

COVID-19

Science & Technology Efforts in India

VOL. IV | ISSUE 10

DISCLAIMER

Contents in this e-Newsletter are for information purposes only and have been made available in public by the relevant department/organisation.

In case of any variance between what has been stated and that contained in the relevant document, the latter shall prevail.

Unless otherwise specifically stated, the information contained herein is made available to the public for information purposes only.

Although we have made the best effort to keep the information updated, the accuracy, completeness or adequacy of information will depend on what is made available by the third party or the same being up-to-date.

This will depend on the availability of the same.

The e-Newsletter is continuously evolving and the aggregation of information is an unceasing process.

The process requires the co-operation of and synergy with all stakeholders.





PREFACE

The second wave of coronavirus posed many challenges. Besides causing mild to moderate infections, it went on to claim several lives. The second wave posed an unprecedented challenge to people's lives as well as the country's medical infrastructure. Both the first and second waves have taught us the most important lessons: preparation and early execution are essential in detecting, containing, and rapidly responding to and mitigating the spread of potentially dangerous emerging infectious diseases.

However, the second wave led to a large number of infections experts believing that many people have achieved immunity, and the effects of the third wave may somehow be weaker. But COVID-19 discipline and appropriate behaviour need to be followed with utmost vigilance.

We continue with compiling new information every fortnight on the pandemic to remain aware of the latest developments. The aim is to inform the readers and strengthen the usefulness of the data. This edition contains compilation and coverage of information related to research contributions, significant efforts, community outreach, fact-checks, and so on, with new functionalities on the inner pages for a better user perspective. For all the sections, a section guideline has been provided and hyperlinked with the respective locations.

Hopefully, the coverage about how the country is overcoming challenges with the help of knowledge will instill confidence and trust in the country's scientists and scientific administrators, ultimately resulting in inculcating scientific temper. Together we can, and we will beat the pandemic, with the collective strengths and spirit of services as the backbone.

We wish an engaging reading to our audiences across all strata of the society and look forward to their suggestions and feedback at covidnewsletter@vigyanprasar.gov.in. Additionally, feedback questionnaires have been included, and a link has been provided for submission. This, in turn, would help our readers in finding the desired and more relevant compiled information.

11 September 2021

Vigyan Prasar

New Delhi



The older issues of e-newsletter are available in the Archival Section at <https://vigyanprasar.gov.in/covid19-newsletters/>

INDEX

TOPICS	PAGE NO.
1. Efforts Impacting COVID Mitigation	01-12
2. Research Supports	13-28
3. COVID Communications	29-34
4. COVID Resources and Outreach	35-44
5. COVID Fact-checks	45-62



EFFORTS IMPACTING COVID MITIGATION

The efforts made by various agencies, apex bodies, domain institutions, and so on, who are working in the STI ecosystem towards meeting the requirements posed due to the pandemic are compiled here for the consumption and benefit of the general public. These efforts are presented here in terms of deliverables, outputs, technologies, products, services, etc., which are impactful and bring in STI elements in the activities and initiatives.

SECTION GUIDELINES

CoviHawkes: An AI tool for COVID-19

Third COVID-19 wave likely to peak around late October; experts submit report to PMO

Agilent donates AriaMx Real-Time qPCR instruments to five hospitals for COVID-19 research

Of the fully vaccinated health care workers at a Delhi hospital 25 per cent got infected, but no hospitalisation

Indian scientist partners with BRICS group to set-up network of genomic surveillance and study the overlap of SARS-CoV-2 with tuberculosis

DBT-BIRAC supported ZyCoV-D developed by Zydus Cadila receives emergency use authorisation

DBT-BIRAC supported nation's first mRNA-based vaccine found to be safe gets a nod from DCGI to move into phase II/III trial

National Institute of Animal Biotechnology, Hyderabad notified as Central Drugs Laboratory for testing and batch release of vaccines

Mission Sagar INS Airavat arrives at Thailand with COVID-19 relief supplies

DBT's 'Mission COVID Suraksha' supported Biological E Limited's novel COVID-19 vaccine candidate, CORBEVAX receives DCGI approval for two clinical trials

ICMR invites expression of interest for validation of rapid antigen detection assays for COVID-19

Genomic surveillance for SARS-CoV-2 in India: Indian SARS-CoV-2 Genomics Consortium (INSACOG)

