

# The Vaccine Conquered Covid-19 Worldwide- Operation Warp Speed and Confrontation of Pharmaceuticals

Mahesh Walle, Mokshada Mhaske and Ranjita Ingle

Department of Chemistry

M. M. Jagtap College of Arts, Science and Commerce, Mahad-Raigad, Maharashtra, India

## Abstract

The emergence of Covid-19 and its fatal effects on human being, the process of synthesis of vaccine their trials in different phases from different leading pharmaceutical companies like Moderna, Pfizer, Bio Ntech etc. in world. The implementation of Operation Warp Speed to launch vaccine as early as possible by collaborative scientific work. The successful development of vaccine for Covid-19 with safety and efficacy.

**Keywords:** Covid-19, OWP and vaccine.

## Introduction

It may be the most important scientific achievement of our time, a vaccine truly developed at warp speed, to stem the tide of a pandemic that has spread to more than 170 countries and killed more than 2 million people around the world. It still astonished us that we have an effective vaccine right now, what we are seeing now is something that has never happened in the history of vaccines.

The tale of the quest for the vaccine is one of both tragedy & jubilation. A pandemic that has forced even historic rivals in the scientific community together for the common good and excel like never before. A scientific breakthrough that's being called the most remarkable human achievement in decades. The biggest product launch in the history of mankind & the story isn't over yet.

With deaths and new infections was surging to record highs. Dr. Anthony fauci, director of the National institute of Allergy & Infectious Diseases since 1984 is ready. In his work at the NIAID, he has battled HIV/AIDS, Ebola & the zika virus. Officially the corona virus is named severe Acute Respiratory syndrome Corona virus 2 or SARS Cov2.<sup>1</sup> The disease it causes will come to be known as COVID-19 named for the year in which it emerged. But corona viruses were first identified in 1965 it is a family of viruses and they can cause everything from a common cold to more severe respiratory diseases like MERS and SARS.<sup>2,3</sup> What we're seeing today is a novel strain of the corona virus family that we haven't seen before. The corona virus derives its name from its unique appearance. A corona virus is one of a whole group of viruses that you can recognize under a microscope because they all have a kind of a crown & they all cause respiratory diseases. Some of them infect people, some of them infect animals & we have had a few new corona viruses jump from other animals to our species over the past 20 years and now we have a new one.

### **Materials and Methods**

The data were collected from documentary named The Vaccine: Conquering Covid<sup>4</sup> and searched by using keywords like Vaccine, Covid-19, Moderna etc.

### **Arrival of Covid-19**

**January 10<sup>th</sup>, 2020**, Professor Zhang Yongzhen, a distinguished infectious disease scientist in China, collects a sample of the new virus sequences in the genome in a marathon 48-hour session. The new strain is more dangerous than MERS, SARs & the other corona viruses world has seen. They don't exist unless they trick the immune system some way to let them in and this particular Corona virus picked up unfortunately just the right, mixture of mutations to be very tricky, particularly its ability to be spread so easily from asymptomatic people. Which means that it gets way ahead of you, the corona virus spreads from person to person through microscopic droplets released when a carrier talks, coughs, sneezes or even breathes.<sup>5</sup> The virus then enters the new victim through the eyes, nose or mouth. They sort of open a door into our cells & they allow the virus in & once the virus is inside a cell, it can take over and the cell starts making literally millions of copies of new viruses. It affects the cells that line blood vessels. It affects the cells in other organ systems.

### **Vaccine Development begins**

Since, 2017 the NIH (National Institute of Health, US) has been working with the BioNtech and Moderna company on developing vaccines quickly. The company is built on the premise that it's new vaccine technology known as mRNA, can be developed to combat new diseases in record time. According to NIH, they can design a vaccine and can test it but can't mass Produce it and get it out to the population.

**13, Jan, 2020**, At the NIH, immunologist Dr. Kizzmekia Corbett helps oversee a vaccine research team she's been working in labs since high School and has been preparing for this moment her entire life. This disease was so concerning, that we needed to have more than one approach and frankly scientifically we didn't know which vaccine would work well.

But developing a vaccine won't be enough with a pandemic about to envelop the entire planet; there will be logistics & supply chain issues, resistance from both a skeptical public and outright conspiracy theorist.

