Mini Review

iMedPub Journals
www.imedpub.com

Advanced Techniques in Clinical Microbiology

2021
Vol.3 No.2:107

Based on Clinical Trials: Evolution of Plasmid-Mediated Antibiotic Resistance

Manmath Kumar Rout*

JRF, Department of Plant Biotechnology, Regional Plant Resource Centre, Bhubaneswar, Odisha, India

Abstract

Antibiotic-resistant infections are a major concern in clinical settings because they significantly raise the risk of death in severely ill patients. Bacterial plasmids drive the horizontal transfer of antibiotic resistance genes among bacteria, boosting resistance evolution. Importantly, there are specific relationships between resistance plasmids and bacterial clones that are particularly beneficial in clinical settings. However, the variables that contribute to these organisations' success are uncertain. In vitro research suggests that plasmids cause fitness costs in bacteria, and that these costs are mitigated over time by compensatory mutations. Some researchers propose that plasmid-imposed costs and subsequent compensatory adaptations may dictate the viability of plasmid-bacteria interactions in clinical settings, hence determining antibiotic resistance development in vivo.

Keywords: Antibiotic, Plasmid, MDR

Received: October 01, 2021, **Accepted:** October 16, 2021, **Published:** October 24, 2021

***Corresponding author:**
Manmath Kumar Rout

manamathkumarrout5@gmail.com

JRF, Department of Plant Biotechnology, Regional Plant Resource Centre, Bhubaneswar, Odisha, India

Citation: Rout MK (2021) Based on Clinical Trials: Evolution of Plasmid-Mediated Antibiotic Resistance. Adv Tech Clin Microbiol. Vol.3 No.2:107

Introduction

The transfer of antibiotic resistance genes contained on plasmids is known as plasmid-mediated resistance. Plasmids can be conjugated between bacteria of the same species or between bacteria of different species. Plasmids frequently include numerous antibiotic resistance genes, which aids in the spread of multidrug resistance (MDR). Antibiotic resistance mediated by MDR plasmids significantly limits treatment choices for Gram-negative bacteria infections, particularly those caused by the Enterobacteriaceae family. Selective pressure from antibiotic use in human and veterinary medicine has aided the global spread of MDR plasmids. Antibiotic resistance genes are carried by resistance plasmids by definition. They're typically accompanied by genes that code for virulence determinants, particular enzymes, or heavy metal resistance. Resistance cassettes frequently contain multiple resistance genes. Antibiotic resistance genes discovered on plasmids confer resistance to the majority of antibiotic families currently in use, including beta-lactams, Fluoroquinolones, and Aminoglycosides [1]. Recombination systems are frequently used to rearrange resistance genes or complete resistance cassettes on the same plasmid or to shift them to a different plasmid or chromosome. Integrons and transposons are examples of such systems. The majority of resistance plasmids are conjugative, which means they encode all of the necessary components for plasmid transfer to another bacteria. Smaller plasmids (typically less than 10 kb) can be mobilised and transferred by a conjugative plasmid (typically greater than 30 kb) [2]. The ability of a bacterium to tolerate the effects of an antibiotic is known as antibiotic resistance. It's a particular kind of drug resistance. Antibiotic resistance arises naturally through random mutation, but it can also be created by putting a population under evolutionary stress. Once such a gene has been created, bacteria can use plasmid exchange to transfer genetic information horizontally (across people) [3]. A bacterium that has many resistance genes is known as multiresistant or, more colloquially, a superbug. Causes Antibiotic resistance can also be induced in a microbe artificially via transformation methods. This could be a good technique to get artificial genes into a microbe. Antibiotic resistance is a result of natural selection in evolution. Antibiotic action is a form of environmental pressure; bacteria that have developed a mutation that allows them to survive will continue to multiply. They will then pass this feature on to their children, resulting in a generation that is entirely resistant. Several studies have shown that antibiotic usage patterns have a significant impact on the number of resistant organisms that emerge. Overuse of broad-spectrum antibiotics, such as second- and third-generation cephalosporins, hastens the emergence of methicillin resistance significantly. Incorrect diagnosis, needless prescriptions, improper patient use of antibiotics, and the use of antibiotics as livestock food additives for growth promotion are all factors that contribute to resistance. The bacterial protein LexA has recently been shown to play a significant role in the acquisition of bacterial mutations, according to researchers. Pathogens that are resistant to antibiotics one of the most common resistant pathogens is Staphylococcus aureus (also known as "Staph aureus" or "Staph infection") [4]. It is

exceedingly adaptive to antibiotic pressure and can be found on the mucous membranes and skin of around a third of the population. Antibiotic resistance is becoming more common in hospitals, and infections caused by drug-resistant organisms result in higher morbidity and mortality. Resistance plasmids play an important role in the propagation of resistance inside and between the veterinary and human healthcare systems. Resistance genes move quickly across bacterium cells of same, but also distinct species. Antibiotic resistance genes are found in almost all plasmids used to transfer DNA. Scientists cultivate bacteria in the presence of antibiotics after they have been treated with plasmids. Only plasmid-containing cells will live, develop, and reproduce [5].

Conclusion

Plasmids frequently have mechanisms for transferring the entire plasmid to different bacteria. This means that by picking up a single plasmid, a bacterium can become resistant to many antibiotics at the same time. They become multidrug resistant as a result. Furthermore, plasmids usually contain genes that regulate bacterial pathogenicity. Multidrug-resistant plasmid-carrying pathogenic bacteria have become more common and are now causing big difficulties all over the world. Plasmids are essential for bacterial evolution and adaptation to changing environments because they contain genes that confer favourable characteristics to the bacterial cell. In a single bacterial cell, different forms of plasmids can coexist. A plasmid is a tiny extrachromosomal DNA molecule that can replicate independently of chromosomal DNA and is physically isolated from it. In molecular cloning, artificial plasmids are commonly utilised as vectors to induce the replication of recombinant DNA sequences within host organisms.

References

1. Alekshun MN, Levy SB (2007) Molecular mechanisms of antibacterial multidrug resistance. Cell 128: 1037-50.
2. Rozwandowicz M (2018) Plasmids carrying antimicrobial resistance genes in Enterobacteriaceae. J Antimicrob Chemother 73: 1121-37.
3. Goldstein AL, McCusker JH (1999) three new dominant drug resistance cassettes for gene disruption in Saccharomyces cerevisiae. Yeast 15: 1541-53.
4. Heuer H, Smalla K (2012) Plasmid's foster diversification and adaptation of bacterial populations in soil. FEMS Microbiology Reviews 36: 1083-1104.
5. Fluit AC, Schmitz FJ (2004) Resistance integrons and super-integrons. Clin Microbiol Infect 10: 272-88.