Guidelines for domestic travel (flight/train/ship/bus inter-state travel) by MoH&FW

SOP for involvement of private sector laboratories for genome sequencing

National Health Authority and Indian Institute of Technology Delhi join hands to scale high-potential health care innovations

CoviHawkes: An AI tool for COVID-19

In the last one and a half years, more than 17 crore cases and 37 lakh deaths have been reported worldwide due to COVID-19. This has been a devastating time for everyone. The sudden rise of cases in India, the second wave of infections, prompted strict lockdowns across the country. While these lockdowns effectively curb the spread of the virus, they often come with severe emotional and financial consequences that tend to outlast the lockdown itself. Science-based and data-driven policies for enacting lockdowns at local levels are the need of the hour. The tool can help policymakers identify local regions that must go into lockdown mode to control the infection rate. Arguably, such local lockdowns would offer a sounder alternative to state-wide or nationwide lockdowns.

This tool is powered by powerful machine learning techniques. They collect data at three levels: country, state, and districts. This data is used to forecast the daily case counts at each of these levels in the future. The tool combines the observed patterns in the case counts from the past with additional factors like demographics (population density) and mobility (decrease in the percentage of people travelling for work due to lockdown) of the region. These forecasts can be used by policymakers to strategically enact lockdowns in those places that are deemed vulnerable in the near future.



Contact info:

mtechoffice.ai@iisc.ac.in

Website link:

<https://sml.csa.iisc.ac.in/covihawkes/>

Third COVID-19 wave likely to peak around late October; experts submit report to PMO

A committee of experts constituted under the National Institute of Disaster Management (NIDM) has warned of a third COVID-19 wave that could peak around late October. The committee was set up under the direction of the Home Ministry, which had sought better preparedness for children who might be at high risk.

The study titled ‘Third Wave Preparedness: Children Vulnerability and Recovery’ has details about the possibility of COVID-19 affecting children and the required strategies to deal with the pandemic. The report has underlined that the “paediatric facilities like doctors, staff, equipment viz. ventilators, ambulances, etc are nowhere close to what may be required in case, a large number of children become infected.”

The report has called for prioritising vaccination among children with co-morbidities and a special focus on those with disabilities. Even with ‘strict interventions’, the peak of the third wave is expected to arrive by late October, and the experts have concurred with earlier assessments of different institutions. Several studies have spoken of the likelihood of a third wave but these are estimates.

The report has categorically underlined two important points – children are vulnerable because they haven’t been vaccinated and are more prone to severe infections though they can pass the virus to others. However, the other estimates have said the third wave may prove to be less severe than the second.

The committee has suggested “a holistic home care model, immediate increase in paediatric medical capacities and prioritising mental health issues among children.” It has mooted structuring of COVID-19 wards in a way that allows children’s attendants or parents to safely stay with them through their recovery.

The report has called for “a scientific approach coupled with focused public spending” to deal with pandemic management.

Website link:

<https://www.csir.res.in/sites/default/files/21%20To%2025%20August%202021.pdf>

Agilent donates AriaMx Real-Time qPCR instruments to five hospitals for COVID-19 research

Agilent Technologies announced the contribution of Agilent AriaMx Real-Time qPCR instruments to five research hospitals in India to support their COVID-19 initiatives and help them serve the community at large. As part of this effort, Agilent India partnered with Tata Memorial Hospital, Mumbai; Tata Medical Center Kolkata; Gujarat Technological University; Science Communication and Dissemination Directorate (SCDD); Council of Scientific & Industrial Research (CSIR), Anusandhan Bhawan, New Delhi; CSIR-Institute of Genomics and Integrative Biology Delhi (CSIR-IGIB); and Kidwai Memorial Institute of Oncology, Bengaluru.

“It’s an honour for Agilent to partner with these eminent institutes and hospitals in their pursuit of fostering innovation, supporting scientific development and furthering research initiatives in these trying times,” said Bharat Bhardwaj, Country GM, Agilent India. Dr Mohammed Faruq,

Principal Scientist, CSIR-IGIB, thanked Agilent and their entire team for extending their support in furthering our COVID-19 research initiatives at IGIB. Since the onset of the pandemic in India, the team at IGIB has been offering various research-based genome sequencing services to numerous government health centres and academia. Dr Faruq



farther added, “Currently, IGIB is supporting the Government of India in RT-PCR tests daily. This instrument from Agilent will make our set-up more efficient and help increase the number of tests done every day. We also hope that it would prove its utility in various research exercises that IGIB is undertaking, including high throughput molecular surveillance, vaccine breakthrough genome sequencing, and reinfections sequencing of SARS-CoV-2.”

