IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, June 2024

Role of Free Plasmid and it's Uptake in AMR Via Horizontal Gene

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Abstract: *Even while clinical settings constitute a key factor in the present worldwide spread of antibiotic resistance, complicated ecological processes will determine what happens to antibiotic resistance genes and bacteria once they are discharged into the environment. Horizontal gene transfer is a common phenomenon in microbial communities that can significantly aid in the spread of antibiotic resistance genes (ARGs) over ecological and phylogenetic barriers. Plasmid transfer in particular has become a growing source of worry due to its shown involvement in facilitating the spread of ARGs. Plasmid transfer is a multi-step process that is susceptible to several influences. Stresses resulting from environmental contaminants are one of the major factors influencing plasmid-mediated ARG transfer in the environment. Indeed, a wide range of established and newly discovered pollutants are currently finding their way into the environment, as demonstrated by the widespread presence of contaminants such as metals and medications in both aquatic and terrestrial environments. Consequently, it is critical to comprehend how and to what degree these stressors might affect the plasmid-mediated ARG dissemination. Many studies trying to comprehend how plasmid-mediated ARG transfer is affected by different environmental factors have been conducted over the previous few decades. The advancements and difficulties in research on how environmental stress controls plasmid-mediated ARG dissemination will be reviewed in this review. Particular attention will be paid to new contaminants such as emerging particulate matter like microplastics, metals and their nanoparticles, antibiotics and non-antibiotic pharmaceuticals, disinfectants and their byproducts, and metals. Insights into in situ plasmid transfer under environmental stressors remain limited despite prior efforts; they can be addressed by future research taking into account the condition of environmental contamination and multi-species microbial communities. The speedy identification of pollutants that facilitate plasmid transfer and those that may impede gene transfer processes can be facilitated by the establishment of standardized high-throughput screening tools in the future, in our opinion. Bacterial infections resistant to antibiotics are a major threat to public health. The emergence and spread of antibiotic resistance genes (ARGs) in the environment or in medical settings poses a major danger to the health of people and animals worldwide. The horizontal gene transfer (HGT) of ARGs is one of the main reasons why antibiotic resistance spreads in both in vitro and in vivo environments. It is commonly known that mobile genetic elements (MGEs) play a significant role in the spread of bacterial resistance. Plasmid-mediated conjugation transfer is the most common and effective way for microorganisms to transmit multidrug resistance, as most drug resistance genes are located on plasmids. While basic in vitro model systems have been the focus of experimental investigations into the mechanisms causing antibiotic resistance to spread, it's possible that these methods may not accurately reflect the horizontal gene transfer (HGT) of antibiotic resistance genes in practical circumstances. Improved models of resistance gene transfer and dissemination in vivo are thus necessary. By more closely simulating the conditions that arise in patients, the in vivo model facilitates a more thorough examination of the circumstances. This is essential for creating creative plans to stop the future spread of genes that cause antibiotic resistance. The purpose of this article is to provide an overview of the processes behind the transmission of antibiotic resistance genes, followed by an example of this dissemination in an in vivo model. Lastly, we go over the difficulties in preventing the spread of genes that confer antibiotic resistance as well as possible remedies.*

Keywords: Free Plasmid.

DOI: 10.48175/568