NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 6, ISSUE 12, Dec. -2020

A REVIEW ARTICLE: BACTERIAL PLASMIDS

MOHMMED LEFTA ATALA
Department of Biology, College of sciences, University of Baghdad.
Author for corresponding: mohammedlafta@hotmail.com

ABSTRACT:

Plasmids are genetic elements of extra chromosomal double stranded, the replication of plasmids is independently of the genomic DNA. Plasmids are integrate with chromosome to form episomes, also they vary from chromosomes when they tiny and code for gene that is not basic to existence of bacteria. Loss of plasmid not slay bacteria, while the existence of plasmids give interest for bacteria. The Plasmid of bacteria differ if the lesser it involved 846bp so long as include single gene. Other plasmids has up 500 genes, while the greater carry 1,674 genes. The plasmid owns sealed circular with super coiled form, but some plasmids as (Eg. Borrelia) are appear linear. Borrelia burgdorferi bacteria owns 17 plasmids, 2 of them are circular in addition to 9 are longitudinal molecule. The bacterial cell perhaps involved many of plasmids with one another. The copies numeral represent the digit of plasmids that present in one bacterial cell. The greater plasmid there is in lesser numbers (1-2), but the tiny plasmid perhaps it exist in rise copies numeral (~40). The plasmid that able to move out for new bacteria are named transferable.

KEYWORDS: Plasmid, bacterial plasmids, types of plasmids.

INTRODUCTION

The Plasmids are extra chromosomal DNA and they are identify in bacterial genus of Enterobacteriacae, also the plasmids are detect in lower eukaryotes cells like fungus (Cohen 1976; Couturier et al., 1988). Bauer, 1980 added that it is clear the plasmids are not necessary for a growth and other vital functions, thus, in many cases it lost with no lethal role on host cell. Plasmids are commonly existing in form of supercoiled, before alkaling lysis and electrophoresis, the plasmids are exist in longitudinal, open ring or supercoiled shape figure -1. A length of plasmid ranges between few kilo bases to some hundred kilo base. The small plasmids ordinarily exist in numerous copies, whilst the bigger molecules they have lesser copies (Tompkins, 1985). The Plasmids are fused to the chromosome which term the episomes as shows in figure -2. The great plasmid, named co integrated, perhaps enter in choppy split to form discrete unit. Like plasmids of Proteus mirabilis that unwind on detached piece in addition to transmit genes as genes of resistance to antimicrobial drugs (Brunton, 1986).

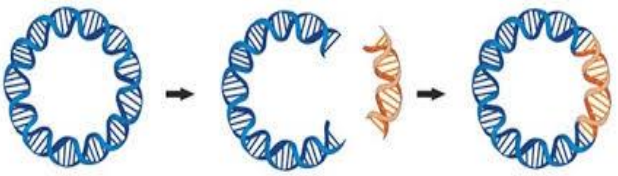

Figure: Fused plasmid in chromosomal DNA. (Brown, 2011)

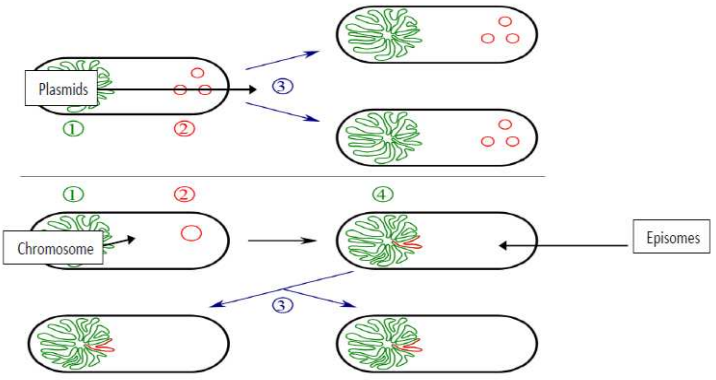

Figure: Super coiled shape of plasmids. (Brown, 2011)

CONJUGATION AND COMPATIBILITY:

