

## Antimicrobial Resistance: Hope for the Best and Prepare for the Worst

Ahmed Morad Asaad

Professor of Microbiology, College of Medicine, Najran University, Najran, Saudi Arabia

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**Corresponding Author:**

Ahmed Morad Asaad

✉ [ahmedmoradasaad@hotmail.com](mailto:ahmedmoradasaad@hotmail.com)

Professor of Microbiology, College of Medicine, Najran University, Najran, Saudi Arabia

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### Editorial

The emergence of multi-drug resistant (MDR) human bacterial pathogens during 1990s and more recently the extensively resistant clinical isolates is hampering efforts to control and manage human infections by these organisms. Continuous increase in the global isolation rates of Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE) and carbapenem-resistant Gram negative bacilli clinical isolates poses a serious therapeutic problem. Antimicrobial-resistant infections currently claim at least 50,000 lives each year across Europe and the US alone, with many hundreds of thousands more dying in other areas of the world. The scenario is more complicated with emerging resistance to treatments for serious diseases, such as TB, malaria and HIV. By 2050, 10 million more people would be expected to die every year than would be the case if resistance was kept to today's level [1-3].

Unfortunately, resistance has eventually been seen to nearly all antibiotics that have been developed. Emergence of linezolid-resistant *Staphylococcus aureus* isolates was reported in 2001 after one year of the drug development. Similarly, daptomycin resistance was reported among *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolates within only 2 years after the drug's discovery in 2004. Recently, Ceftaroline was available in the market in 2010, and Ceftaroline-resistant *Staphylococcus aureus* isolates emerged one year later [4].

The global crisis of antimicrobial resistance is attributed to several causes. First, the overuse of antibiotics clearly drives the evolution of resistance. Epidemiological studies have demonstrated a direct relationship between antibiotic consumption and the emergence and dissemination of resistant bacteria strains. Second, antibiotics are unregulated and available over the counter without a prescription in many other countries. The ability to purchase such products online has also made them accessible in countries where antibiotics are regulated. It is noteworthy that this lack of regulation results in antibiotics that are easily accessible, plentiful,

and cheap, which promotes overuse. Third, incorrectly prescribed antibiotics also contribute to the promotion of resistant bacteria. Studies have shown that treatment indication, choice of agent, or duration of antibiotic therapy is incorrect in 30% to 50% of cases. Finally, antibiotics are widely used as growth supplements in livestock on a global scale [5,6].

The development of new antibiotics by the pharmaceutical industry had essentially stalled due to economic and regulatory obstacles. Of the 18 largest pharmaceutical companies, 15 abandoned the antibiotic field. Mergers between pharmaceutical companies have also substantially reduced the number and diversity of research teams. Antibiotic development is no longer considered to be an economically wise investment for the pharmaceutical industry. Another factor that causes antibiotic development to lack economic appeal is the relatively low cost of antibiotics [5].

The first required response to high levels of antimicrobial resistance must be to reduce the selective pressure generated by antibiotic usage. As patients require treatment, it is not always possible to modify substantially or reduce antimicrobial use. Infection control protocols and surveillance programs are the most important control measure that can be applied to the containment of antibiotic-resistant bacteria in a hospital setting. Indeed, coordinated efforts to implement new policies, renew research efforts, and pursue steps to manage the crisis are greatly needed. Progress in these areas, as well as new agents to treat bacterial infections remains crucial.

## References

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