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***Letter to Editor***

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# Vaccine production using plasmids of non-pathogen bacillus species against *Bacillus anthracis*

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**Abstract**

*Bacillus anthracis* (*B. anthracis*) is the etiological operator of Bacillus anthracis influencing the two people and creatures. Completely harmful types of B. anthracis convey two large plasmids: pXO1 and pXO2. Several studies have reported transformation of mentioned plasmids from this bacillus to non-pathogen species. Therefore, we can use these non-pathogens for decreasing dangers of work with anthrax bacillus when our aim is preparing vaccine against anthrax.

**Key words:** *Bacillus anthracis*, Non-pathogen species, Vaccine.

**Dear Editor**,

*Bacillus anthracis* (*B. anthracis*), the etiological operator causing anthrax, is a Gram-positive, spore-forming bacterium. It can be used in biologic attacks and has been a top bioterrorism concern since the 2001 anthrax assaults in the USA [1]. Fully virulent forms of *B. anthracis* carry two large plasmids: pXO1 and pXO2. The first plasmid that is pXO1 encodes anthrax toxins, and pXO2 encodes proteins that form the poly-D-glutamic acid capsule. Anthrax toxin (AT), including lethal toxin (LT) and edema toxin (ET) are exotoxins each composed of two proteins. The A component is either the lethal factor (LF, 89 kDa) or edema factor (EF, 90 kDa), and the B component is the protective antigen (PA, 83 kDa) [2]. LF is a zinc metalloprotease that inactivates mitogen-activated protein kinase kinases (MAPKK). EF is a calmodulin-dependent adenylyl cyclase that increases cAMP levels in the cells by creating cAMP from ATP. Meanwhile, PA is a non-toxic cell-binding component in charge of transporting LF and EF into the cell, where they exert their toxic impacts [3].

In *B. anthracis, B. thuringiensis*, and the emetic *B. cereus,* main virulence factors are placed extrachromosomally on large plasmids [4]. *B. anthracis* plasmids can without much of a stretch be exchanged for composing aims. For example, it is believed that a plasmid less isolates of *B. anthracis* is unclear from *B. cereus*. Although pXO1 and pXO2 are thought to be particular to *B. anthracis*, there are several reports of rare *B. cereus* strains harboring plasmids with similarity to these plasmids [5].

*B. cereus* strains that harbor pXO1 and pXO2-like plasmids, named *B. cereus* Biovar *anthracis*, have been segregated as the causative operators of anthrax-like infections in primates [5].

Similar *B. cereus* strains that create the anthrax toxins have been recognized as the etiological specialists of anthrax-like respiratory infections [6]. In any case, there were contrasts in malady introduction between *B. anthracis* and *B. cereus* infection [6].

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*B. cereus* strain G9241 is a typical strain about similarity of plasmids. It contains two virulence plasmids, pBCXO1 and pBC210, as well as pBClin29, a linear plasmid that harbors cryptic prophage genes. The plasmid pBCXO1 has high closeness to pXO1 and contains the poison genes pagA, lef, and cya. The amino acid sequences of PA, LF, and EF are 99.7%, 99%, 96% indistinguishable, separately, to their partners in *B. anthracis* [6].

According to these findings, we can use these non-pathogens for decreasing dangers of work with anthrax bacillus when our aim is preparing vaccine against anthrax. This vaccine can be safe for both vaccine production and its application.

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