Universal Coronavirus Vaccine

By John Benson

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1. Introduction

In December of 2020, I thought I had retired from my brief career as virological writer with the posting of the paper described and linked below.

Light at the End of the COVID-19 Tunnel: *The Pfizer COVID-19 Vaccine Emergency Use Authorization was approved by the FDA today (Dec 11). It will start to be distributed on a priority basis in the next few days. The FDA hearing on the Moderna Vaccine is on December 17.*

The questions most have are:

- *When will conditions start to return to normal?*
- *When will conditions return to "pre-pandemic normal"?*

This paper will provide some information on both questions, and also information on a system that might help accelerate herd immunity.

https://energycentral.com/c/um/light-end-covid-19-tunnel

Since the above post many of us have thought we were done with COVID-19, but COVID-19 was not done with us.

In answer to your expected first questions, I got the Pfizer vaccine as soon as I could (both doses), and ditto boosted it. In spite of this Omicron nailed me three days after last Christmas (yes, a family gathering with few precautions, so me too). The good news was the symptoms were pretty mild.

I would really like to be rid of COVID! I religiously read *Science* (the weekly publication of AAAS) and Scientific American. Somewhere in doing this I read that at least one firm was working on a universal COVID vaccine. Driven by an argument with my wife about whether I should get a second booster (she won, and I got boosted again), I started researching the universal coronavirus vaccine and other COVID matters. I found the results very enlightening, thought my readers might also, and thus this post.

2. Universal COVID Vaccine

First of all, the proper name for this is a Pan-Sarbecovirus Vaccine or a Pan-Coronavirus Vaccine. Sarbecoviruses are a family of viruses that include SARS-CoV-2 and all current variants such as Delta and Omicron, 10 additional variants, SARS1, and other potentially dangerous zoonotic viruses. In other words COVID-19 and most of its potentially infectious relatives. I found an article from a respected source that said the term Sarbecovirus came from SARS1 (Sars-CoV-1) and is now the subgenus containing the above viruses. Pan-Coronavirus is perhaps less exact (there are many coronaviruses that are not members of the Subgenus Sarbecovirus), but perhaps more widely used, and also used by very well regarded doctor (see below).

On Tuesday (Jan 11), White House chief medical advisor Dr. Anthony Fauci testified to Congress about the country's efforts to develop a pan-coronavirus vaccine, meant to combat both Covid and other similar viruses that could emerge in the coming years. The short-term applications of a vaccine that effectively tackles all forms of Covid could be significant, Fauci said: "We won't be chasing after the next variant."[1]

Longer term, Fauci said, the development of a universal coronavirus vaccine could help prevent the world's next pandemic. Non-COVID-19 coronaviruses have been responsible for diseases like SARS and MERS over the past two decades, alongside many common cold infections.

"The importance of developing a pan-coronavirus vaccine, namely one that would be effective against all SARS-CoV-2 variants, and ultimately against all coronaviruses, becomes even more apparent," Fauci told the Senate Health, Education, Labor and Pensions committee.

There's no set timeline for such a vaccine to become publicly available, but multiple research efforts are underway — with promising early results.

In April 2021, Duke University researchers announced that their pan-coronavirus vaccine was "100% effective in non-human tests including testing on primates." The study noted "success in primates is very relevant to humans."

Five months later, Duke and two other academic institutions — the University of Wisconsin and Boston-based Brigham and Women's Hospital — received a total of roughly $36.3 million to fund the continued development of pan-coronavirus vaccines.

And in December, the U.S. Department of Defense's Walter Reed Army Institute of Research announced its own development of a vaccine that, in pre-clinical trials, "not only elicits a potent immune response but may also provide broad protection against SARS-CoV-2 variants of concern as well as other coronaviruses."

The Walter Reed vaccine, termed SpFN, completed its first phase of human trials last month, according to Defense One. It would still need to undergo phase 2 and phase 3 trials before advancing further.

"There's a lot of investment, not only in improving the vaccines that we have for SARS-CoV-2, but a lot of work… to develop the next generation of vaccines, particularly universal coronavirus vaccines," Fauci said at the hearing.

According to Fauci, the technology behind these vaccine efforts isn't new. Rather, it relies on "clinical research investments" made decades before the Covid pandemic…

There is another firm working on a Pan-Coronavirus Vaccine, Based in Vancouver, BioVaxys Technology Corp. is a British Columbia-registered, early-stage Biotechnology Company that is developing viral and oncology vaccine platforms, as well as immuno-diagnostics. See the subsection below for the rest of this story.

