Advanced Engineering Days

aed.mersin.edu.tr

Antibiotic Resistance: How it develops and affects the public health

Neslihan Çiflik *[1], **Furkan Ayaz** [1,2]

[1]*Mersin University, Biotechnology Department, Türkiye, neslihanciflik1@gmail.com*
[2]*Mersin University, Biotechnology Research and Application Center, Türkiye, furkanayaz@mersin.edu.tr*

Cite this study: Çiflik, N., & Ayaz, F. (2022). Antibiotic Resistance: How it develops and affects the public health. 4th Advanced Engineering Days, 43-44

Keywords
Antibiotics,Antibiotic resistance, Bacteria, Infection

Abstract

The inclusion of antibiotics in clinical practice was considered one of the most beneficial methods in the fight against infectious diseases. The incorporation of antibiotics into clinical practice has saved the lives of many patients. At the same time, the ability of bacteria of the same species to survive at concentrations of antibiotics that inhibit or kill other bacteria has created the bacterial resistance to antibiotics, called the antibiotic's ability to survive. Resistant bacteria are more advantageous than non-resistant bacteria, and only the presence of resistant bacteria is detected in the antibiotic containing environment over time. In this proceeding review we will be discussing the antibiotic resistance and its possible effects on the public health systems.

Introduction

The increase in antibiotic resistance, which causes hundreds of thousands of deaths in a year, has been identified as a global health threat [1]. In addition, according to a recent report, it is estimated that antibiotic resistance will cause approximately 300 million premature deaths by 2050 and cause serious damage to the economy [2, 3]. This situation leads to the emergence of almost incurable infections by destroying the large areas of treatment of antibiotics, resulting in the absence of a reliable and different option in the treatment of infected patients. Many antimicrobial compounds are produced naturally, and the survival mechanisms of bacteria living with these compounds have developed. These organisms are called "self-resistant" because they are resistant to too many antimicrobials. Another resistance is the term "acquired" resistance to a population of bacteria sensitive to the antimicrobial compound in clinical settings [4].

Results

From an evolutionary perspective, bacteria use two important genetic methods to resist antibiotic attacks. The first of these is called antibiotic resistance caused by mutations and the other is called horizontal gene transfer [5]. Mutation resistance develop when antibiotics are given to a population of bacteria that are not resistant to the antibiotic over time mutations occur in some of the genes where the antibiotic exerts its effect [6]. In antibiotic containing environment, antibiotic-resistant bacteria became more dominant than non-resistant ones, leading to the extinction of non-resistant bacteria. These mutations in genes have enabled bacteria to develop resistance to antibiotics [7].

It should not be overlooked that with the emergence of resistance to all antibiotics used in clinical methods, the possibility of developing resistance to a new antibiotic in the future is high. In clinical practice, antibiotics are used primarily to prevent the spread of infection rather than to combat bacterial infection [8]. If antibiotic use is compromised, there are not many options for an infected patient other than palliative care. As another way, bacterial infections can be avoided and it is thought that different methods can be developed apart from the use of prophylactic antibiotics.

Creating a new antibiotic is extremely costly. Discovery of a new antibiotic in clinical practice is a constantly demanded situation. The reason for this is that it is thought that the effects of current methods will be lost. The use of all antibiotics should be clinically minimized so that resistance formation does not progress so rapidly [9].

Discussion

In summary, procedures should be established to reduce the effects of antibiotic-resistant bacteria arising from the use of antibiotics. Places where antibiotics are frequently used in clinical settings should be made hygienic and should be going regularly through infection control systems.

If the use of antibiotics becomes endangered, it will be impossible to offer aseptic conditions for long-term recovery times. A different prophylactic procedure will be required for major surgical procedures. Another method that can be developed is the production of vaccines that will protect against the most common nosocomial infections. Resistant bacterial species pose a global problem as they can spread very quickly throughout the world. Trainings should be applied under the name of raising awareness about this important problem.

References

1. O'Neill, J. (2014). Review on antimicrobial resistance. *Antimicrobial resistance: tackling a crisis for the health and wealth of nations*, *2014*(4).
2. CDC, A. (2019). Antibiotic resistance threats in the United States. *US Department of Health and Human Services: Washington, DC, USA*.
3. O'neill, J. Antimicrobial resistance: tackling a crisis for the future health and wealth of nations. London: Review on Antimicrobial Resistance; 2014.
4. Wayne, P. A. (2008). Performance Standards for Antimicrobial Susceptibility Testing, Ninth Informational Supplement.
5. Munita JM, Arias CA. (2016). Mechanisms of Antibiotic Resistance. Microbiol Spectr. 4(2). VMBF-0016-2015. PMID: 27227291; PMCID: PMC4888801.
6. Woodford, N., & Ellington, M. J. (2007). The emergence of antibiotic resistance by mutation. *Clinical Microbiology and Infection*, *13*(1), 5-18.
7. Martínez, J. L. (2012). Bottlenecks in the transferability of antibiotic resistance from natural ecosystems to human bacterial pathogens. *Frontiers in microbiology*, *2*, 265.
8. Nordmann, P., & Poirel, L. (2002). Emerging carbapenemases in Gram-negative aerobes. *Clinical Microbiology and Infection*, *8*(6), 321-331.
9. Toleman, M. A., Bennett, P. M., & Walsh, T. R. (2006). IS CR elements: novel gene-capturing systems of the 21st century?. *Microbiology and molecular biology reviews*, *70*(2), 296-316.