Willetts and Wilkins, (1984) announced that the extra chromosomal genetic materials divided into that cause conjugation and non-conjugation. plasmids that cause conjugation are promote the sexual conjugation between bacteria Figure 3, by which the plasmid move from bacterial cell to other bacteria. Del Solar, (1998) added that the Conjugation are located on transfer or tra genes, which are not found on the non-conjugative type. A non-conjugative plasmids transfer with conjugated plasmids when they were in the same bacterial cells in the same time. Many types of conjugative plasmids can found in the single cell. Like E. coli which contain seven various plasmids. When they are found in single cell, various plasmids may be compatible. But the plasmids that are incompatible then go to be rapidly lost from the cell. The phenomenon of incompatibility is not well understood until now (Gratia and Thiry, 2003).

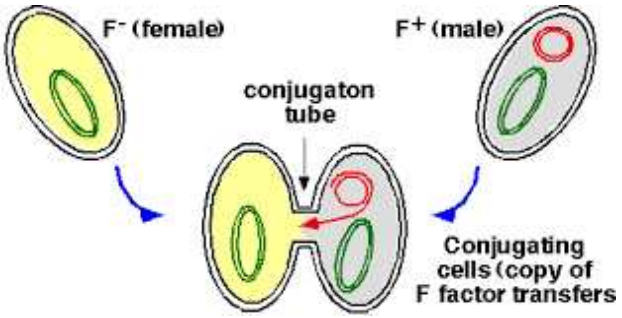

Figure: Conjugated bacterial cells. (Ryan, 2004)

BACTERIAL ARTIFICIAL CHROMOSOMES (BACS):

The bacterial artificial chromosome is orbicular deoxyribonucleic acid molecule figure 4. BACs involves a replicon region which is depends onto F factor contains oriS and repE coding an ATP-driven helicase along with parA, parB, and parC to support the segmentation. The Fertility factor is able to load a quarter of the bacterial chromosome, so, The bacterial artificial chromosomes are able to save a big DNA include reach above to 350 kb, although, much BAC library involve packaging about 120 kb. Novel BAC involved locations that support retrieval a cloning DNA. A DNA molecule is cloned into BACs in the same form to cloning in cloning vectors, DNA is bounded to a longitudinal vector after that enters to the host cell by electroporation step (Monaco, 1994; Palazzolo, 1990).

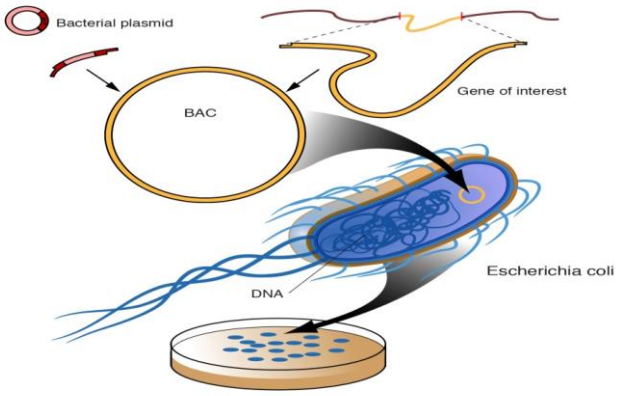

Figure 4: Bacterial artificial chromosomes. (http://www.genome.gov/Glossary/resources/bac_bacterial_artificial_chromosome.pdf**)**

KINDS OF PLASMIDS:

Levine, (1985) divided into Natural plasmids: These are found normally in bacteria, also Recombinant plasmids are others that loaded into bacteria for reveal of genetic studies.

Cryptic plasmids: which with no recognized functions. These plasmids perhaps play role in exclude the incompatible plasmids.

Integrative plasmids: These can inserts into chromosome which named episomes.

Metabolic plasmids: these involved genes which aid in the metabolism.

Virulence plasmids: these contains genes which appear ferocity features for cell.

Conjugation plasmid: which is ambidextrous to cause auto transport. This Inclined to be

greater owing to they must ingest genes encodes to auto transport. The conjugation plasmid in gram-positive bacterium are lesser from that in gram negative bacteria.