[1] Megan Sauer, CNBC, "Dr. Fauci: 'Universal coronavirus vaccines' could help the world tackle Covid — and the next pandemic," Jan 12, 2022, https://www.cnbc.com/2022/01/12/dr-fauci-pan-coronavirus-vaccine-could-address-covid-next-pandemic.html

2.1. A Serendipitous Discovery

There are two ways to gain immunity from a serious disease: (1) the easy way – get vaccinated and (2) the hard way – get the disease and survive.

Most don't know about the SARS-CoV-1 virus. It ravaged the Far East for several months, and then naturally burned itself out (and disappointed many pharma manufacturers working on a vaccine for this virus). However many people that were infected with this first coronavirus recovered (and many didn't).

"Scientists have observed that people who survived the 2002-03 SARS pandemic and then were administered a Covid-19 vaccine developed antibodies that cross-reacted with all of the Sarbecoviruses that they tested," said Dr. David Berd, Chief Medical Officer of Biovaxys. "That observation suggested to us that a similar Pan-Sarbecovirus immune response could be generated by immunizing with… spike protein from SARS1 and SARS-Cov-2, i.e., our BVX-0320 and BVX-1021 products."[2]

Note that I verified the above highlighted text. Go through the link below for details: https://www.nature.com/articles/d41586-021-02260-9

In collaboration with Ohio State University, clinical stage biotech company BioVaxys Technology Corp. (CSE:BIOV) (OTCQB:BVAXF) recently announced production of its newly developed vaccine BVX-1021 for the strain of coronavirus that causes Severe Acute Respiratory Syndrome (SARS1), the respiratory illness responsible for the deadly 2002–2004 pandemic. There are no vaccines approved for SARS1.

It might be reasonable to assume that a vaccine against SARS1, combined with another vaccine against COVID-19 might provide same protection as highlighted above.

3. COVID-19, Other Vaccine News

Meanwhile, big pharma companies are on paths of their own. One company, Sorrento Therapeutics, Inc., a major player in the cancer immuno-oncology field *who recently reported promising results with a universal chimeric mRNA COVID-19 vaccine that elicits potent neutralizing antibodies and protection against not only omicron, but delta variants as well.*[2]

"The concept of a universal mRNA vaccine is still very appealing for at least two reasons," said Dr. Henry Ji, Chairman and CEO of Sorrento. "One is that the virus could continue accumulating more mutations to eventually nullify the effectiveness of marketed mRNA vaccines. Secondly, a universal mRNA vaccine against COVID-19 is much needed worldwide, especially in developing countries."

During the past two years, Sorrento scientists explored various strategies to develop mRNA vaccines that can potentially provide broad and effective protection against predominant SARS-CoV-2 variants of concern (VOCs) as well as potential future variants.

[2] Cision PR Newswire, "Race to Develop Universal 'Variant-Proof' Covid Vaccine Involves Several Players," March 24, 2022 https://www.nbc4i.com/business/press-releases/cision/20220324LN03133/race-to-develop-universal-variant-proof-covid-vaccine-involves-several-players/

Sorrento scientists have perfected the expression of the spike protein to potentially improve the safety profile of the COVID-19 mRNA vaccines…[3]

Sorrento's designer mRNA vaccine, utilizing a chimeric mRNA that incorporates the Delta receptor binding domain (RBD) into the Omicron spike protein, provided strong, broad-spectrum protection against both BA.1 and BA.2 sublineages of Omicron, and Delta variant in immunized animals.

Author's comment: "chimeric" (above) means relating to or denoting an RNA molecule with sequences derived from two or more different organisms, formed by laboratory manipulation. EUA (below) is "emergency use authorization".

Sorrento intends to develop and seek EUA approval of this next-generation mRNA vaccine in Mexico and other developing countries.

Back in January 2022, Pfizer Inc. (NYSE:PFE) and BioNTech SE (NASDAQ:BNTX) initiated a study to evaluate an Omicron-based COVID-19 vaccine in adults 18 to 55 years of age. The study draws upon some participants from the companies' Phase 3 COVID-19 booster study and is part of their ongoing efforts to address Omicron and determine the potential need for variant-based vaccines.[2]

"Emerging data indicates vaccine-induced protection against infection and mild to moderate disease wanes more rapidly than was observed with prior strains," said Prof. Ugur Sahin, CEO and Co-founder of BioNTech. "This study is part of our science-based approach to develop a variant-based vaccine that achieves a similar level of protection against Omicron as it did with earlier variants but with longer duration of protection."

3.1. WHO Recommendations for Ending the Pandemic

Our health establishment must perform some more work, and not assume that the Pandemic will end on its own. The World Health Organization (WHO) recently issued a good document that summarized the current situation, possible future directions COVID-19 (and related) viruses might take and what is probably required to end the Pandemic in 2022.