Website link:

<https://www.csir.res.in/sites/default/files/21%20To%2025%20August%202021.pdf>

Of the fully vaccinated health care workers at a Delhi hospital 25 per cent got infected, but no hospitalisation

In an indicator of the diminishing role of vaccines in preventing transmission of the coronavirus, a little over 25 per cent of the fully vaccinated health care workers of a Delhi hospital contracted a fresh or ‘breakthrough’ infection. None of the nearly 600 vaccine recipients, however, reportedly required hospitalisation. While previous reports of similar infections have been reported in other studies in India, this is the first time that such a high percentage has been reported as part of a single study.

The study involved health care workers at the Max group of hospitals in Delhi and Gurugram and was led by scientists at CSIR-IGIB. It appears as a pre-print and is yet to be peer-reviewed. The timing between the first and second dose varied, but 482 received the second dose within 42 days of the first dose. About half the recipients had been previously infected with SARS-CoV-2.

Levels of antibodies: To confirm a reinfection, the researchers relied on levels of antibodies that were directed towards the nucleocapsid region of the coronavirus, which is different from the region (spike protein) that vaccine-generated antibodies normally target. Currently, all the vaccines are designed to produce antibodies against the spike-protein and so high levels of antibodies against the nucleocapsid region were taken to be markers of a fresh coronavirus infection. A breakthrough infection is one where someone tests positive at least two weeks after their second dose.

Shantanu Sengupta of the CSIR-IGIB and one of the scientists who led the study said that 25 per cent was a ‘conservative estimate’ as many of the infections were likely asymptomatic and only a subset of them who manifested symptoms were likely to get themselves tested.

The data indicates an “urgency to explore routes towards more effective use of vaccines”, the authors say. Because a single dose of ChAdOx1-nCoV19 to previously infected subjects induces humoral immunity comparable or better than two doses in naïve subjects, a single dose could be optimally directed to populations with high seropositivity.

Website link:

<https://www.csir.res.in/sites/default/files/26%20To%2031%20August%202021.pdf>

Indian scientist partners with BRICS group to set-up network of genomic surveillance and study the overlap of SARS-CoV-2 with tuberculosis

The Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India in collaboration with BRICS countries is implementing SARS-CoV-2 NGS-BRICS consortium and a multi-centric programme to study the impact of severe COVID-19 conditions on TB patients.

The SARS-CoV-2 NGS-BRICS consortium is an interdisciplinary collaboration to advance COVID-19 health-relevant knowledge and to contribute to improvements in health outcomes. The consortium will accelerate the translation of genomic data leading to clinical and public health research and interventions from clinical and surveillance samples by utilising the high-end genomic technologies, and epidemiologic and bioinformatics tools for future use in diagnostic assays and tracking transmission dynamics of COVID-19 and other viruses. The Indian team of Professor Arindam Maitra, Professor Saumitra Das, and Dr Nidhan K Biswas from National Institute of Biomedical Genomics; Dr Ashwin Dalal from Centre for DNA Fingerprinting and Diagnostics; and Dr Mohit K Jolly from Indian Institute of Science along with Dr Ana Tereza Ribeiro de Vasconcelos from National Laboratory for Scientific Computation - LNCC/MCTI, Brazil; Professor Georgii Bazykin from Skolkovo Institute of Science and Technology, Russia; Professor Mingkun Li from Beijing Institute of Genomics, Chinese Academy of Sciences, China; and Professor Tulio de Oliveira from University of KwaZulu-Natal, South Africa will participate in this consortium.



The second multi-centric programme consists of an interdisciplinary team of researchers from India, Brazil and South Africa who would investigate the impact of severe COVID-19 on transient peripheral immunosuppression and lung hyperinflammation conditions in TB patients for epidemiology and comorbidity. This team consists of Dr Subash Babu, Dr Anuradha Rajamanickam, Dr Banurekha Velayutham and Dr Dina Nair from National Institute of Research in Tuberculosis, India; Dr Valeria Cavalcanti Rolla from Lapclin-Tb/ Infiocruz; (Dr Bruno de Bezerril Andrade from IMU, LIB, MONSTER/ IGMFIOCRUZ; Dr Adriano Gomes da Silva from LAPCLIN-TB/ INIFIOCRUZ; Dr. Maria Cristina Lourenço from LBB/ INI-FIOCRUZ, Brazil; and Dr Bavesh Kana, Dr Bhavna Gordhan, Dr Neil Martinson and Dr Ziyaad Waja from University of the Witwatersrand, Johannesburg, South Africa.