**16 January 2020-**It was clear the disease is already spreading outside China. At the National Institutes of Health Dr. Anthony Fauci tells his team that this is a pandemic in the making. The NIH works with Moderna on a genetic vaccine. It is the newest technology made out of Synthetic mRNA. When a corona virus mRNA vaccine is injected in the body it instructs DNA to create a harmless version of the corona virus spike protein. Our immune system still recognizes this powerless spike protein as an invader and begins producing antibodies. Y-shaped proteins that bind like a lock and key to the intruder & kill it. Now, our immune system is trained and if we get infected with the real corona virus, our body recognizes the signature spike protein & knows how to defeat it. No mRNA vaccine has ever been approved for human use because the methodology is so new. Dr. Andrew Weissman and Dr. Katalin Kariko are considered pioneers of mRNA technology because of the work they did at the University of Pennsylvania Medical School. RNA is very fragile, it's tough to work with and must be stored at sub zero temperature. The RNA that developed had enormous potential, there was a problem though, RNA is inflammatory. When injected into mice, untreated synthetic RNA can cause fatal inflammation because the immune system sees it as an invader. So it was studied what made RNA inflammatory & then how to get rid of that inflammation. With some chemical modification the pair figures out a method that allows the mRNA to be safely injected into the cells, an adjustment that would help convince the skeptics that mRNA had the potential to revolutionize vaccines. Dr. Weissman and Dr. Kariko's work will eventually become the basis of the Moderna and Pfizer-Biontech vaccines. They have been suggested for the noble prize.

**January, 2020** Covid-19 officially reaches almost shores of all continents, Soon the world is locked into a cycle of shutdowns, layoffs & deaths. Dr. Nita Patel leads the corona virus vaccine team at Novavax said- they also have made a vaccine for SARs and MERs as well as Ebola, so we know our vaccine platforms will be safe for corona virus Covid-19 as well.

**1st March 2020-** A new partnership enters the vaccine race. Germany Company BioNtech teams up with pharmaceutical giant Pfizer. Like Moderna, its vaccine is based on the mRNA research pioneered back at the University of Pennsylvania by Dr. Andrew Weissman & Dr. Katalin Kariko, with this vaccine. When the WHO declared a global pandemic that's at a different level there was actual fear in people that this could get out of control. There will soon be more than 80 vaccines in development across the globe. In March, the companies that get activated for vaccine are Moderna, Pfizer-Biontech, Novavax, Oxford-AstraZeneca, Johnson-Johnson & Inovio. Just two months after the genome was sequenced Moderna starts the world's first phase one clinical trial. Jennifer Haller (phase one volunteer) to receive the experimental Covid-19 vaccine. NIH director Dr. Francis Collins made a strategy to build a clinical trial in record time with 9 pharmaceuticals. The new partnership was formed and known as ACTIV (Accelerating Covid-19 Therapeutic Intervention and vaccine).

### **Operation Warp Speed (OWS)**

**1<sup>st</sup> April 2020**, Globally death pass 1,80,000 Operation Warp Speed announced its good to develop, manufacturer & deliver 300 million doses to the public by the end of 2020. To ensure success, Operation Warp Speed backs two companies in each vaccine category, if one company fails each vaccine type has a back-up. Pfizer-BioNtech is also developing a genetic vaccine. One of operation Warp speed's first mission is to accelerate the vaccine trials, that normally take 6 to 10 years without sacrifice any of the rigorous safety protocols of each phase. The preclinical phase tests the vaccine on animals, phase one trials tests the vaccine in about 100 people. Phase two tests the vaccine in several hundred adults, with some getting a placebo. Then scientists wait to see how many people become infected..

**27<sup>th</sup> July 2020**. The number is staggering more than half a million people are dead worldwide. Pfizer-BioNtech & Moderna both advance to phase three trials Novavax is in phase two. Johnson-Johnson is in a combined phase one & two Oxford Astrazeneca is finishing its phase one & two INOVIO shows promising results from its phase one trial. Despite the amazing progress, a critical oversight by one drug threatens to derail its entire effort.

**28<sup>th</sup> September, 2020** with over Six million cases of COVID-19 & almost 190,000 deaths in the US. Nine pharmaceutical companies issue an unprecedented joint statement, on safety and integrity. By late October, vaccine trials are beginning to generate data, fueled in large part by spiking infection rates. By early November, Pfizer -BioNtech & Moderna are four months into late stage, large scale trials for their vaccines, involving tens of thousands of volunteers. After receiving an injection, volunteers make a two-year commitment so their health & safety can be closely monitored. In Pfizer's trial, out of over 43,000 volunteers received a vaccine 94 gets infected.

