

Antibiotic resistance: a growing threat

Antibiotic resistance is becoming one of the world's leading causes of death, because efforts to prevent and combat it have been inadequate.

Several million deaths a year worldwide. A 2016 report estimated that resistance to antimicrobial drugs could be responsible for 10 million deaths per year by 2050 (1). A study published in 2022 on 12 infectious diseases and 23 bacteria in 204 countries sheds new light on this problem (2).

The study had a large number of contributors, from health institutions around the world, who collated data from numerous sources on infectious disease epidemiology and associated mortality, available drugs, rates of resistance, etc. Modelling of these data showed that infections due to antibiotic-resistant bacteria contributed to about 5 million deaths in 2019, 1.3 million of which were directly attributable to bacterial resistance, making it one of the leading causes of mortality worldwide (2).

The main infections responsible for these deaths were lower respiratory tract infections, septicaemia and intra-abdominal infections. The six antibiotic-resistant bac-

teria that caused the greatest number of deaths were: *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* (2).

Not profitable enough. Action is needed on various fronts to tackle microbial resistance, including reducing the use of antibiotics in intensive animal-rearing, rationalising their use in humans, and developing antibiotics with new mechanisms of action (3). However, after a golden era of antibiotic development that brought a succession of new antibiotics to the market until the 1970s, academic and industry research in the field slowly dried up (3,4). Selling new antibiotics no longer fitted into the pharmaceutical industry's business model which, from the 2000s, was focused on longer-term (and very costly) treatments for the niche markets offered in particular by cancers and rare diseases (4-6).

Many initiatives have been launched over the years in an effort to kick-start research into new antibiotics, but with little success (3). In practice, it would require massive international public funding to encourage universities

and drug companies to conduct open-source research to develop new antibiotics, which would then be used rationally to minimise the emergence of resistance (3,5).

The speed and efficacy with which public authorities and the pharmaceutical industry responded in the case of covid-19 vaccines show that alternative economic models are effective. What is required in this case is a revival of ambitious antibiotics research and development, with its funding delinked from sales revenues, to avoid the overuse that drives bacterial resistance.

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Selected references from Prescrire's literature search

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