



DNA Vaccines: Changing The Genetic Makeup Of Humanity

Description

INDIA: Invented by scientists in India, this is “the first plasmid DNA vaccine that has been authorized for human use” and purports to inject so-called ‘naked DNA’ under the skin of your arm. When inducted into the patient’s DNA, permanent changes to the germ-line will pass the genetic modifications to offspring. ? TN Editor

India last month began boasting that it has created – and its regulatory body approved – the world’s first DNA vaccine, ZyCoV-D.

The vaccine, developed by a company called Zydus Cadila, expects to have it available for use as early as next month, giving hope to a country that has suffered more than 447,000 deaths at the hand of the virus.

What is a DNA vaccine and could this new class of vaccination become the next tool in the world’s fight against COVID-19?

A DNA vaccine is a form of a software vaccine, explained Tel Aviv University’s Prof. Jonathan Gershoni.

A software vaccine is one in which scientists vaccinate with the blueprint of the virus – just the DNA or the RNA corresponding to the genes that code for the spike protein – injecting it in a palatable and effective way into the body. The cells then synthesize the viral protein, which leads to the production of antibodies against the viral spike.

This is as opposed to a hardware vaccine, which actually contains hardware, that is physical bits and pieces of the virus protein.

“You can have a hardware vaccine that consists of a killed virus, for example, or an attenuated virus,” Gershoni explained. “Or you can have a subunit vaccine as well, such as the vaccine for Hepatitis B, which is just purified spike protein.

“The immune system identifies the presence of the viral protein... and that stimulates the immune

system to respond and make highly specific targeted antibodies that inactivate the virus.”

All of the traditional childhood vaccines that exist today are hardware vaccines.

However, since the late 1980s, scientists began playing with the idea that there could be applications for injecting DNA or RNA directly – first, in trying to develop gene therapy, and more recently, in the development of what Gershoni calls software vaccines.

“We know that the information flow in biology goes like this: the genetic material is stored in a very stable molecule, double-stranded DNA,” Gershoni said. “However, the information that flows from the gene needs to be transcribed to create a disposable and intermediate genetic material in the form of RNA. So, RNA in the traditional sense, is simply a disposable copy of the DNA gene.”

However, it is the RNA and not the DNA that is able to interact with the protein manufacturing machinery, known as ribosomes. The ribosomes are what recognize the RNA and systematically translate the genetic material, which is written in the language of RNA, into the hardware – that is to say, the protein.

“The hardware is the protein and the instruction manuals, the recipes that tell us how to make these proteins, can be either in DNA or RNA,” he said. “DNA or RNA, therefore, fall under the category of software vaccines.”

In the beginning, scientists favored DNA because it is far less finicky than RNA, which breaks down easily. But on the other hand, the RNA is a more direct way of delivering the instruction manual because the ribosomes cannot interact with the DNA. As such, in systems that use DNA as the genetic material being transferred, the next required step, once the DNA has been delivered to the cells, is that those cells have to make RNA copies of the genes. Only then can the RNA copy of the foreign DNA be translated by the ribosomes to produce the target protein that can then stimulate the correct immune response.

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