

Pharmaceutical progress on treatment for Covid- 19, Kunal Jain summarises the reported developments and highlights from a recent virtual conference on this subject in Israel

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first identified in December 2019 in Wuhan, China and now has more than 2.4 million positive in more than 200 countries. In this mayhem, the key question is – What’s next ? When will things return back to normalcy ? Will there be an end to this virus scare ? The answer to initial two questions depend on what each country opts to undertake in the battle to fight – exhaustive testing to quickly identify suspects, rapid isolation of cases, quarantine, complete lockdown. This note is to summarise the steps being taken across the world on a possible cure to the spread of the virus.

Researchers are working across the globe to develop treatments, some are working through old molecules hoping to find effective drugs while others are applying the latest breakthroughs in synthetic biology to engineer sophisticated treatments and vaccines. Currently there are more than 50 actionable projects being worked upon across the broadly three paths:

- a. **Repurposed/Pre-existing Drugs** – this involves study of existing drugs that are already approved to treat other diseases to see if they are effective to treat COVID-19. This is the fastest way to safely stop COVID-19 as they do not require extensive testing and are readily available in large quantities across world. Some of repurposed drugs being used currently include anti-malarial *chloroquine* and three potential antiviral - *favipiravir*, *remdesivir* and *lopinavir*. On March 28, 2020, the US FDA enabled use of oral tablets of *chloroquine phosphate* or *hydroxychloroquine sulfate* under an emergency use authorization at the discretion of physicians treating people with COVID-19.
- b. **Antibodies** – are proteins that stick to virus SARS-CoV-2 which can be manufactured through recombinant technology and injected into patients to prevent or reduce infection. Today few companies are working on transferring

antibodies from recovered patients to check for patient-to-patient transfers as quick approach. Companies such as AbCellera is using tools/machine learning to rapidly screen millions of cells from recovered patients to identify antibodies effective in fighting the virus; Distributed Bio is using computers to reengineer antibodies to better target virus whereas Johnson & Johnson, which has in the past responded to outbreaks of Ebola and Zika viruses is taking a multipronged approach to the coronavirus by working on multiple approaches for treatment.

- c. **Vaccines** – vaccines work by simulating infection which allows the body's immune system to make antibodies for fighting against the virus. Two companies stand out in this novel path of drug discovery,
1. Massachusetts-based Moderna Therapeutics – first dose of mRNA COVID-19 vaccine developed by US National Institutes of Health and Moderna secured initial approval being the first participant in their Phase 1 study on March 16, 2020. Company had launched Phase 1 vaccine trial against COVID-19 in record time (m-RNA vaccine) after having secured initial approval from FDA for testing in less than 50 days. Secured \$483 mn in US government funding in April 2020 to cover advancing its novel coronavirus vaccine candidate drug through clinical testing.
 2. China's CanSino Biologics – CanSino's drug (Ad5-nCoV) works on adenovirus-based vector vaccine platform to fight COVID-19. CanSino was amongst the first company to secure Chinese approval for Ebola vaccine in 2017 and is working on similar technology to develop the vaccine this time. Company has secured quick Chinese regulatory nod to start human testing of their vaccine on 18th March 2020. Pre-clinical study results depicted that vaccine can develop strong immune response in animals with safety. Recently, company disclosed that they are advancing to phase 2 clinical trial
 3. Other companies expected to commence trials soon include Pennsylvania based Inovio working on INO-4800, GlaxoSmithKline-Clover Biopharma working on potential recombinant, BioNtech-Fosun for Chinese markets and BioNTech-Pfizer for global markets (ex-China), MIGAL-Galilee Research working to adapt vaccine initially developed to prevent IBV, Germany's CureVac is working on mRNA drug platform to produce vaccine, Arcturus Therapeutics is working on vaccine that relies on engineering RNA

Summary of discussion at a Virtual COVID-19 Innovation Conference in Israel

Recently, we attended a virtual COVID-19 Innovation Conference - Worldwide Online Event hosted by Cukierman & Co. Life Sciences and GoforIsrael to enable start-ups, established companies, innovators, governmental laboratories and academic institutions from all over the world to collaborate on solutions to end the pandemic. Key objective for this event was to present emerging companies and technologies that are working on any related solutions to help fighting the coronavirus now, its potential next generation mutations, and preventing it from hurting us in the future.

- Dr. Eyal Zimilichman (MD, MSc) Chief Medical Officer and Chief Innovation Officer at Sheba Hospital, Israel shared innovative approaches followed in recent times - Sheba's isolation hospital (40 bed outside main building) features robots scooting around with carts, equipped to take over many bedside tests & treatments that would normally be conducted by doctors. Instead of face-to-face meetings, the medical staff speaks with patients via digital screens or using phone apps using telemedicine technologies. The only time doctors really have contact is if they swab them, otherwise most of the work is done remotely. In addition to relying on robots, doctors are guiding patients via live feed on how to properly perform self-testing.
- Professor Yi Ning (MD, Dr. Sc, MPH) Executive Director, Peking University Meinian Public Health Research Institute from Shanghai, China spoke on approach followed by the Chinese government to fight against the deadly virus, which was really a combination of three elements – control over source, measure and protection. Several diagnostic/medical technology companies worked round the clock to perform testing using RT-PCR kit which can produce results in three hours and there has been strong demand from multiple countries for import of Chinese testing kits in last few days. Next approach was to cut further transmission of virus (once tested) and these included taking help from large local companies such as Alibaba, Baidu, Tencent & Huawei who have all launched new health tech features aimed at diagnosing. Other approaches include social distancing, quarantine, telemedicine & use of medical technology/ diagnostics apart from innovator companies working on drug discovery
- Professor Frederic Tangy (PhD, Dr.Sc) Head of Vaccine Innovation Lab – Institute Pasteur from Paris, France spoke on urgent need of approved vaccines to curb the rising spread of corona virus case. He mentioned that though in an ideal world, we would expect sharing of interim discoveries by different organizations as world collectively fights towards deadly virus through collaborative approach, but the business reality reflects fierce competition amongst leading pharma companies on becoming the first to file/first to market companies to garner billions of profits. He expects fully approved drug for fighting the corona virus by early next year to be available for consumption by the world.

Till medicines/vaccines against COVID-19 become available, 'testing, testing and more testing' to support detection of cases and isolation of patients/contacts is the only effective strategy against the disease. A relatively better record of countries like South Korea in controlling the pandemic shows the benefit of testing, it delays the spread and that provides the medical fraternity with valuable time to set up hospital care system and for pharmaceutical companies to develop a treatment.

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