which designates a proportion of patients who develop a MDRO as a result of genetic mutations in the bacteria. MDRO are common bacteria, including frequently occurring Methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE).

"Antibiotics have been one of the most useful and critical drugs in modern medicine, but our overuse of these drugs has hurt us by supporting the development of MDROs", said Kerri Thom, M.D., M.S., associate professor at the University of Maryland School of Medicine and a co-author of the study. "Our model suggests that substantial reductions in infection rates are possible if stewardship programs aggressively pursue opportunities to reduce unnecessary usage of antibiotics."

More information: Sean L. Barnes et al, The Impact of Reducing Antibiotics on the Transmission of Multidrug-Resistant Organisms, *Infection Control & Hospital Epidemiology* (2017). [DOI: 10.1017/ice.2017.34](https://doi.org/10.1017/ice.2017.34)

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