**9<sup>th</sup> November, 2020**. Pfizer-BioNtech releases these trial results to the press. Pfizer & BioNtech to submit covid -19 vaccine data to FDA as full results show 95% efficacy. The Measles vaccine introduced in 1963 was 98% effective. The FDA would only approve a vaccine with at least a 50% success rate. Just one week later, Moderna also makes medical history with it was gene-based vaccine with 94.5% effective essential matching Pfizer numbers.

**Results**

The results are a stunning Validation of how safe and effective m-RNA technology is a revolutionary leap forward in the overall science of vaccines. In late November, one of the major player in the vaccine race made headlines. Oxford Astrazeneca is widely expected to be next in line, with an approved vaccine. It's much cheaper to produce & doesn't require being frozen. It can be stored in refrigerators. 11 days after announcing trial results Pfizer Biotech applies for EUA an " Emergency Use Authorization" It's the first step to getting the vaccine to people in the world. Starting in December the CDC (Centre for Disease Control and prevention) releases a series of nationwide recommendations for vaccine distribution, but individual countries implements them differently-

**Phase I A** covered about 2.4 million Americans, includes health care workers & the elderly in long-term care facilities.

**Phase 1B** includes people above 75 & older, essential workers like police, fire Fighters & teachers.

**Phase 1C** includes 65-74 year old people with high risk medical conditions Workers in other essential industries like food Service transport.

On December 11<sup>th</sup>, 2020 The FDA in US gives Pfizer-BioNtech an Emergency Use Authorization, that means the vaccine is deemed safe and effective & ready to be dispensed nationwide. The FDA approves Moderna's vaccine.

Table1.Efficacy of vaccine of different pharmaceuticals.

Pharmaceutical	Type	Doses	Efficacy	Storage	Cost in \$
Oxford Astrazeneca	Genetically modified virus	2	62-90%	Regular Fridge Temperature	3
Moderna	RNA (gene base)	2	95%	-20 <sup>0</sup> C for 6 months	25
Pfizer-BioNtech	RNA	2	95%	-70 <sup>0</sup> C	25

**The new Threat**

As health Departments try to Speed up vaccinations, yet another threat emerges, The virus is mutating, New strains that are estimated, to be up to 70% more contagious than the original have emerged in the UK, Brazil & South Africa.

**Conclusion**

The pharmaceutical from worldwide has successfully developed efficient and safe mRNA vaccine to use against corona virus. The development of vaccine renders in record time while it also shows its efficacy against new strain of corona virus. The volunteers, doctors and scientist are the savior of world. Now the main challenge is to avail vaccine for each individual in the world.

**References**

1. Wang, Changtai, et al. "The establishment of reference sequence for SARS-CoV-2 and variation analysis." *Journal of medical virology* 92.6 (2020): 667-674. <https://doi.org/10.1002/jmv.25762>
2. Tavakoli, Ahmad, Katayon Vahdat, and Mohsen Keshavarz. "Novel coronavirus disease 2019 (COVID-19): an emerging infectious disease in the 21st century." *ISMJ* 22.6 (2020): 432-450. <http://dx.doi.org/10.29252/ismj.22.6.432>
3. Al-Tawfiq, Jaffar A., Alimuddin Zumla, and Ziad A. Memish. "Travel implications of emerging coronaviruses: SARS and MERS-CoV." *Travel medicine and infectious disease* 12.5 (2014): 422-428. <https://doi.org/10.1016/j.tmaid.2014.06.007>
4. Wu, Joseph T., Kathy Leung, and Gabriel M. Leung. "Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study." *The Lancet* 395.10225 (2020): 689-697. [https://doi.org/10.1016/S0140-6736\(20\)30260-9](https://doi.org/10.1016/S0140-6736(20)30260-9)
5. Sarda, Swapnil R., et al. "COVID-19: A global pandemic." *medical science* (2020). <http://dx.doi.org/10.17628/ecb.2020.9.266-272>
6. Documentary: The vaccine : Conquering Covid. Directed by Peter Reiss and John Hirsch executive producing alongside Perez and Lindsey Foster Blumberg for Science Channel and Discovery, 2021. Discovery+ <https://go.discovery.com/tv-shows/the-vaccine-conquering-covid>