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Bacterial Transformation

Taagore Anandakumar.B*

*Department of Biotechnology, Vydehi Institute of Biotech Sciences (VIBS), Bangalore University, Karnataka-560066, India

Short Commentary

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*For Correspondence

Taagore Anandakumar.B:
Department of Biotechnology,
Vydehi Institute of Biotech
Sciences (VIBS), Bangalore
University, Karnataka-560066,
India

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ABSTRACT

Earlier the transformation used to take place for only unicellular organisms but nowadays the transformation takes place to multicellular organisms too. Many multicellular organisms have undergone transformation successfully such as drosophila, mice etc. The most common methods of genetic transformation are the plasmid method [1], the vector method and the gene gun method. The vector method and the plasmid method have a lot in similarity the vector method is used extensively like the plasmid method.

INTRODUCTION

Earlier the transformation used to take place for only unicellular organisms but nowadays the transformation takes place to multicellular organisms too. Many multicellular organisms have undergone transformation successfully such as drosophila, mice etc. The most common methods of genetic transformation are the plasmid method, [1] the vector method and the gene gun method. The vector method and the plasmid method have a lot in similarity the vector method is used extensively like the plasmid method.

The process in which the genetic transformation [2] takes place is a risky and expensive process. It involves the movement of material from one organism to another organism [3]. The process involves appropriate conditions such as temperature and pressure etc. The genetic transformation process involves high accuracy. Transferring of genetic material across many materials takes place in genetic transformation [4].

The process of genetic transformation can be done through biological, chemical or physical methods [5]. Efficient method of transformation and regeneration mechanisms is necessary for genetic

transformation [6]. The genetic material should move without any disturbance or damage to the DNA material, from outside of the cell to inside of the cell. The process of genetic transformation occurs at a very low frequency. The process takes place through a large number of bacteria. In this process of transformation we will regenerate the cells and select the DNA from it [7]. The movement of the transgenes through the cell wall takes place over here [8].

Genetic transformation helps in the development of abiotic and biotic stresses of the cells [9]. Most popular way of genetic transformation is the Electroporation method [10]. This is a low cost, simple and rapid of bacterial transformation. The expression of the transformed DNA varies from organism to organism [11]. Genetic transformation is helpful in generation of organism with useful qualities, such as plants, animals [12] etc. Even transgenic products such as transgenic potato can be obtained through bacterial transformation [13]. New methods to increase the speed, efficiency, reproducibility and safety are required [14]. Much achievement can be done through genetic transformation such as creation of new potato variety [15].

The transfer of genetic material in bacteria is different from that of the eukaryotes. Unlike eukaryotes bacteria do not exchange the entire genetic material; it exchanges a part of the genome. The process in which the exchange of the genome takes place is through transformation, transduction and conjugation. This is mainly a two step process where first the DNA is transferred than integrated into the genome [16]. Once the process of transformation takes place the altering of the recipient genetic material takes place. The process of genetic transformation takes place through the cell membrane. The transformation process is far more complex in eukaryotes than in prokaryotes. The genetic material is organized in membrane bound nuclei. The process of transformation takes place with the help of enzymes. The DNA first binds itself to the surface of the bacterial cell wall and passes to the cytoplasmic membrane via the enzyme DNA translocase. Both the strands of the DNA do not pass to the recipient bacteria. Only one strand passes and the other strand is degraded by nuclease in the process. The translocated single stranded DNA gets integrated into the bacterial chromosome. The process of transformation is different in gram positive bacteria and gram negative bacteria. The reason for this is the external structure of the bacterial cell wall. The structure and composition of the cell membrane varies between gram positive and gram negative bacteria. Gram negative bacteria require additional channel for the passage of DNA. This channel is formed with the help of enzymes such as secretin. The uptake of DNA sequence is non-specific. The uptake of specific DNA sequence is far more efficient than non-specific sequence uptake. Genetic transformation minimizes the space between the human and production requirement [17]. The transformation of DNA can take place through different physical methods into the specific genetic sequence [18].

Genetic DNA can be extracted through various methods such as the CTAB method [19] but it should be extracted in an accurate and safe manner. Efficient extraction of DNA can help in rapid genetic transformation of the transgenes through the cell wall [20].

Standard procedure should be applied for the transformation of DNA into the cell wall [21]. This process of genetic transformation was first discovered by Griffith [22]. The availability of target tissue is necessary for the gene transfer system [23]. The process of genetic transformation can be artificially done in the lab. The efficiency of genetic transformation can be enhanced by varying the different DNA to particle ratios [24].

The surfaces of bacteria such as E.coli are generally negatively charged due to phospholipids and lipopolysaccharides on its surface. DNA is negatively charged. Divalent cation functions by shielding the charges by coordinating the phosphate group and the other negative charges. In this manner it will help the DNA molecule to adhere to the cell surface. By making the cells come in contact with the divalent cations in cold condition it will weaken the cell surface structure and makes it more permeable to the DNA. The main factor that prompts the DNA to enter into the cell is the thermal imbalance caused by the heat-pulse. This compels the DNA to enter the cell either through pores or the damaged cell wall.

CONCLUSION

Many methods are being tested to improve the efficiency of genetic transformation such as the shock wave mediated transformation [25]. We are waiting for more advances to happen in the field of bacterial transformation.

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