

# The Silent Crisis: Unveiling Antibiotic Resistance

Faryal Ikram, Maryam Bashir, Bisma Razzaq and Muhammad Adnan Sabir Mughal\*

Department of Pathobiology and Biomedical Sciences, MNS University of Agriculture, Multan

\*Corresponding Author: [adnansabir330@gmail.com](mailto:adnansabir330@gmail.com)

## ABSTRACT

Antibiotics are regarded as a wonderful drug for both humans and animals as these are essential for the treatment of infectious diseases but increasing use of antibiotics leads to the development of antibiotic resistance which is a major life-threatening issue. Antibiotics are cytostatic or cytotoxic to the pathogens that permit our immune system to stop or kill the growth of microorganisms. Bacterial mechanisms for inactivation of drug action such as modification in their cell wall, decrease permeability and active pumping system are the major reasons for antibiotic resistance development. Most commonly, antibiotic resistance occurs by changes in the ribosomal target. Globally, numerous strategies have been introduced to overcome this problem. Safety measures include tracking systems that track the use of antibiotics, health and diagnostic practices to decrease the risk of disease, but these are not enough. Understanding issues related to antibiotic resistance will be very helpful to overcome this global public health threat.

**Keywords:** Antibiotics, Infectious diseases, Antibiotic resistance, Modifications, Strategies

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### Introduction

Many antibiotics are used for the treatment and prevention of diseases in humans and animals, to control the spread of diseases and their contamination [1]. Antibiotics are cytostatic or cytotoxic to the pathogens that permit our immune system to stop or kill the growth of microorganisms. They stop the formation of bacterial cells, RNA, DNA and their proteins by their specific functions as shown in Fig. 1 [2]. Antibiotics are a great blessing in fighting against diseases and saving the lives of many people. Many antibiotics are widely used for therapeutic means and considered as a wonder drug [3]. Antibiotics were first discovered by Alexander Fleming. The 1950s to 1970s period was considered as a golden era for the discovery of such wonderful antibiotics. Now Millions of drugs are discovered that make antibiotics less expensive and their demand is also increasing and their irregular and huge use in agriculture, animal husbandry develop resistance in antibiotics. New drugs are discovered, and the production of new drugs is directly proportional to the development of resistance. Antibiotics resistance develop when pathogens are resistance to drugs that are used to prevent and treat infections. Development of antibiotics resistance is a major issue nowadays because outbreaks of infectious diseases increased, and productivity of live stocks decreased [4].

membrane permeability that reduce the uptake of drugs, and their efflux pump eject out the antibiotic at a faster rate. This can also occur due to variations in porin such as OprD porins that are resistant to carbapenem. In tetracycline and quinolones, resistance occurs due to active pumping system that eject out or concentrate the antibiotic within the cell [7,8].

### Current strategies adopted by different governments to encounter the rising problem of antibiotic resistance

As discussed in the above part, huge and irregular use of antibiotics in increasing productivity of crops and in livestock as a growth promotes greatly increasing antibiotics resistance. It is thought that in 2050, 10 million worldwide deaths will occur due to antibiotics resistance. The government introduced various programs to decrease the misuse of antibiotics in huge amounts to gain benefits of antibiotics. In America, USDA make sure that the antibiotics residue should not exceed the level as introduced by FDA and USDA. Many other countries also introduced safety measures in this regard [9,10].

Safety measures include tracking systems that track the use of antibiotics and health practices and diagnostic practices to decrease the risk of disease [11]. WHO and the Institute of Medicine in USA also introduced restrictions. To compensate for the antibiotic resistance, strict safety measures should be adopted for a very long period. But these methods are not enough to overcome antibiotics resistance because microorganisms modify themselves and develop resistance rapidly so there is a need to adopt scientific strategies to overcome this problem.

### Conclusion

Antibiotics are considered as a blessing in the treatment and prevention of infectious diseases but their excessive use in agriculture and poultry leads to the development of antibiotic resistance. Antibiotic resistance is a global life-threatening issue that can cause millions of deaths in future. Governments are trying to overcome this problem by using different strategies but these methods are not enough to overcome antibiotics resistance because microorganisms are modifying themselves and develop resistance rapidly so there is a need to adopt scientific strategies to overcome this problem.

