From the President

Historically, pandemics have often come with a second wave that turned out to be worse than the first. Pandemic outbreaks have changed societies through massive mortalities, determining the outcome of wars and influencing the ways of traditional thought processes. Although looking at the history of each pandemic is important, they are unique in their own time and environment. A real time analysis of the different data components during a raging pandemic is difficult and as the situation evolves, the structure of interpretations changes. As tragic as a pandemic may be, they have opened up opportunities for advances in science involving basic sciences, medicine, public health, economic policies and provoked critical ideas developed by social scientists and philosophers. The world now faces a second wave of COVID-19 pandemic possibly by a virus more contagious than the first.

Observations suggest that the second wave is primarily due to faults in the collective behavior of society where precautions to be taken for COVID-19 have been ignored following the lull after the first wave. The most potent weapon against the Corona virus disease of wearing a proper mask in a correct manner that entails protection between people who are in contact have not been followed. Evidence for transmission through respiratory droplets and possibly aerosols indicate the importance of masks, physical distancing and hand washing.

Every calamity like this gives us opportunities for study of the unfamiliar situations that we encounter. There are lessons to be learn't. For example, we need to know, do the characteristics and effects of the virus vary between the first and the second wave? Are there new variants and if so, is it more contagious or more virulent? Is there a change in the age groups that are affected in the second wave in contrast to the first? Are the symptoms similar or there are differences? What was the response to currently used drugs during the second phase in contrast to the first? Collection and analysis of such data becomes important and helps us to understand the characteristics of the second wave and the behaviour and danger of SARS-CoV-2.

While physical barriers are ways to avoid the virus, immunization is the only way to make a huge population resistant to infections as no drugs are available. We can get immunity in two ways, either by natural infection or by administering vaccines. If 70% people are vaccinated, 'herd immunity' is possible where transmission of the virus through populations become less. Currently, vaccination has been initiated in India with Covishield and Covaxin as the primary vaccines. A Russian vaccine is being looked at currently. With a heavy population burden, vaccination for all in India presents a huge challenge.

The basis of vaccination is ‘immunological memory’. The body is trained to recognize a pathogen through vaccination. Understanding the immune mechanisms in play during infections, helps us understand how a vaccine works. Much of the mechanisms we understand, but at the same time, there are surprises from the immune reactions that we need to understand as we go through the course of a disease.

We have two systems of defense, the innate and the adaptive immunity. When a pathogen enters the body, the frontline soldiers as cells of the innate immune system recognizes the invader by ceratin pattern recognition receptors on the pathogen surface. The attack that is mounted is non-specific in nature and attacks the invaders to eliminate them. If elimination is successful then the onslaught ends. If not, the cells of the innate immune system release signals to sensitize the adaptive immune system to provide further immune backing. While doing so, these cells digest the pathogen and expresses the fragments on their surface. T cells of the adaptive immune system recognize these fragments and then destroys the virus directly or indirectly. The T-cells themselves can eliminate the virus or initiate the B-cells to produce antibodies for neutralization of the virus. Adaptive immune system sometimes takes a week to respond but the ‘memory’ of this response can survive for years in the body. Once in a while this response may fail and we need to know why they fail or why they succeed?

The pathogen forms the most important component of this story. During the course of infections, the pathogen modulates itself. The changes that the pathogen undergoes occurs naturally under selective pressure. Pathogens are exposed to the immune system of the host where it faces a variety of assault, it encounters drugs and antibodies generated by vaccination. It tries to adapt as selective forces works on the virus and creates variants. Some advantageous changes are preserved, while mutations not favorable to the virus are eliminated, as they do not present any advantage to the virus.

Since SARS-CoV-2 was first detected in Wuhan, China, in December 2019, a number of mutations have been detected in the strains retrieved from different parts of the world. The mutation D614G gives the virus advantages to infect and spread easily. First detected in South Africa, the mutant E484K enables the mutant to partially escape from the antibodies that are generated by the immune system of an infected person as protection.

Demographic studies are crucial to trace the trajectory of the spread of a disease. One of the failures of this pandemic has been the inability to collect, analyze and release epidemiological data on time. If we do not have reliable data on infections, rate of cure and deaths by gender, sex and age, it is not possible to provide any models for the future.

Sequencing of the coronavirus and interpretation of the data combined with geographical distribution is essential. This effort has to be scaled up, we have not increased our efforts in this direction even though we have the capabilities. To predict if we shall see a third wave and of what possible intensity, we need such data for interpretation of the future trajectory of the

