

## BOOK CHAPTER | Vaccines &amp; Protection

## Vaccines and Health Protection in a COVID 19 Era.

**Ogundeinde Isaac Adeyinka,**  
Adjunct Lecturer, Yaba College of Technology  
Yaba, Lagos State, Nigeria  
**E-mail:** daddytwinsid@yahoo.com  
**Mobile:** +2348035760919

**Abstract**

The COVID-19 era has been a global period of suspended mental thought across the nations of the world. It's a period of lockdown when the entire world went into a collapsed state with the arrival of COVID-19 in China. It is a "stay at home" and "use face mask" era. While schools, research centres and churches were closed, markets and banks were kept open to business. Yet, COVID-19 cases continued to rise. It was an era that saw government across the world panic and disturbed. The COVID-19 era provided the world entirely a unique opportunity to create or strengthen its national laboratory system, establish hospitals in every region to reduce number of people travelling outside their country abroad for treatment, to invest in building capacity to develop antiviral medications and vaccines and to ensure better international health policies.

**Keywords:** COVID-19, Health, Vaccination, Protection, Policies

**Introduction**

A vaccine is a substance used to stimulate the production of antibodies and provide immunity against one or several diseases, prepared from the causative agent of a disease, its products, or a synthetic substitute, treated to act as an antigen without inducing the disease. The administration of vaccines is called vaccination. It is the most effective method of preventing infectious diseases. Vaccination is a simple, safe and effective way of preventing people against harmful diseases, before they come into contact with them. The first vaccine was introduced by British physician, Edward Jenner, who in 1796 used cowpox virus (vaccinia) to confer protection against smallpox, a related virus, in humans.

**Vaccines**

**Types of Vaccines:** Researchers have devised different types of vaccines.

**Weakened or attenuated,** vaccines consists of microorganisms that have lost the ability to cause serious illness but retain the ability to stimulate immunity. **Inactivated** vaccines are those that contain organisms that have been killed or inactivated with heat or chemicals.

Inactivated vaccines elicit an immune response, but the response often is less complete than with attenuated vaccines. Another other type of vaccine is a **subunit vaccine**, which is made from proteins found on the surface of infectious agents.

### **Coronavirus (COVID-19) Vaccines.**

A COVID -19 vaccine is a vaccine intended to provide acquired immunity against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19). Prior to the COVID-19 pandemic, an established body of knowledge existed about the structure and function of coronaviruses causing diseases like severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS). This knowledge accelerated the development of various vaccine platforms during early 2020. The initial focus of SARS-CoV-2 vaccines was on preventing symptomatic, often severe illness. On January 10, 2020 the SARS-CoV-2 genetic sequence data was shared through GISAID, and by March 19, the global pharmaceutical industry announced a major commitment to address COVID-19.

The COVID-19 vaccines are widely credited for their role in reducing the severity and death caused by COVID-19. Many countries have implemented phased distribution plans that prioritize those at highest risk of complications, such as the elderly, and those at high risk of exposure and transmission, such as healthcare workers. As at 13<sup>th</sup> January, 2022, 9.60 billion doses of COVID-19 vaccines have been administered worldwide based on official reports from national public health agencies. By December 2020, more than 10 billion vaccine doses had been preordered by countries, with about half of the doses purchased by high-income countries comprising 14% of the world's population. The coronavirus (COVID-19) vaccines are safe and effective. They give the best protection against COVID-19.

The first mass vaccination programme started in early December 2020 and the number of vaccinated doses administered is updated on a daily basis on the COVID-19 dashboard. The WHO Emergency Use Listing process determines whether a product can be recommended for use based on all the available data on safety and efficacy and on its suitability in low-and middle-income countries. Vaccines are assessed to ensure they meet acceptable standards of quality, safety and efficacy using clinical trial data, manufacturing and quality control measures.

### **Formulation**

Towards the end of 2020, about eleven of the vaccine candidates in clinical development uses adjuvants to enhance immunogenicity. An immunological adjuvant is a substance formulated with a vaccine to elevate the immune response to an antigen, such as the COVID-19 virus or influenza virus. Specifically, an adjuvant may be used in formulating a COVID-19 vaccine candidate to boost its immunogenicity and efficacy to reduce or prevent COVID-19 infection in vaccinated individuals. Adjuvants used in COVID-19 vaccine formulation may be particularly effective for technologies using the inactivated COVID-19 virus and recombinant protein-based or vector-based vaccines. Aluminum salts, known as "alum", were the first adjuvant used for licensed vaccines, and are the adjuvant of choice in some 80% of adjuvanted vaccines. The alum adjuvant initiates diverse molecular and cellular mechanisms to enhance immunogenicity, including release of proinflammatory cytokines.