More than two years since the first SARS-CoV-2 infections were reported, the COVID-19 pandemic remains an acute global emergency. The emergence and rapid spread of the Omicron Variant of Concern towards the end of 2021 precipitated an acceleration of SARSCoV- 2 transmission worldwide, at an intensity the world had not yet seen. More than 143 million new cases were reported globally in the first two months of 2022 alone – one-third of the 433 million cases that had been reported up to 28 February since the onset of the pandemic. The pandemic is not over, although COVID-19 is now affecting countries in very different ways.[4]

WHO started with a set of scenarios that define possible future directions that the pandemic might take.

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[3] Globe Newswire via Yahoo Finance, "Sorrento Reports Promising Results With a Universal Chimeric mRNA COVID-19 Vaccine That Elicits Potent Neutralizing Antibodies and Protection Against Omicron (BA.1 and BA.2) and Delta Variants," March 20, 2022, https://finance.yahoo.com/news/sorrento-reports-promising-results-universal-212600816.html

[4] Strategic Preparedness, Readiness and Response Plan to End the Global COVID-19 Emergency in 2022. Geneva: World Health Organization; 2022 (WHO/WHE/SPP/2022.01). Licence: CC BY-NC-SA 3.0 IGO, https://www.who.int/publications/i/item/WHO-WHE-SPP-2022.1?msclkid=aa451ddac00511eca700bd40f7a8f49c

For planning purposes, we can envisage three potential scenarios regarding viral evolution and human immunity over the next 12 months: a base case, a best case, and a worst case.

The base case is our current working model, and is based on what we know about the duration of vaccine-derived and infection-derived immunity, the natural history of SARS-CoV-2 and its evolution over the past two years, and our knowledge of other respiratory viruses. It should be acknowledged, however, that there is a high degree of uncertainty attached to all scenarios, and we must therefore build in the flexibility to adapt to rapid and dynamic changes in viral transmission, disease severity, and their impact on individual and population-level immunity.

Base case: *The virus continues to evolve. However, severity is significantly reduced over time due to sustained and sufficient immunity against severe disease and death, with a further decoupling between incidence of cases and severe disease leading to progressively less severe outbreaks. Periodic spikes in transmission may occur as a result of an increasing proportion of susceptible individuals over time if waning immunity is significant, which may require periodic boosting at least for high-priority populations; a seasonal pattern of peaks in transmission in temperate zones may emerge.*

Best case: *Future variants that emerge are significantly less severe, protection against severe disease is maintained without the need for periodic boosting or significant alterations to current vaccines.*

Worst case: *A more virulent and highly transmissible variant emerges against which vaccines are less effective, and/or immunity against severe disease and death wanes rapidly, especially in the most vulnerable groups. This would require significant alterations to current vaccines and full redeployment and/or broader boosting of all high-priority groups.*

Really worst case: *Another potential scenario to be kept in mind is the emergence of an essentially new SARS-CoV-2 virus. This could be through a new emergence from a pre-existing or newly established animal reservoir, or due to a recombination event in which a patient co-infected with two separate variants of SARS-CoV-2 produces new infectious viral particles that have genetic characteristics shared with both parent lineages. This scenario would effectively be a reset, with a completely susceptible global population. This scenario is not explicitly included as a planning scenario, but should be considered a background threat, and all COVID-19 response and readiness capacities should be understood to yield a resilience dividend pertaining to that threat.*

The next step is to define actions that we need take to cover each of the first three cases above. The only thing we can say about the “really worst case” is that at least we’ve been there before. There are four broad categories of actions. I will briefly summarize these below. For the full text (eleven pages) go through the link in reference 4 above.

3.1.1. Surveillance, laboratories, and public health intelligence

Surveillance: *Public health decision-making at local, national, regional and global levels must be based on real-time, accurate data and analysis. For COVID-19 this means, at a minimum, data from disease surveillance and data on and health system utilization and capacity. Put simply, effective prevention and response to COVID-19 is dependent on dynamic knowledge of what to respond to, where and at what scale, with what available capacity, and who is most vulnerable.*

The COVID-19 pandemic continues to expose marked weaknesses in multiple aspects of public health intelligence in nearly all countries, with many countries now beginning to scale down SARS-CoV-2 testing programs.