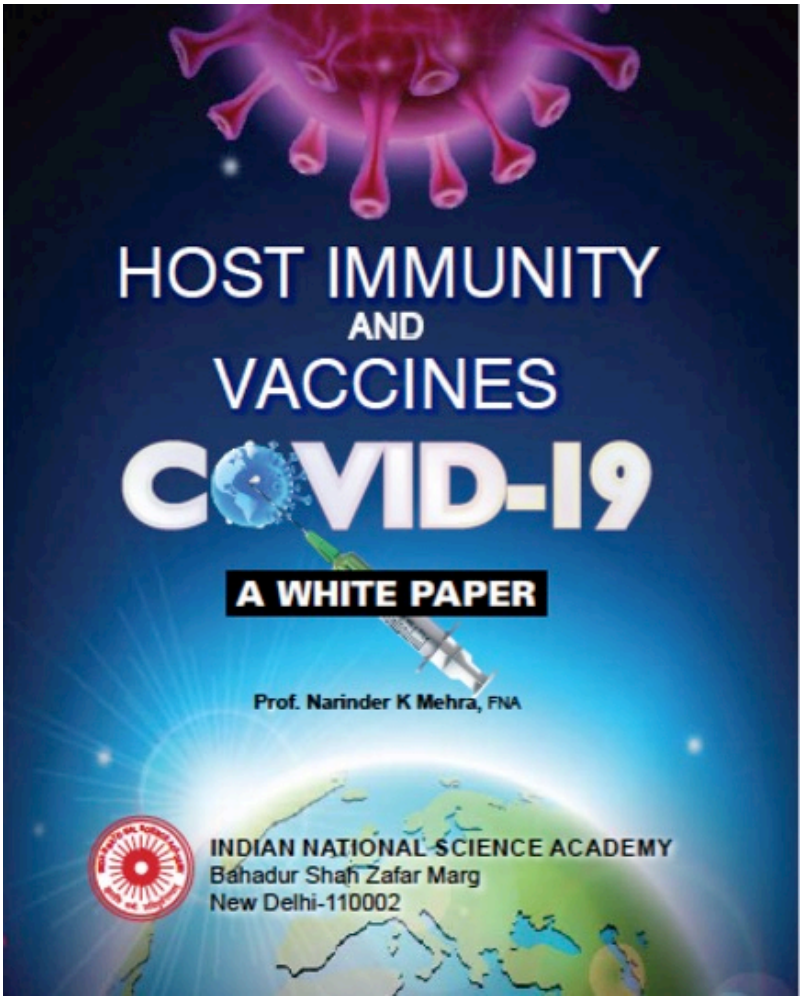
disease.

Lessons are to be imbibed and applied. Because of uncertainties in data available due to the enormity of the problem, the understanding of the COVID-19 pandemic is still nebulous. Our positive response to scientific data, innovation and policy formulation for providing guidance at the level of the public will go a long way for tracking a path for survival through these times. The biology of the suffering combined with behavioral changes in society remains difficult to interpret and negotiate.

INSA has recently published a white paper on Host Immunity and Vaccines. E-copy is available on request.

May 6, 2021 *Chandrima Shaha*

Email: president@insa.nic.in



From the President

The COVID-19 pandemic has significantly disrupted our existence and the long term impact of this disease on our personal lives and work is not known. However, the rapidity and efficiency with which the life science research community responded to the crisis, and contributed to the isolation and identification of the virus leading to designing of diagnostic kits and vaccines is commendable. The contributions of other fields of science to the fight against the virus is equally to be appreciated.

In general, there has been a severe interruption in almost all fields of science. Stark impact has been felt by the life science researchers as multiple problems cropped up starting from interruption and termination of experiments to losing jobs. This pandemic has shown how important life science research is, to answer basic scientific questions on an emerging disease and therefore, we need to ensure that the field does not suffer due to lack of support. It is crucial to reinforce life-science research and arrange to help the scientists to regain the lost ground to prepare for the future -atime with a much improved way of communication, collaboration and new ways of doing science. It is important that we engage with the scientists and other stakeholders within the ecosystem of the life science research, including the life sciences industry as the the upcoming horizon has to be mapped out.

First, it is essential that the status of the doctoral and post-doctoral students who are the main workforce for research is analysed. They can be classified as two groups - the first are those whose laboratories did not have the facilities for research on infectious diseases and hence they could not join the research efforts to help their laboratories, the second group was able to volunteer to work for testing, designing kits, sequencing the virus etc. While the first group struggled for the reason of not having access to work, the second group also diverted from their own area of interest so as to be able to serve the country. Both groups of students require help in terms of financial support and resources to continue their interrupted work asthe institutions reopen. The doctoral students (5th year) who are yet to submit their theses require an extension of tenure with fellowship support for about an year to be able to complete their work, publish their data and submit theses. Under these trying conditions, they will also require more time as they need first-authored papers to submit theses. There are beautiful data on SARS Cov-2 that have emerged from laboratories across the world and this became possible because students and scientists in the laboratories indulging in research pertaining to SARS-Cov-2, put in their heart to deliver. So, we need to nurture and support the young minds for their curiosity and committed endeavors.

There are two other groups – the students who have submitted their theses and are stranded here in spite of having offers for post-doctoral fellowships, and the scientists who have returned from abroad without jobs. So, there is this population of skilled manpower which can be utilized to add zest to the efforts of combating COVID-19. They could be put in various institutes as contractual employees with monetary support.

The returnto work has been difficult as well, because infection rates are high in some set-ups. The travel to workplace also is difficult as the public transport is not without risks. The work environment may remain uncertain for some more time to come. All these are sources of stress and counselling for students to combat the uncertainty is desirable. While we speak about the professional aspect of life, personal lives have been disrupted of many due to closure of schools, change in the mode of education of children, loss of job of spouse and other difficulties.

In view of above projections, it is essential that the Government takes appropriate measures to reduce hardships for the scientists and students in different stages of their careers.

Chandrima Shaha

September 8, 2020