### **Clinical Research**

COVID-19 vaccine clinical research uses clinical research to establish the characteristics of COVID-19 vaccines. These characteristics include efficacy, effectiveness and safety. Thirty vaccines are authorised for use by national governments, including eight approved for emergency or full use by at least one WHO-recognised stringent regulatory authority; while five are in Phase IV. 204 vaccines are undergoing clinical trials that have yet to be authorized.

Nine clinical trials consider heterologous vaccination courses. Thirty vaccines are authorised by at least one national regulatory authority for public use.

### **COVID-19 booster dose**

A booster dose of the COVID-19 vaccine is available for everyone aged 18 and over, and some people aged 16 and over, who have had 2 doses of the vaccine at least 3 months ago. Everyone aged 12 and over can get a 1<sup>st</sup> and 2<sup>nd</sup> dose of the vaccine.

### **Types of COVID-19 vaccines**

Several COVID-19 vaccines, including the Pfizer-BioNTech and Moderna vaccines, have been developed to use RNA to stimulate an immune response. When introduced into human tissue, the vaccine contains either self-replicating RNA or messenger RNA (mRNA), which both cause cells to express the SARS-CoV-2 spike protein. This teaches the body how to identify and destroy the corresponding pathogen. RNA vaccines often, but not always, use nucleoside-modified messenger RNA.

**Adenovirus vector vaccines:** These vaccines are examples of non-replicating viral vector vaccines, using an adenovirus shell containing DNA that encodes a SARS-CoV-2 protein. The viral vector-based vaccines against COVID-19 are non-replicating, meaning that they do not make new virus particle, but rather produce only the antigen which elicits a systemic immune response. Authorised vaccines of this type are the Oxford –AstraZeneca COVID-19 vaccine, the Sputnik V COVID-19 vaccine, Convidecia, and the Janssen COVID -19 vaccine.

**Inactivated virus vaccines:** inactivated vaccines consists of virus particles that are grown in culture and then killed using a method as heat or formaldehyde to lose disease producing capacity, while still stimulating an immune response. Authorized vaccines of this type are Chinese CoronaVac and the Sinopharm BIBP and WIBP vaccines; the Indian Covaxin, Russian CoviVac, theKazakhstani vaccine QazVac, and the Iranian COVIran Barekat.

**Subunit vaccines:** Subunit vaccines present one or more antigens without introducing whole pathogen particles. The antigens involved are often protein subunits, but can be any molecule that is a fragment of the pathogen. The authorized vaccines of this type are the Peptide vaccine EpiVacCorona, ZF2001, and MVC-COV1901.

**Intranasal Vaccines:** Intranasal vaccines target mucosal immunity in the nasal mucosa which is a portal for viral entrance to the body. These vaccines are designed to stimulate nasal immune factors, such as IgA. In addition to inhibiting the virus, nasal vaccines provide ease of administration because no needles (and the accompanying needle phobia) are involved. Nasal vaccines have been approved for other infections, such as influenza e.g. Flumist (USA).

The COVID-19 vaccines are the best way to protect yourself and others. Research has shown that the vaccines help:

- To reduce your risk of getting seriously ill or dying from COVID-19
- Reduce your risk of catching or spreading COVID-19
- Protect against COVID-19 variants.

The 1<sup>st</sup> dose gives you some level of protection from 3 or 4 weeks after you've had it. But you need 2 doses for stronger and longer-lasting protection.

### **Side effect and safety**

The COVID-19 vaccines approved for use have met strict standards of safety, quality and effectiveness. They can cause some side effects, but not everyone gets them. Any side effects are usually mild and should not last longer than a week, such as: a sore arm from the injection; feeling tired; a headache; feeling achy; feeling or being sick.

## Planning and Development

Vaccine development has been expedited via unprecedented collaboration in the multinational pharmaceutical industry and between governments.

Multiple steps along the entire development path are evaluated, including:

- The level of acceptable toxicity of the vaccine (i.e. its safety)
- Targeting vulnerable populations
- The need for vaccine efficacy breakthroughs
- The duration of vaccination protection
- Special delivery systems (such as oral or nasal, rather than by injection)
- Dose regimen
- Stability and storage characteristics
- Emergency use authorization before formal licensing
- Optimal manufacturing for scaling to billions of doses, and
- Dissemination of the licensed vaccine.

## Conclusion

Even after getting vaccinated, precautions must be taken continually to protect yourself, family, friends, relatives, neighbour and anyone else you may come in contact with. COVID-19 vaccines are highly effective, but some people will still get ill from COVID-19 after vaccination. There is also still a possibility that you may also pass the virus on to others who are not vaccinated. So, stay at least 1metre away from other people; Wear a properly fitted mask over your nose and mouth; Avoid poorly ventilated places and settings; Clean your hands frequently; Stay home if unwell and get tested; Stay informed about the virus in areas where you live, work and worship.

## References

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