### References

- [1] Hao H, Cheng G, Iqbal Z, Ai X, Hussain HI, Huang L, Dai M, Wang Y, Liu Z, Yuan Z. Benefits and risks of antimicrobial use in food-producing animals. *Frontiers in microbiology*. 2014 Jun 12;5:288.
- [2] Levy SB, Marshall B. Antibacterial resistance worldwide: causes, challenges and responses. *Nature medicine*. 2004 Dec;10(Suppl 12):S122-9.
- [3] Zaman SB, Hussain MA, Nye R, Mehta V, Mamun KT, Hossain N. A review on antibiotic resistance: alarm bells are ringing. *Cureus*. 2017 Jun;9(6).
- [4] Qureshi MA, Fatima Z, Muqadas SM, Najaf DE, Hunsain M, Moeed HA, Ijaz U. Zoonotic diseases caused by mastitic milk. *Zoonosis, Unique Scientific Publishers, Faisalabad, Pakistan*. 2023;4:557-72.
- [5] Prashanth K, Vasanth T, Saranathan R, Makki AR, Pagal S. Antibiotic resistance, biofilms and quorum sensing in Acinetobacter species. *Antibiotic resistant bacteria: a continuous challenge in the new millennium*. 2012 Apr 4:179-212.
- [6] Southon SB, Beres SB, Kachroo P, Saavedra MO, Erlendsson H, Haraldsson G, Yerramilli P, Pruitt L, Zhu L, Musser JM, Kristinsson KG. Population genomic molecular epidemiological study of macrolide-resistant *Streptococcus pyogenes* in Iceland, 1995 to 2016: identification of a large clonal population with a pbp2x mutation conferring reduced in vitro  $\beta$ -lactam susceptibility. *Journal of clinical microbiology*. 2020 Aug 24;58(9):10-128.
- [7] Li T, Liu C, Lu J, Gaurav GK, Chen W. Determination of how tetracycline influences nitrogen removal performance, community structure, and functional genes of biofilm systems. *Journal of the Taiwan Institute of Chemical Engineers*. 2020 Jan 1;106:99-109.

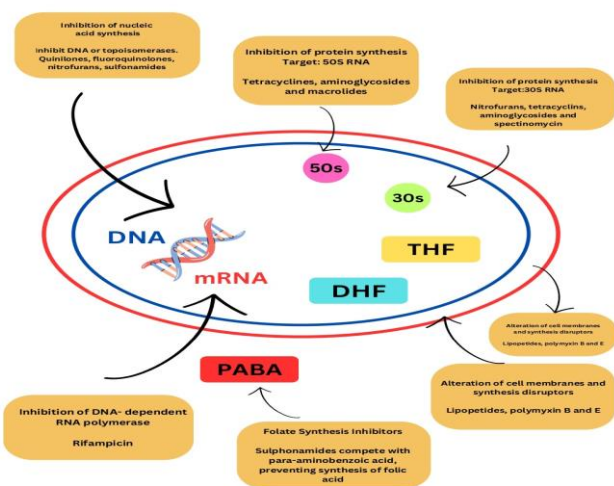


Fig. 1: Modifications in bacteria

### Mechanism of Antibiotics Resistance

Many bacteria acquire antibiotic resistance through different mechanisms such as modifications in the receptor sites and the origins where antibiotics target [5]. Most commonly resistance occurs by changing in the ribosomal target. Penicillin resistance occurs because of variations in the PBPs in beta-Lactamase enzymes in various bacteria [6]. Some bacteria produce enzymes that inactivate antibiotics. Some bacteria change the inner or outer

- [8] Guo R, Li K, Qin J, Niu S, Hong W. Development of polycationic micelles as an efficient delivery system of antibiotics for overcoming the biological barriers to reverse multidrug resistance in *Escherichia coli*. *Nanoscale*. 2020;12(20):11251-66.
- [9] Culp EJ, Waglechner N, Wang W, Fiebig-Comyn AA, Hsu YP, Koteva K, Sychantha D, Coombes BK, Van Nieuwenhze MS, Brun YV, Wright GD. Evolution-guided discovery of antibiotics that inhibit peptidoglycan remodelling. *Nature*. 2020 Feb 27;578(7796):582-7.
- [10] Ranjalkar J, Chandy SJ. India's National Action Plan for antimicrobial resistance—An overview of the context, status, and way ahead. *Journal of family medicine and primary care*. 2019 Jun 1;8(6):1828-34.
- [11] O'Neill J. Tackling drug-resistant infections globally: final report and recommendations.