Maintaining and strengthening SARS-CoV-2 surveillance in every country is vital to track the spread and evolution of SARS-CoV-2, rapidly detect and characterize new variants of interest and concern, and calibrate public health and social measures, as well as medical interventions. However, at this stage in the pandemic, as vaccine-derived and infection-derived immunity increases worldwide, there is a need to reallocate resources to enable a more strategic and sustainable approach for SARS-CoV-2 surveillance…

Laboratories and diagnostics: *Timely and accurate diagnostic testing for SARS-CoV-2 continues to be an essential part of the comprehensive COVID-19 response strategy. Diagnostic testing for SARSCoV- 2 supports both individual-level case finding and access to the clinical care pathway, and community-level actions to inform the overall public health response.*

As the pandemic continues and the virus evolves, national and subnational policies on SARS-CoV-2 testing approaches and services, including the use of professionally-administered tests and COVID-19 self-testing, will need to be adjusted.

National policies should be evidence-based, agile, and take into account the latest epidemiology, available resources, and the needs of priority populations. As policies evolve and new therapeutics and care pathways become available, clear and up-to-date messaging will be needed for health workers, individuals and communities so that people understand the meaning of their test results and what actions to take…

Zoonotic disease surveillance: *Several animal species are known to be susceptible to SARS-CoV-2. The establishment of animal reservoirs, in which the virus circulates and genetically evolves, has been observed on several occasions in wild or farmed species, such as mink, hamsters, and white-tailed deer, with reverse transmission to humans. WHO is working closely with other international organizations and partners involved in animal health to promote increased surveillance in animal populations known to be at risk, including wild populations, and monitor the evolution of SARS-CoV-2 virus associated with these jumps between species. This essential, yet currently underutilized, component of surveillance requires urgent investment and wider implementation. At present very little is known about potential SARS-CoV-2 reservoirs in many parts of the world. Over the longer term, a One Health approach to disease surveillance must be incorporated into routine pandemic preparedness, readiness and response…*

Author's Comment: One Health is a collaborative, all-sector, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment. For more information, go to the CDC site linked below:

https://www.cdc.gov/onehealth/index.html

3.1.2. Vaccination, public health interventions, & engaged communities

COVID-19 Vaccination: *the different goals of the Covid-19 vaccination program include: i) minimize deaths, severe disease, overall disease burden, and the impact on health systems, ii) resume full socio-economic activity, and iii) reduce future risks, including the risk of new variants.*

To these ends the WHO challenges leaders to ensure that countries vaccinate 70% of their populations by the middle of 2022,

In pursuit of the 70% goal, national efforts must be focused primarily on fully vaccinating the most clinically vulnerable in society in accordance with WHO's Prioritization Roadmap, and using an optimal schedule of vaccines, including boosters. Achieving 100% vaccination coverage in the most clinically vulnerable groups will optimize public health impact on the road towards 70% of the population being vaccinated…

Author's comments: The above content was heavily edited for clarity and brevity. The WHO Prioritization Roadmap is defined in the document linked below.

https://apps.who.int/iris/bitstream/handle/10665/351138/WHO-2019-nCoV-Vaccines-SAGE-Prioritization-2022.1-eng.pdf

Author's Comment: The one area where we clearly need to up our game is assuring that near-state-of-the-art COVID vaccines are widely distributed around the world. I've watched as several variants of concern have emerged in remote (and poorly vaccinated) locations and quickly spread around the world. **None of us will be safe until all of us are safe**!

Public Health and Social Measures (PHSM): *Until the acute emergency of COVID-19 is ended, it will remain necessary to maintain basic PHSM, even in periods of low circulation of SARS-CoV-2. Countries should be ready to scale up PHSM as the burden of COVID-19 increases to avoid preventable morbidity and mortality, and reduce the risk of spread of the virus and therefore the emergence of new variants. Recognizing that some PHSM, such as contact tracing and quarantine, are resource-intensive and disruptive, authorities may need to prioritize their use where they are most critical, such as amongst the most vulnerable, and should use a risk-based approach that takes into consideration the benefits and risks of adjusting contact tracing and quarantine policies…*

Information management: *The first goal of information management for COVID-19 is to understand the nature of the public conversation about the disease and the measures designed to protect against it. For this, robust social listening systems are needed that can accommodate diverse datasets that facilitate rapid integrated analysis to produce insights that can be rapidly acted on to improve the emergency response and immunization program strategies. Pandemic information interventions can include helping people discern between accurate vaccine information and misinformation, promoting peer-to-peer approaches to address questions and concerns, building resilience in the public by quickly pre-emptively debunking and refuting misinformation before it is amplified, leveraging networks of trusted messengers such as health care workers and community leaders, and partnering with fact-checking and civil society organizations…*

Risk communication and community engagement: *To address the varied and dynamic COVID-19 situations at sub-national levels, alongside competing public health priorities, Member States must ensure operational readiness for any COVID-19 scenario in the context of inevitable concurrent events. Localized responses must be co-designed with communities to ensure relevance, acceptability, sustainability and effectiveness…*