Suicide plasmid: It bring transmit for new cell yet no redouble more. They are really fill able plasmids.

R plasmids: It big conjugation plasmid which load antibiotic impedance genes. these plasmid can be conjugation or mobilization.

Colicin plasmid: It tiny plasmid that coding to genes that creat colicins (bacteriocines). Which kill bacteria.

F plasmids: they include genes that mediate subjective transfer by conjugation. Margaret and Elizabeth, (1999).

REPLICATION OF PLASMIDS:

A group of sequences important for independent replication to plasmids or genomic DNA is named replicon. Proliferation of plasmids need existence of oriV and tra genes. In addition to partition mechanism is important to transferring plasmids to daughter cells. Yonder second types of geminate; THETA geminate which exist in plasmid generality for trendy gram negative bacterium and rotary circle duplication that exist in a few plasmid of gram-positive bacterium. In order to personal transfer in new cell, the plasmid must be involved all of the origin of replication (ori) and transacting replicator (Rep) protein. The plasmid contains mono or more of ori. Double geminate regulation let plasmid to duplicate in different hosts. The benefits of multiple ori give it greater in size. Rep protein connect and catalyze the iteron, and it is represent the bound sites of Rep protein geminate. A Rep protein make as stimulator for replication also work as negative regulators of own synthesis (Masaki et al., 2015**;** Morgan, 2007)

As soon as the Rep proteins link the refined iterons, so the protein is benefit in curvature of DNA and strand segregation. Which give bound DNA helicase and primase, in order to permission the action of DNA polymerase. So, a plasmid obtain geminate.

Last of division, a daughter cell gain on a correct numbers of DNA. The second mode it murder the cells which no get a replicon. A previous way involved effective plasmid site with string which design plasmid in daughter cells or through monomerization of plasmid. A final order labor with make prolonged lived murder action and a low lived murder override action. Perhaps the child cell which not gain plasmid nor kill exceed action, the child cell finally obtain kills. The order is variant named toxin-antitoxin (TA) mechanisms, then as after isolation cells murder with intemperance order. A gene of toxin encode constant protein, while of the antitoxin it any the labile protein or a not translated, antisense RNA. Antitoxin offset a toxin through connecting with toxin or by block translation of toxin translation. When a child cell miss take of plasmid transcribe, will receive a TA compound in a cytoplasm. A antitoxin it quickly decadent with a child cell enzyme with neither replenished together because obscurity a plasmid. A toxin content remain long time, reacts together with cell and lead to murder or increase tardiness (Masaki et al., 2015; Alberts et al., 2002; Weigel et al., 1997).

PLASMID PROFILING:

The profile of plasmid is a method of separation of plasmids from bacteria then electrophoresis to gets DNA. Bacteria are grow in Luria broth at 37C^{o} with OD equal to 0.8 at 600 nm. A bacterial sol then centrifuged with 6000rpm into 7min. then the granule will dissolved in 1ml of TE buffer. The bacterial cell are break down by utilizing of lysis sol involved

3% SDS with 50 mM Tris (pH 12.6). A sol then heated to 55C° into 20 min. through water bath and remedy together with two volume of phenol-chloroform blend. The heating acts break down to RNA and longitudinal chromosome. The sol then suspended through vibration after that centrifuged at 6000 rpm, 4 C° into 15 minutes. Then the supernatant it collect of tube. The 5 mm thickness ranged 0.7-1% agarose gel is casting. 35 µl of specimen is blended with 10 µl of 0.25% tracking dye and transport for wells at the gel for electrophoresis. Specimen are electrophoresed into two hours after that soiled by ethidium bromide and spotted by UV source. The plasmid volume is limited with DNA indicator. Retraction analysis is complete to limit a longitudinal link among DNA marker and a plasmid mobility. The smaller plasmid is migrate ahead of chromosomes (Pyzik and Marek. 2013**)**.

