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COVID-19 Vaccines: A Path to Normalcy at HBCUs

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Abstract: ***The COVID-19 pandemic has affected virtually every aspect of human life. One of the hardest - hit sectors of American life has been the educational sector. Since SARS - CoV - 2 is an enormously successful pathogen, the decision to transition from in - person learning to a remote learning structure was justified and necessary. Historically Black Colleges and Universities (HBCUs) were particularly economically vulnerable academic institutions during the pandemic compared to non - HBCUs, given lower enrollments and funding disparities that have existed for over a century. According to many credible reports, the messenger ribonucleic acid (mRNA) vaccines from Moderna and Pfizer - BioNTech are safe and efficacious. mRNA vaccines are a departure from conventional vaccine technology that relied on attenuated or inactivated microbial pathogens. Instead, mRNA vaccines are nucleotide sequences packaged in a lipid - containing particle designed to stimulate human production of the SARS - CoV - 2 spike protein to activate human immune mechanisms to deal with future pathogenic challenges. The emergence of viable mRNA vaccines offers hope to reopen HBCUs; however, reopening must be coordinated and compliant with state and federal safety guidelines.***

Keywords: COVID-19; mRNA vaccine; HBCU; mitigation strategies

1. Introduction

COVID-19 is already one of the most devastating mass casualty events in our nation's history, and although there is light at the end of the proverbial tunnel, more work is required. HBCU students, staff, faculty, and administrators must get vaccinated as soon as possible. This article explores basic vaccine immunology and other COVID-19 vaccine issues. While all three vaccines circulating in the United States are efficacious and safe, this article focuses on the two efficacious and innocuous mRNA vaccines from Moderna and Pfizer - BioNTech [1 - 2]. This article also proffers recommendations for HBCUs as institutions prepare for the next academic year and strategies for future global health crises.

On May 15, 2020, the previous presidential administration, initiated Operation Warp Speed (OWS). While the initiative provided needed funding and other resources to accelerate the pace at which COVID-19 vaccines would be available to the public, OWS in no way was the sole precipitant in the production of the vaccines that will ultimately end the COVID-19 global pandemic. Scientific achievements never happen overnight and usually take the dedication of hundreds of scientists over a long period. It is important to note that messenger RNA (mRNA) vaccines have been the focus of immunologists for many years before the knowledge of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Experiments performed by scientists in the 1970s and 1990s paved the way for the mRNA COVID-19 vaccines to be administered to millions of people worldwide [3].

Quite simply, vaccines are designed to harmlessly expose our immune system to a pathogenic biomolecule without causing disease. Following the immunological presentation, both cell - mediated and humoral - mediated forces of the immune system meticulously coordinate the production of specific antibodies designed to detect and destroy the disease - precipitating substance. Additionally, the generation of specialized lymphocytes called memory T cells and memory B cells protect against disease in the event of subsequent exposure. Historically, viral vaccines have been prepared using several experimental strategies such as using viral peptides, live - attenuated viruses, viral vectors, or using inactivated viruses. The mRNA vaccine promotes cellular production of antigenic proteins, ultimately bringing about an immune response to fight COVID-19. Ongoing investigations are being conducted to determine the extent to which COVID-19 vaccines reduce the possibility of transmission events [4].

2. mRNA Vaccines

Almost twenty years ago, while working on my Ph. D. in Microbiology and Cell Science, I was asked to analyze different types of vaccines available or under investigation. The most intriguing vaccine strategy was the prospect of using messenger RNA to convert human cells into vaccine manufacturing plants [5]. The first approved mRNA vaccine to be utilized in the United States in 2020 is truly a magnificent achievement with enormous possibilities, not only for microbial pathogenic diseases but other diseases such as cancer [6 - 7] and autoimmune diseases [8]. A significant advantage of mRNA vaccines is their rapid production process since essentially all you need to create an mRNA vaccine is the genomic sequence of the viral pathogen. Specifically, mRNA vaccines contain ribonucleotides that encode a portion of the spike protein, the knob - like structure protruding from the viral surface. Unlike predecessor vaccines, mRNA vaccines do not pose the same health risks as previous vaccines. mRNA vaccines are produced in a cell - free system and therefore are much safer than earlier vaccines since the threat of cellular or viral contamination is virtually nonexistent [3].

Additionally, the selection of mRNA, as opposed to DNA or weakened virus, eliminates the possibility of gene integration with host chromosomes because mRNA does not enter the cell's nucleus. After you receive the intramuscular

injection of the COVID-19 vaccine in the deltoid muscle, the mRNA enters your cells via fusion of the vaccine's lipid nanoparticle protective coat and cell membranes (Figure 1). Once inside your cells, mRNA is converted into coronavirus spike protein using a process called translation. From a manufacturing and biological mechanism perspective, mRNA vaccines are incredibly safe. Most data indicate that following vaccination protocols and at least 14 days for immunity development that vaccines are approximately 99% effective at preventing hospitalizations and illness. Data from COVID - NET, a website that monitors the number of hospitalizations due to COVID-19 infections in the United States, show that at the same time vaccination rates increased, hospitalizations decreased [9]. A growing amount of evidence demonstrates that both the Moderna and Pfizer - BioNTech vaccines are safe for all racial and ethnic groups.

