

# Optimizing antibiotic use and combating antibiotic resistance

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Antibiotic resistance is one of the greatest problems facing medicine today. A major threat comes from over-use of antibiotics in healthcare. A team of researchers from the University of Leicester has provided a set of recommendations about how to address the problem of antibiotic over-use.

The research, led by Dr. Carolyn Tarrant, Associate Professor in the Department of Health Sciences, highlights how the global problem of [antibiotic resistance](#) can be overlooked in favour of more immediate concerns, including the consequences of missing a serious infection.

The research, published in *Clinical Microbiology and Infection*, suggests six simple tips for a coordinated approach to optimising antibiotic use:

- Access to antibiotics should be carefully regulated
- The immediacy of the problem of resistance should be emphasised
- Rules for antibiotic prescribing should be made collectively, with involvement of clinicians and patients
- Doctors' prescribing behaviour should be monitored and fed back to them
- Reputational incentives and sanctions should be introduced
- Perverse incentives that drive over-use should be addressed

Dr. Tarrant said: "Rather than expecting individual doctors to bear the responsibility for reducing their prescribing to protect antibiotics for the

future, our research argues that we should use more collective approaches. This means establishing consensus rules for [antibiotic use](#), sharing data on prescribing, and using public reputation as a way of encouraging good prescribing practice.

"Current approaches to reducing antibiotic over-use tend to focus on the behaviour of individual prescribers, but our research identifies the need for coordinated action across whole communities of prescribers."

Dr. Eva Krockow, Research Fellow in the Department of Health Sciences said: "Often it's hard to tell whether patients have bacterial infections and need antibiotic treatment. Under circumstances of uncertainty, doctors worry about missing an infection and the patient deteriorating, to be safe, they err on the side of overprescribing.

"This means that doctors sometimes prescribe antibiotics when they aren't helpful—in cases of a viral infections such as colds, or when they aren't necessary—in cases where a bacterial [infection](#) may clear on its own. This seems rational on an individual level, but leads to an overall outcome of reduced antibiotic effectiveness."

In a linked publication, led by Professor Andrew Colman, Professor of Psychology, the researchers provide the grounding for these recommendations. They prove that antibiotic prescribing is a social dilemma for doctors: a problem that needs coordinated action to preserve a shared resource.

In research published in *PLOS ONE* they prove that the choice doctors face when deciding to prescribe an antibiotic take the form of a tragedy of the commons dilemma—where individual decisions to over-use [antibiotics](#) may provide the best short-term outcome for individual doctors and their patients, but the overall outcome of loss of antibiotic effectiveness through over-use is collectively worse for all.

Professor Colman, said: "If [doctors](#) behave perfectly rationally, always acting in the interests of their patients, the inevitable result will be bad for them and their patients. Unless appropriate steps are taken, [antibiotic prescribing](#) will be increased until they are no longer effective.

"Solutions to this type of problem involve collective commitment to common goals, and cooperation between those using the shared resource."

**More information:** Andrew M. Colman et al. Medical prescribing and antibiotic resistance: A game-theoretic analysis of a potentially catastrophic social dilemma, *PLOS ONE* (2019). [DOI: 10.1371/journal.pone.0215480](#)

C. Tarrant et al. Optimizing antibiotic prescribing: collective approaches to managing a common-pool resource, *Clinical Microbiology and Infection* (2019). [DOI: 10.1016/j.cmi.2019.03.008](#)

Provided by University of Leicester

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