

How much Can We Rely on a Scrambled COVID-19 Vaccine? It is not the Only Way Out!

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ABSTRACT

The COVID-19 pandemic has engulfed the world in the blink of an eye and created a state of panic. Vaccine is one of the suggested ways to counter the menace. Smallpox was an ideal vaccine candidate yet, it took about 182 years to eradicate. Vaccines are associated with incidents of mishap like the “Cutter incident”. COVID-19 vaccine has a political, commercial angle to it, with at least 62 vaccine candidates in the pipeline. Potential obstacles in development of vaccines are mutations in strains of SARS-CoV-2, lack of details of biological properties of the virus and incomplete information of pathogenicity, lack of suitable animal models. The potential side effects of the vaccine are eosinophilic infiltration, increased infectivity following challenge infections, antibody-dependent enhancement of infections. The general public has to stop anticipating that a vaccine is nearby and believe that for now, vaccine is face mask, hand wash, and social distancing and hope that either the virus goes weak or an effective vaccine arrives rather early than late.

KEYWORDS: SARS-CoV-2, Vaccine, Side-effects, Face mask, Hand wash, Social distancing

The COVID-19 pandemic has engulfed the world in the blink of an eye and created a state of panic. The sheer rapidity of the spread of this epidemic has ensured that most countries are now affected by this disease. Hence the swiftness of the response by the government authorities to mitigate the disease.^[1] Many ways have been suggested as to how to counter this menace. Developing an effective vaccine has been suggested as one of the ways to establish a herd immunity and hence to make this virus redundant.^[2] However, it is well known that the path to any vaccine has been a treacherous one historically.

First, not all organisms are suitable for a vaccine. It is a complex phenomenon and not a magic wand. Else with the evolution of vaccines, we would have been disease-free now. Hence, it seems rather odd when politicians promise about vaccines in coming days. Taking a cue from this the general public also is anticipating a vaccine and always has a query as to “When is the vaccine arriving.”

Smallpox is an ideal vaccine candidate. It has a stable genome, only infects humans (no known animal reservoir) and with no known subclinical infections.^[3] In fact, the first vaccine was the smallpox vaccine in 1798.^[4] Yet, it took about 182 years to eradicate the disease. The history of vaccines is filled with incidents of accidents and mishaps. The most infamous is the “Cutter incident” of 1955. In this incident involving the live Salk vaccine, some polioviruses were not inactivated and were still live. This resulted in 40,000 polio cases, 51 cases of permanent palsy and 5 deaths. The US government had to stop a vaccination program for a possible influenza pandemic in 1976–1977 because of high reported cases of Guillain–Barré syndrome.^[5] Rotavirus vaccine is used for the prevention of severe diarrhea caused by

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Rotavirus. However, Center for Disease Control had to suspend its use after reports of increased incidence of bowel intussusception after the use of vaccine.^[6] In Kyoto, Japan in 1948, there were about 68 deaths out of 606 vaccinated children following a vaccination of toxic alum precipitated toxoid.^[7]

There are many such examples where the vaccines have come to public domain after a “Baptism by fire.” Today sadly a COVID-19 vaccine has a political, commercial angle to it.^[8] At present, at least 62 vaccine candidates are in the pipeline for the development of an effective vaccine for COVID-19. However, according to some estimates, a realistic and effective vaccine is more than a year away.

The angiotensin-converting enzyme-2 receptor is the most sought after target for the vaccine. However, there are multitudes of mutations observed in sequenced strains of SARS-CoV-2. This has resulted in subtypes such as L and S which in turn have significant differences in transmissibility, severity, and geographical distribution. These are potential obstacles in development of the vaccine.^[9,10] Other hindrances include the lack of details of biological properties of the virus and incomplete evidence-based information as to whether the virus infects only respiratory or gastrointestinal tract as well. The potential side effects of the vaccine are eosinophilic infiltration manifesting due to undesired and unwarranted immunopotentialization. Whole virus vaccines or even complete S protein vaccines have been observed to cause increased infectivity following challenge infections.^[11] There is thus an uncertainty about response in humans as has been seen in animal models.^[12] Furthermore, there will be a need for boosters as the mucosal immunity is short lived. However, the biggest issue is the lack of suitable animal models for testing of efficacy and safety.^[12] Some studies also quote the phenomenon of antibody-dependent enhancement of infections following vaccination.^[13,14] Furthermore, by the time a new vaccine is available, there might not be any patients available for clinical trials and also no significant market.^[15]

A vaccine trial consists of many quality checks or clinical trials. These are absolutely necessary as some trials with SARS-related coronavirus have shown to actually enhance the disease. Furthermore, because no effective vaccine is present for the related coronaviruses such as SARS and MERS, it does not ooze much confidence for this virus now. The fastest vaccine from inception to licensing was Mumps virus. It took about 4 years to develop that. Hence, it will be really admirable if we get a vaccine before a year.^[16] With the ongoing clinical trials even if the efficacy is about 50%, then it can be approved for a wider use.^[17] The

general public has to stop anticipating that a vaccine is nearby and believe that for now, vaccine is face mask, hand wash, and social distancing and hope that either the virus goes weak or an effective vaccine arrives rather early than late.^[18] Interestingly, there is a hypothesis that the mask may act as a crude vaccine actually, quite like “Variolation”. By this, a person is exposed to small doses of virus, which may make the person immune without being symptomatic.^[19]

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Conflicts of interest

There are no conflicts of interest.

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