LATEST CORONAVIRUS VACCINE UPDATE

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Category: Opinion

Coronaviruses have arisen again after a series of viral epidemic attacks by the members of *coronaviridae* family, namely by the SARS-CoV in 2002-2003 and the MERS-CoV in the middle-east in 2012. The 2019 novel coronavirus (SARS-CoV-2) is a new human coronavirus that emerged at the end of December 2019 in Wuhan, China. This virus seems to be associated with milder symptoms but is much more widely transmitted in the community. The fatality rate of the novel coronavirus infection is estimated at around 2% (Fatality rate can change as a virus can mutate, according to epidemiologists), lower than that of SARS (10%) and much lower than that of MERS (34%). SARS-CoV-2 has globally caused more than 12·1 million cases of COVID-19, resulting in 551000 deaths and severe economic disruption.

Coronaviruses are large viruses consisting of a non-segmented, positive-strand RNA genome of ~30 kb. They exhibit a crown-like structure which is basically spike glycoproteins. The virus gains entry into the host through binding of this S glycoprotein to host cell receptor- angiotensin-converting enzyme 2 (ACE2). Due to its high mutation rates of S glycoproteins, viruses are subjected to continuous modification leading to difficulty in vaccine development.

Considering the high rate of transmission of SARS-CoV-2, a global search for a vaccine against

COVID 19 is at its peak. Currently, there are 199 candidate vaccines being tested all over the world. Majority of vaccines are protein subunit based vaccines targeting the spike protein of SARS CoV2, RNA based, and non-replicating vector-based. Although majority are under pre-clinical trials, about 11 candidate vaccines have reached human clinical trial stages, including three recombinant protein-based vaccines, two viral vector-based vaccines, one DNA vaccine, two mRNA vaccines, two inactivated virus vaccines, and one autologous dendritic cell-based vaccine loaded with antigens from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Vaccines candidates in the phase III trial includes, the British-Swedish company **AstraZeneca** and the **University of Oxford** based, called **ChAdOx1**, which uses chimpanzee adenovirus to express proteins, reported on July 20 in the journal Lancet. The vaccine is safe, causing no severe side effects. The advantages of the viral vector are the ability to elicit an elevated immunogenic response and prolonged persistence even at a lower level in the host. It raised antibodies against the coronavirus as well as other immune defenses.

The inactivated vaccine developed by **Sinopharm**, **Wuhan Institute of Biological Products** is also in the phase III trials, uses an inactivated version of SARS-CoV-2 along with an alum as adjuvant. The vaccine induced a positive immune response by producing neutralizing antibodies. Another vaccine candidate developed by a private Chinese company **Sinovac Biotech** is testing an inactivated vaccine called **CoronaVac.** In July the company launched a Phase III trial in Brazil in July. Since Phase I/II trials on 743 volunteers found no severe adverse effects and produced an immune response.

Six Indian companies which are **Zydus Cadila**, **Serum Institute of India**, **Biological E, Bharat Biotech, Indian Immunologicals,** and **Mynvax** are on the forefront of vaccine development out of these, two of them, **Bharat Biotech** and **Zydus Cadila** are starting with phase I/ II human clinical trials of their most advanced vaccines.

Hyderabad based **Bharat Biotech's Covaxin** is an "inactivated" vaccine, which is made using particles of the Covid-19 virus that were killed so that they would not be able to infect or replicate in those injected with it. Injecting particular doses of these particles serves to build immunity by helping the body create antibodies against the dead virus. The company launched Phase I/II trials in July.

Also, Ahmedabad based **Zydus Cadila's ZyCov-D** is a "plasmid DNA" vaccine. DNA vaccines use genetically engineered plasmids–a type of DNA molecule–that are coded with the antigen (a toxin or substance given off by the virus) against which the immune response is to be built. The DNA sequence injected would match that of the virus, helping the body build antibodies against it. On July 3 the company announced approval to start human trials.

Although scientists all over the world are putting their best efforts into developing a vaccine, the process does not come without its own set of obstacles. The foremost challenge that any group of researchers has encountered is the deficiency of technical knowledge with respect to SARS-CoV-2. Bringing an effective vaccine from the labs to the public use in stipulated time requires a strong and global collaboration between various academic groups and industries. The hope for the rapid development of a vaccine in the near future will only be possible when certain new standards will be developed to balance the scientific needs with the regulatory and public health considerations.

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