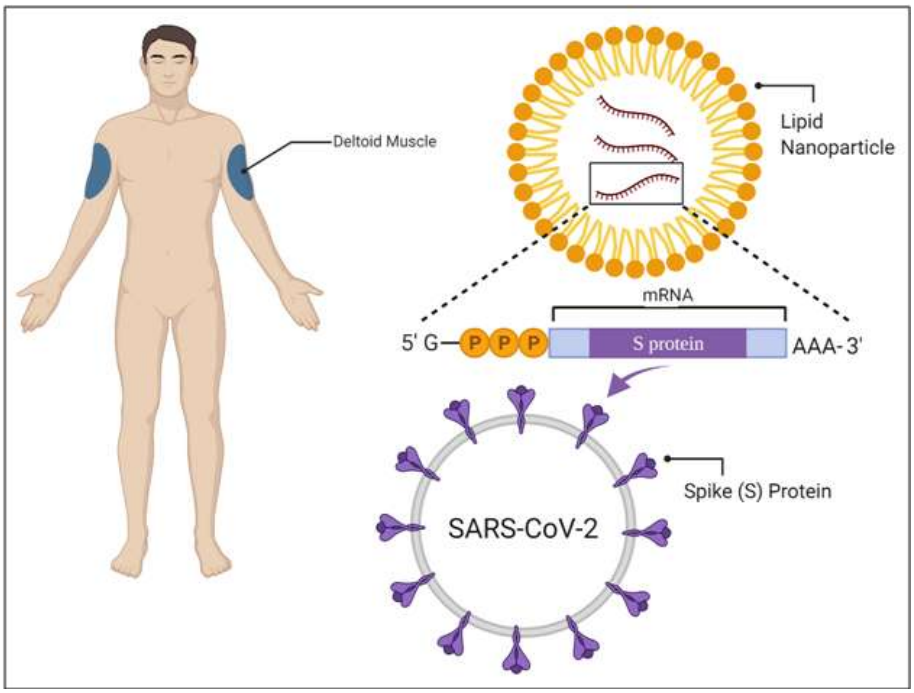

Figure 1: mRNA vaccine injection site and injection molecules

3. COVID-19 and Historically Black Colleges and Universities

I understand vaccine hesitancy from the perspective of HBCU populations. Historical references from mendacious medical maneuvers from the Tuskegee Experiment to Henrietta Lacks have created a rational skepticism of government - mandated medical programs. However, in this case, the eradication of SARS - CoV - 2 and the end of the pandemic can only be achieved if a large swath of the population from every racial/ethnic group is immunized. The currently available COVID-19 vaccines are not designed to prevent infection. Vaccines are designed to prevent disease, hospitalizations, and death. After you are vaccinated, you can and will still contract COVID-19; however, the severity of the disease in many cases will be manageable and not require a stay in a healthcare facility. At this inflection point, we must resist the temptation to rush into pre - pandemic operating procedures.

Moreover, I understand the urgency to return to normal in HBCUs. However, I contend that HBCU administrators must employ a measured, cautious approach that adheres to safety protocols proposed by experts in epidemiology, microbiology, and public health to minimize person - to - person transmission of the importunate viral enemy. Even as federal, state, and local governments ease restrictions on social distance guidelines, masks, and COVID-19 testing, I urge HBCUs to consider the utilization of specific virus mitigation strategies during the upcoming 2021 - 2022 academic year for certain events, especially those that require large gatherings such as commencements and sporting events. Moreover, the adoption of procedures to ensure that students, staff, faculty, administrators, and guests are vaccinated before campus entry is another method that should be examined to ensure public safety. For example, the creation of an electronic platform to document vaccinated employees and matriculants would promote transparency. HBCUs should also consider confining non - vaccinated persons to remote work and learning environments or require that non - vaccinated persons wear masks in public settings. In the absence of this level of transparency, the most prudent option is to mandate mask use in classrooms, libraries, dormitories, and other locations. In terms of dormitories, administrations must make special precautions to avoid room assignments that include the cohabitation of a vaccinated and unvaccinated individual.

Additionally, HBCUs should consider producing a public health database that presents the main mitigation strategies that helped keep the campus population safe during the pandemic. Also, the database should contain potential academic contingencies that will be implemented during the next public health crisis. National data show that African Americans lag behind other racial groups in terms of vaccination rates. This suggests that despite the unprecedented federal focus on reducing health disparities,

African Americans' needs are not being met. HBCUs should consider implementing a series of on - campus vaccination clinics for incoming or returning students, faculty, and staff. Proactive vaccination strategies such as vaccination clinics will increase vaccination percentages. A focus on installing or repairing ventilation systems in HBCU dormitories and buildings is necessary to counteract transmission of SARS - CoV - 2 and other infectious agents. Transparency regarding campus infection - related morbidity and mortality rates should also focus on HBCUs and be widely available on institutional media platforms. One feature of the vaccine that is not yet established understands how long immunity will last for humans after receiving the vaccines. It could be that following COVID-19 immunization; humans are immune to the pandemic virus on the scale of years. Alternatively, and more likely, adequate antibody production and therefore protection to COVID-19 will only last for about 6 - 10 months [10]. If the latter scenario is determined, it will call for another round of immunizations or booster shots in the fall semester or early spring semester.

4. Conclusion

Data suggests that mRNA vaccines are highly effective vaccines at preventing illness, hospitalizations, and mortality. Based on their design, mRNA vaccines can be developed faster than historical vaccine candidates and are much safer than other vaccine approaches because the risk of genomic recombination events is reduced. Moreover, since the development of the mRNA does not require eukaryotic cells, the probability of contaminating vaccine artifacts is virtually nonexistent. Lastly, just as in professional football or basketball, the game doesn't end in the third quarter. Neither does a pandemic end when politicians and administrators begin to repeal sagacious infection mitigation strategies. We must stay vigilant and continue to be directed by epidemiologic data until the probability of community spread is eradicated on our campuses. Then, and only then, will it be safe to resume normal activities at our great institutions.

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