

## Antibiotic Resistant Bacteria: A Global Menace

**Kumar S and Tripathi M\***

Centre of Excellence, Department of Microbiology, Dr Ram Manohar Lohia Avadh University, Faizabad (UP), India

**\*Corresponding author:** Manikant Tripathi, Centre of Excellence, Department of Microbiology, Dr Ram Manohar Lohia Avadh University, Faizabad (UP), India, Email: manikant.microbio@gmail.com; shailendra.microbio@gmail.com

### Mini Review

Volume 1 Issue 3

**Received Date:** October 05, 2017

**Published Date:** October 09, 2017

### Abstract

Antibiotic is a secondary metabolite and responsible for destruction or prevention of bacterial growth. The bacteria resistant to the available antibiotic(s), referred as antibiotic resistant. Antibiotic resistance threatens the effective prevention and treatment of infectious diseases caused by bacteria. It happens when bacteria are exposed to several antibacterial drugs inappropriately. Microorganisms that develop antimicrobial resistance to several antibiotics of different classes are also referred as “superbugs”. Due to antimicrobial resistance, the drugs become ineffective and infections turn chronic in the human body. These resistant microorganisms are found in animals, food, air, water, and soil. They can spread from person to person. The major causes of antimicrobial resistance are misuse or overuse of antibiotics, use of antibiotics without medical prescription, poor infections control and sanitary conditions. Antimicrobial resistance occurs naturally through genetic changes and/ or exchanges. Such resistance development increases the cost of treatment and further, it requires more intensive care. Public awareness programs, appropriate use of antibiotics, proper control of infections, and the most important, the coordinated efforts to minimize the emergence and spread of antibiotics resistance are required.

**Keywords:** Antibiotics; Disease; Microorganisms; Superbugs; Antibiotic resistance

### Introduction

Antibiotic resistant bacteria are those microorganisms which have developed resistance to few antibiotics that generally kill the bacteria. The resistant bacteria are not destroyed even after antibiotics treatment and thus their growth occur in infected person. It is major problem in several areas such as medical and agricultural developments [1]. Antibiotic resistance is responsible for many human deaths. The major cause of antibiotic resistance are inappropriate and excessive of antibiotics, prolonged or repeated treatment with antibiotics, direct

contact with infected person or object that has been contaminated with antibiotic resistant bacteria, etc. It is important to prevent the spread of resistant bacteria to others. There are several ways for spread of antibiotic resistance: the antibiotic manufacturing pharmaceutical industries release large quantities of antibiotics into the environment, during wastewater treatment, presence of antibacterial compounds in soaps and other products contribute to antibiotic resistance, drinking contaminated water [2]. Several bacteria oppose the action of certain

antibiotics due to genetic changes, rendering the antibiotics ineffective [3].

### Mechanisms of Antibiotic Resistance in Bacteria

Antibiotics are powerful tools that fight against bacterial infections. It work in two ways, bactericidal (kills the bacteria) and bacteriostatic (prevents the bacteria from dividing). However, many bacteria have now developed the ability to become resistant to antibiotics such as methicillin resistant *Staphylococcus aureus*. There are several mechanisms followed by microorganisms for attaining multiple antibiotics resistance, the major mechanisms are enzymatic destruction or inactivation of antibiotics, decreased cell wall permeability to antibiotics, altered antibiotic, rapid efflux mechanisms to remove antibiotics, misuse or overuse of antibiotics, increased mutation rate as a stress response, etc. [4,5]. There are several multiple antibiotics resistance bacteria are reported for example, *Staphylococcus* sp., *Salmonella typhimurium*, *Mycobacterium tuberculosis*, *Escherichia coli*, etc. The antibiotic resistance genes from one bacterium are transfer to another one through horizontal gene transfer and so new generations of antibiotics resistant bacteria are produced [6].

The epidemiology of antibiotic-resistant microbes at the human-animal-environmental interface involves complex systems that include transmission of resistant bacteria, as well as resistance genes and the impact of antibiotic-selective pressures in animals, humans, and environment [7]. Various resistance mechanisms are continuously emerging and spreading globally, resulting in increased death, disability, and treatment costs of infections [7].

### Prevention of Antibiotic Resistance in Bacteria

There are several ways that can be adopted to prevent the development of antibiotic resistance in bacteria such as (i) avoid antibiotic use without medical prescription, (ii) the choice and dosage of antimicrobials are appropriate, (iii) use of appropriate antibiotic for infection instead of broad spectrum antibiotics, (iv) avoid constant use of antibiotics and public awareness activities regarding antimicrobial resistance, (v) antibiotics should be the last option of treatment not the first because most common infections will get better by themselves through time, bed rest and healthy intake, etc. [8]. Moreover, the antibiotic resistance can also be prevented through practicing good hygiene such as, washing of hands or use

of alcohol based sanitizer, throwing disposable household waste with regular garbage, etc. A global action plan in 2015 has been adopted by The World Health Assembly to restrict antibacterial resistance [9]. Several researchers have been working on antibiotic resistance management [10,11].

### Conclusions

The development of antibiotic resistance in bacteria may be restricted by the use of appropriate antimicrobial compound against an infection, select an antibiotic which targets the specific organism, rather than relying on a broad-spectrum antibiotics, complete an appropriate course of antibiotic treatment, avoid prolong use of antibiotics, use an appropriate antibiotic dose for eradication, discarding any leftover medicine properly after completed course of treatment. The governments are also involved in many public health awareness programs such as educating the public regarding regulated use of antibiotics. In future, it is necessary to discover new antibiotics to overcome the threat of antibacterial resistance.

### References

1. Prasad R, Murthy SK, Prasad R, Gupta V, Lata S (1996) Multidrug resistance: an emerging threat. *Curr Sci* 71(3): 205-213.
2. Elbossaty WF (2017) Antibiotic drugs and multidrug resistance bacteria. *Int J Pub Health Safe* 2(3).
3. Bennett PM (2008) Plasmid encoded antibiotic resistance: acquisition and transfer of antibiotic resistance genes in bacteria. *Br J Pharmacol* 153(1): 347-357.
4. Li XZ, Nikaido H (2009) Efflux-mediated drug resistance in bacteria. *Drugs* 69(12): 1555-1623.
5. Stix G (2006) An antibiotic resistance fighter. *Sci Am* 294(4): 80-83.
6. Hussain T (2015) Pakistan at the verge of potential epidemics by multi-drug resistant pathogenic bacteria. *Adv Life Sci* 2(2): 46-47.
7. Purohit MR, Chandran S, Shah H, Diwan V, Tamhankar AJ, et al. (2017) Antibiotic resistance in an Indian rural community: a 'one-health' observational study on commensal coliform from humans, animals, and water. *Int J Env Res Public Health* 14(4): 386.

8. Tortora GJ, Funke BR, Case CL (2010) Microbiology An Introduction, Antimicrobial Drugs Pearson Education Inc 574-576.
9. World Health Organization (2015) Antimicrobial Resistance Draft Global Action Plan on Antimicrobial Resistance.
10. Michael CA, Dominey-Howes D, Labbate M (2014) The antibiotic resistance crisis: Causes, consequences and management. Front Public Health 2: 145.
11. Tong SYC, Davis JS, Eichenberger E, Holland TL, Fowler Jr VG (2015) *Staphylococcus aureus* infections: epidemiology, pathophysiology, clinical manifestations and management. Clin Microbiol Rev 28(3): 603-661.