

## ASSOCIATION OF AFRICAN UNIVERSITIES (AAU)

### THE COVID-19 DIARY

#### EPISODE THREE: VACCINES, VARIANTS AND HERD IMMUNITY

##### CONCEPT NOTE

This episode of *The COVID-19 Diary* presents insights into vaccine development, variants of COVID-19 and herd immunity. The intension is to equip science journalists with more insights into how vaccines are a critical and essential part in the fight to flatten the curve and ultimately halt the spread of the virus.

##### A. VACCINE DEVELOPMENT

Vaccines have been developed in record time in response to the outbreak of SARS-CoV-2 which was declared a pandemic by the World Health Organization (WHO) on 11<sup>th</sup> March 2020. Vaccines are often created after a thorough review to ensure that they comply with Food and Drug Administration (FDA) requirements. It passes through the research and development (R&D) stage, as scientists cooperate to build a vaccination rationale based on how an infectious organism causes disease. Then there are nonclinical trials, which help scientists learn more about how a vaccine works, as well as its safety and effectiveness in human applications. Scientists now submit all their findings to the FDA as an Investigational New Drug (IND) application. The vaccine is administered to thousands of people in the clinical development stage and is divided into three study phases: study one is conducted in a small group of people between 20 and 100 who have never been exposed to the disease under study and are otherwise healthy; study two involves more people with typically varying health statuses and demographic groups; and study three is conducted in a larger group of people with typically varying health statuses and demographic groups. Following the completion of these steps, scientists submit a Biological License Application (BLA) to the FDA, asking approval to distribute and commercialize the vaccine for human use<sup>1</sup>.

Vaccination, according to WHO, is the simplest and most effective way of protection from diseases. Thus, in the case of COVID-19, the efficacy of its vaccination programs on disease transmission, morbidity, and mortality is heavily dependent on the population's willingness to receive the vaccine. Despite the fact that developing new vaccinations takes years, some of the COVID-19 vaccines were produced in less than 18 months due to the urgent worldwide need to combat the pandemic. The WHO has validated a number of these COVID-19 vaccines for use under the Emergency Use Listing (a process which 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). Approximately 10 vaccines have received the WHO

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<sup>1</sup> <https://www.modernghana.com/news/1128895/no-microchip-in-covid-19-vaccines-microchip-assoc.html>

Emergency Use Listing as of mid-January 2022; 18 vaccines have been allowed for early or limited use, and 37 vaccines are in phase 3 clinical studies.

Vaccination services are available in almost all parts of the world, yet a section of the population refuse to be vaccinated due to a variety of reasons, including but not limited to fears about the vaccine's safety, uncertainty about its advantages, some religious and moral beliefs and a myriad of conspiracy theories. Immunization of children has also been a topic under discussion since the vaccination campaign began, particularly in Africa. Its trajectory the United States has reached a stage where clinical trials for younger children aged 6 months to 4 years have been completed and the FDA Advisory Committee is scheduled to review the EUA request for this population on February 15, 2022<sup>2</sup>.

## **B. VARIANTS OF SARS-CoV-2**

Scientists had anticipated that mutations or variations in the genome of SARS-CoV-2 would occur over time. This has been proven as the virus has replicated its genome, and RNA, billions of times while errors have been incorporated. These have resulted in mutations or variants<sup>3</sup>.

A variant refers to a mutation that occurs in a virus over time. Thus, every virus is susceptible to gradual changes even though most of these changes have little to no impact on the virus' properties. However, some changes may also affect the virus's properties, such as how easily it spreads, the associated disease severity, or the performance of vaccines, therapeutic medicines, diagnostic tools, or other public health and social measures<sup>4</sup>.

The three main concerns with any viral variant have been:

- *Does it spread easier? In other words, are we going to start seeing more cases?*
- *Does the variation or the mutation in the virus cause disease severity, or higher rates of death?*
- *What are its effects on vaccination and potentially therapeutics? With mutations, does the efficacy of vaccines decline?*

The emergence of SARS-CoV-2 variants that are posing an increased risk to global public health has prompted their characterization into *Variants of Interest* (VOIs), *Variants of Concern* (VOCs) and *Variants under Monitoring* (VUMs) in order to prioritize global monitoring and research, and ultimately to inform the ongoing response to the COVID-19 pandemic. Given the continuous evolution of the virus, these working definitions may be periodically adjusted, and those posing a diminishing risk relative to other circulating variants may be reclassified.

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<sup>2</sup> <https://emedicine.medscape.com/article/2500139-overview>

<sup>3</sup> <https://newsnetwork.mayoclinic.org/discussion/how-emerging-variants-could-affect-covid-19-testing-vaccines-and-spread/>

<sup>4</sup> <https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/>

- **A variant of interest** is a coronavirus variant that, compared to earlier forms of the virus, has genetic characteristics that predict greater transmissibility, evasion of immunity or diagnostic testing or cause more severe disease.
- **A variant of concern** has been observed to be more infectious, more likely to cause breakthrough or re-infections in those who are vaccinated or previously infected. These variants are more likely to cause severe disease, evade diagnostic tests, or resist antiviral treatment. Alpha, beta, gamma, and delta variants of the SARS-CoV-2 coronavirus are classified as variants of concern.
- **A variant under monitoring** is a new detected variant that may transmit more easily or cause more severe illness, but is not yet confirmed.
- **A variant of high consequence** is a variant for which current vaccines do not offer protection. As of now, there are no SARS-CoV-2 variants of high consequence.

### C. HERD IMMUNITY

Herd immunity', also known as 'population immunity', is the indirect protection from an infectious disease that happens when a population is immune either through vaccination or immunity developed through previous infection. It is like having a barrier of people who are protected to break the chain of transmission. In other words, you do not need every single person in population to necessarily be protected. According to Dr. Soumya Swaminathan, WHO's Chief Scientist who has been throwing more light on herd immunity, to achieve herd immunity in the population, for measles, you need about 95% of the people to have immunity or antibodies. In that case if 5% of children not vaccinated, these others actually have enough protection in the population to prevent the measles virus from actually going from one person to the next<sup>5</sup>.

For a highly transmissible virus like SARS-CoV-2, scientists believe that at least 60 to 70% of the population should have immunity to really break the chain of transmission. Herd immunity can be achieved faster through vaccination. If herd immunity is allowed to happen naturally (i.e. an infection is allowed to run wild in the population and infect a lot of people), it may be attained at some point but at a great human cost due to the length of time it would take and ultimately the number of people who would die in the process. The strategy, therefore, and naturally the better option, is to vaccinate enough people as a fast rate to achieve the immunity within the shortest possible time.

While encouraging an uptake of vaccination, the existing protocols such as continuous testing to detect and diagnose those infected for effective treatment, masking and social distancing need to be followed to slow down transmission, to control it, and to try to contain it.

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<sup>5</sup> <https://www.who.int/news-room/questions-and-answers/item/herd-immunity-lockdowns-and-covid-19>

**The goal of this webinar is to assemble the experts (scientists, researchers, science journalists, academics, etc.) to throw more light on vaccines and their critical role in contribution to herd immunity within a population.**

**For more information on participation as a speaker or a participant, please email us on ;**

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