International travel and mass gatherings *WHO will continue to support national authorities in their decision-making process on how to implement, calibrate or lift risk*

mitigation measures in the context of international travel in the context of COVID-19. This includes risks at points of entry (airports, ports and ground crossings), informed by regular assessments and updated reviews on the effectiveness of these measures. WHO will also continue to support countries and event organizers to evaluate, mitigate and communicate the risks of SARS-CoV-2 transmission associated with mass gatherings…

3.1.3. Safe and scalable clinical care, and resilient health systems

Integrated clinical care pathways: *Ensuring safe and effective care for people with COVID-19 and its after-effects requires dynamic translation of available evidence into guidance, and a strategic approach to assessment and management across the continuum of primary, emergency, critical, and rehabilitative care. Effective management of COVID-19 requires mechanisms for early recognition, triage and safe patient flow, and access to reliable diagnostics and timely resuscitation and treatment. Many patients with acute signs and symptoms of COVID-19 will need life-saving care even prior to having a definitive diagnosis, and clinical presentations evolve with changing variants. Health care systems must be ready to respond to the varying needs of people with mild, moderate, severe and critical disease…*

Infection prevention and control: *COVID-19 has confirmed the central role that infection prevention and control (IPC) plays in the prevention and containment of outbreaks in health care facilities and in the community. Data from WHO and Organization for Economic Cooperation and Development show that immediate access to sufficient personal protective equipment (PPE) and IPC training roll out in the first few months of the pandemic would have prevented many infections among health workers globally, saved lives, and averted huge costs…*

Protecting, supporting and enabling the health workforce: *The COVID-19 pandemic continues to have a profound impact on health and care workers, in terms of increased workload, risk of infection and death (approximately 115 000 health workers died from COVI-19 between January 2020 and May 2021), quarantine, work stoppages related to deteriorating working conditions, stigma and violence, mental health issues, alongside increasing demands for services and for health workers to take on new roles and tasks in national response plans…*

Three consecutive rounds of the WHO pulse survey on continuity of essential health services during the COVID-19 pandemic, published in August 2020, April 2021, and February 2022 respectively, indicated that health workforce availability was both the most common cause of service disruptions and the most important bottleneck in scaling up access to essential COVID-19 tools…

Mental health and psychosocial support: *The COVID-19 pandemic has had a profound direct and indirect impact on global mental health. According to recently published WHO research, the first year of the COVID-19 pandemic saw a 25% increase in the global prevalence of anxiety and depression. WHO has also found that that the pandemic has disproportionately affected the mental health of young people, who are also at disproportionally high risk of suicidal and self-harming behaviors. Women have been more severely impacted than men, and people with pre-existing physical health conditions, such as asthma, cancer and heart disease, were more likely to develop symptoms of mental disorders…*

Maintaining essential health services: *Countries continue to balance and address the demands of responding directly to COVID-19 with the need to maintain the safe delivery of other essential health services and public health functions.*

As countries optimize their capacities to address the drivers of SARS-CoV-2 spread and COVID-19 impact, some adaptations in service delivery may no longer be required, others may need to continue for a limited period, and others that are found to be effective, safe and beneficial can be incorporated into routine post-pandemic practice, contributing to longer term health system resilience and progress toward universal health coverage…

3.1.4. Research, development, and equitable access to countermeasures and essential supplies

Tackling vaccine inequity: WHO and partners created the Access to COVID-19 Tools (ACT) Accelerator in April 2020 to accelerate access to tests, treatments, and vaccines…

To enhance the efficiency of international support, from technical assistance to delivery financing, WHO, UNICEF and Gavi have established the COVID-19 Vaccine Delivery Partnership with other key partners including World Bank and Africa CDC. The partnership is focused on intensifying engagement and support initially in 34 prioritized countries with less than 10% coverage in mid-January and that were off track to reach 70% immunization target by June 2022…

Research and development priorities: *The R&D Blueprint for Epidemics will continue to be the global strategy to expedite research before and during epidemics. Its aim is to fast-track the availability of effective tests, vaccines, medicines, and social science that can be used to save lives.*

Future global COVID-19 research priorities were updated on 24-25 February 2022 during the third COVID-19 Global Research and Innovation Forum hosted by the R&D Blueprint.

Go through the link below for more information;

https://www.who.int/news-room/events/detail/2022/02/24/default-calendar/draft-covid-19-research-and-innovation-powering-the-world-s-pandemic-response-now-and-in-the-future

Final author's comment: Reference 4 has additional information on this, but I really need to end this post.