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Editorial

Vaccination Against COVID-19: The Only Way Out

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Introduction

Vaccines are necessary for the prevention of coronavirus 2019 (COVID-19) disease, which is also helpful to protect high risk groups from complications. The mRNA-based vaccine is encapsulated with a lipid nanoparticle known to be mRNA-1273 encodes and stabilized with full-length spike protein present in severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the causative agent of COVID-19 disease.[1]

An efficacy of 94.1% for prevention from COVID-19 ailment and severe disease has been presented by mRNA-1273.[2] On the other hand safety concerns regarding temporary local and systemic side effects were neither identified nor addressed. Estimated vaccine effectiveness in preventing death was 72% during the period from day 14 through day 20 after the first dose, and for the period 7 or more days after the second dose, hospitalization reduced by 87%.[3]

Two messenger RNA (mRNA) vaccines are currently available in the United States, one developed by Pfizer/BioNTech (BNT162b2) stored at -70^0 c and the other by Moderna (mRNA-1273) stored at -20^o C. Oxford-AstraZeneca viral vector (genetically modified virus) Vaccines based on viral vector vary from conventional vaccine in the sense of not containing original antigens, rather using individual's own cells to produce them. Modified virus to be called the vector is used to present genetic code for antigen into the human cells, where in case of COVID-19, the spike proteins present on the envelope of virus. After infection these codes instruct human cells to produce plenty of antigen, which then activate immune response and vaccine acts as simulator as happens in case of natural infection with various pathogens especially the viruses. This is an advantage of activating a durable immune response by using T cells which present cellular immunity and B cells to produce antibodies. These vaccines are a lot more useful to developing countries because they can be stored in normal refrigerator at 2^0 to 8^{0}c. This explains that a portion of SARS-CoV-2 genetic code is shoot-up in the body that stimulates the body to start the synthesis of viral proteins only, instead of whole virus. This phenomenon sensitizes immune mechanism, enough to handle viral attack. Sputnik prepared in Russia also viral vector (genetically modified virus) can be stored in normal refrigerator at 2^0 to 8^{0}c. SinoPharm also viral vector, being developed in China can be stored in normal refrigerator at 2^0 to 8^{0}c. This vaccine exposes the immune system of body with deactivated particles of virus which does not execute serious complications of disease.[4]

Now vaccines have been made available throughout the globe. In these vaccines, instructions to make "spike" protein of SARS-CoV-2 are carried by mRNA. The spikes are actually prickly projections on the surface of the virus, which is structured like those rubber balls that dogs love to chase or like the quills of a porcupine.[5]

After injecting the vaccine, macrophages take up mRNA from and nearby injecting site and triggers these cells to synthesize spike protein, which is presented on the external surface of the macrophages and immune response is induce mimicking the fighting pathway with infections and protects us from natural infection with SARS-CoV-2. Enzymes in the body then degrade and dispose of the mRNA. There is not any involvement of live virus, nor allow any genetic material to approach the nucleus of the cells.

Although, these mRNA vaccines are used for the first

time at broader level in clinical practice, scientists have been working on mRNA vaccines for years, and despite this wonderful parody piece, saying that the technology is "obvious," in fact the breakthrough insight that put the mRNA inside a lipid coating to prevent it from degrading is quite brilliant — and yes, this may be the first time the New England Journal of Medicine has referenced a piece in The Onion.

The components of immunity protection include:

- Antibodies, which are proteins that circulate in the blood and recognize foreign substances like viruses, and neutralize them.
- Helper T cells help to recognize pathogens.
- Killer T cells kill pathogens.
- B cells make new antibodies when the body needs them.

All of the four components have been found to be present among people recovered from COVID-19. Though, the strength of immunity, duration and stability of immune response is not clear yet.

The efficacy noted after the first dose has raised questions about the provision of single dose to as many people as possible or people received first dose should be given the second dose as scheduled. Though it is pertinent that 95% people presented efficacy after second dose that boosted the immune response and important in providing durable immunity. Food and Drug Administration (FDA) and the Centre for Disease Control (CDC) have recommended proceeding with the two-dose schedule whenever possible. Only side effects reported are mild fever with slight aches and pains in the body in very few individuals after vaccination.[6]

Durability and protection with vaccines could not be promised as it is tested since the summer of last year only. Moderna vaccine presented the data of Phase I trial suggesting the life of neutralizing antibodies as around 4 months and then start declining over the time. Since there is no definite time line regarding the life of antibodies therefore it is not possible to predict the duration of protection with vaccines and need of booster doses However, both companies are developing vaccines that could be administered as boosters, and that also have coverage for emerging variants of SARS-CoV-2 less susceptible to vaccine inhibition.[3]

However, emerging evidence now strongly suggests that mRNA vaccine recipients are less likely to transmit infection to others. In a large observational study conducted in Israel, those who had been vaccinated had a 90% reduction in the risk of asymptomatic infection compared with those not vaccinated.[1] The CDC advises that those who are pregnant or lactating be offered the vaccine but data are limited regarding safety profile as few abortions are reported. Furthermore, among those who do get infection after vaccination, it appears that viral loads are lower than in infected people who have not been immunized. Lower viral loads most likely lead to reduced risk of transmission. Persons who become COVID 19 positive antibodies are reported to remain in the system of that infected person for four to six months but variation is seen from person to person, but they also must get themselves vaccinated to ensure long lasting immunity against this infection. There are two excellent reasons to recommend vaccination over herd immunity. The first is that immunization protects the individual from COVID-19, which is a potentially life-threatening disease. Second data serve as a reminder that many vaccines in wide use today powerfully protect against both disease and transmission so much so that infection control is one of the main motivators behind some vaccine policies. Researchers still don't know how long immunity lasts from the vaccines and if follow-up shots will be needed, especially to protect against new variants of COVID 19 virus. In coming months it is expected that whole world population will get vaccinated, which will bring the life back to normal.[2]

World Health Organization Director General Tedros Adhanom critiques the "shocking inequity in the vaccines distribution in the world" and demanded a fair distribution. Usually one in three persons living in high income countries have been vaccinated against COVID-19 whilst the number is one in 500 people amongst low income countries.

During the interim period, we need to strengthen the society by maintaining public health instructions including social distancing, wearing masks, washing hands, taking care of cough and respiratory hygiene, sidestepping crowds, and assuring good ventilation.

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