REFERENCES:

1) Cohen, SN. (1976). Transposable genetic elements and plasmid evolution. Nature 263: 731-8.
2) Couturier, M.; Bex, F.; Bergquist, PL. and Maas, WK. (1988). Identification and classification of bacterial plasmids. Microbiol Rev.52:375-95.
3) Bauer, WR.; Crick, F. and White, JH. (1980). Supercoiled DNA. Soc. Am. . 243: 100-13.
4) Tompkins, L. (1985). DNA methods in clinical microbiology. In: Lenette EH, Manual of clinical microbiology (4th edition), Washington D.C.: American Society for Microbiology. p1023-28.
5) Brunton, J.; Clare, D. and Meier, MA. (1986). Molecular epidemiology of antibiotic resistance plasmids of Haemophilus species and Neisseria gonorrhoeae. Rev Infect Dis. 8:713-24.
6) Brown, TA. (2011). Introduction to Genetics: A Molecular Approach. Garland Science. p. 238.
7) Willetts, N. and Wilkins, B. (1984).Processing of plasmid DNA during bacterial conjugation. Microbiol. Rev. 48:24-41.
8) Del Solar, G,; Giraldo, R.; Ruiz-Echevarría, MJ.; Espinosa, M. and Díaz-Orejas, R. (1998). Replication and control of circular bacterial plasmids. Microbiol Mol Biol Rev. 62 (2):434-64.
9) Gratia, JP. Thiry, M. (2003). "Spontaneous zygogenesis in Escherichia coli, a form of true sexuality in prokaryotes". Microbiology.149 (9): 2571–84.
10) Ryan, KJ. Ray, CG.(2004). Sherris Medical Microbiology (4th ed.). McGraw Hill. pp. 60–4.
11) Monaco, A. P. and Larin, Z. (1994). YACs, BACs, PACs and MACs: artificial chromosomes as research tools. Trends Biotechnol. 12, 280–286.
12) Palazzolo, M. J.; Hamilton, B. A. and Ding, D. L. (1990). Phage lambda cDNA cloning vectors for subtractive hybridization, fusion-protein synthesis and Cre–loxP automatic plasmid subcloning. Gene 88, 25–36.
13) http://www.genome.gov/Glossary/resources/bac_bacterial_artificial_chromosome.pdf
14) Levine, MM.; Nataro, JP.; Karch, H.; Baldini, MM.; Kaper, JB. and Black, RE.(1985). The diarrheal response of humans to some classic serotypes of enteropathogenic Escherichia coli dependent on a plasmid encoding an enteroadhesiveness factor. J. Infect. Dis.152:550-9.
15) Margaret, C. M. S.; Elizabeth Sockett. (1999). Genetic Methods for Diverse Prokaryotes. Methods in Microbiology, vol. 29. Academic Press. pp. 75–77. ISBN 978-0-12-652340-9.
16) Masaki, S.; Zoe, K. Sanchez and Kazuhide, K.

(2015) .Genomic of microbial plasmids:classification and identification based on replication and transfer systems and host taxonomy. Review. Frontiers in microbiology. doi: 10.3389/fmicb.2015.00242

17) Alberts, B.; Johnson, A.; Lewis, J.; Raff, M.; Roberts, K. and Walter, P. (2002). Molecular Biology of the Cell. Garland Science. ISBN 0-8153-3218-1. Chapter 5: DNA Replication Mechanisms
18) Weigel, C. Schmidt, A.; Rückert, B.; Lurz, R. and Messer, W. (1997). "DnaA protein binding to individual DnaA boxes in the Escherichia coli replication origin, oriC". The EMBO Journal. 16 (21): 6574–83.
19) Morgan, DO. (2007). The cell cycle : principles of control. London: New Science Press. pp. 64–75.
20) Pyzik, E. and Marek, A. (2013). Plasmid profile analysis and evaluation of antibiotic susceptibility of Staphylococcus aureus strains isolated from table chicken eggs. Polish Journal of Veterinary Sciences.16(2): 307–312.