This collaborative study is expected to provide valuable co-morbidity data pertaining to pulmonary TB patients with or without COVID-19 co-infection that is expected to be generated for better disease management.

Contact info:

amI@nibmg.ac.in

Website link:

<https://dbtindia.gov.in/pressrelease/indian-scientist-partners-brics-group-setup-network-genomic-surveillance-and-study>

DBT-BIRAC supported ZyCoV-D developed by Zydus Cadila receives emergency use authorisation

Zydus Cadila received approval for emergency use authorisation (EUA) from the Drug Controller General of India (DCGI) for ZyCoV-D on 20 August 2021. This is the world’s first and India’s indigenously developed DNA-based vaccine for COVID-19, which is to be administered in humans including children and adults 12 years and above. Developed in partnership with DBT under the ‘Mission COVID Suraksha’ and implemented by BIRAC, ZyCoV-D has been supported under COVID-19 Research Consortia through National Biopharma Mission for pre-clinical studies, phase I and phase II clinical trials and under the Mission COVID Suraksha for phase III clinical trial. This three-dose vaccine, which when injected produces the spike protein of the SARS-CoV-2 virus and elicits an immune response, plays a vital role in protection from the disease as well as viral clearance. The plug-and-play technology on which the plasmid DNA platform is based can be easily adapted to deal with mutations in the virus, such as those already occurring.



Interim results from phase III clinical trials, in over 28,000 volunteers, showed primary efficacy of 66.6 per cent for symptomatic RT-PCR positive cases. This has been the largest vaccine trial so far in India for COVID-19. This vaccine had already exhibited robust immunogenicity, tolerability and safety profile in the adaptive phase I/II clinical

-  **Developed under Mission COVID Suraksha**, by Zydus Cadila and DBT-BIRAC*
*Department of Biotechnology - Biotechnology Industry Research Assistance Council
-  A three dose needle-free vaccine, to be **administered to individuals aged 12 years & above**
-  **Big boost to AatmaNirbhar Bharat** and the fight against Covid-19
-  Reportedly effective against coronavirus mutants, **especially Delta variant**

trials carried out earlier. Both the phases I/II and III clinical trials have been monitored by an independent Data Safety Monitoring Board (DSMB).

Vaccine Technology Centre (VTC), a vaccine research centre of the Zydus group, Translational Health Science and Technology Institute (THSTI), an autonomous institute of DBT, Interactive Research School for Health Affairs (IRSHA), Pune, and GCLP lab set-up under DBT-National Biopharma Mission (NBM) also played a vital role in this success story.

Website link:

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1747669>

DBT-BIRAC supported nation's first mRNA-based vaccine found to be safe gets a nod from DCGI to move into phase II/III trial

Genova Biopharmaceuticals Ltd., the Pune-based biotechnology company, working on the nation's first mRNA-based COVID-19 vaccine, submitted an interim clinical data of the phase I study to the Central Drugs Standard Control Organisation (CDSCO), the Government of India's National Regulatory Authority (NRA).

The Vaccine Subject Expert Committee (SEC) reviewed the interim phase I data and found that HGCO19 was safe, tolerable, and immunogenic in the participants of the study.

Genova submitted the proposed phase II and phase III study titled 'A Prospective, Multicentre, Randomized, Active-controlled, Observer-blind, Phase II Study Seamlessly Followed by a Phase III Study to Evaluate the Safety, Tolerability, and Immunogenicity of the Candidate HGCO19 (COVID-19 Vaccine) in Healthy Subjects', which was approved by the office of the DCGI, CDSCO.

The study will be conducted in India at approximately 10-15 sites in phase II and 22-27 sites in phase III. Genova plans to use the DBT-ICMR clinical trial network sites for this study.

Genova's mRNA-based COVID-19 vaccine development programme was partly funded by DBT under Ind CEPI in June 2020. Later on, the DBT further supported the programme under the Mission COVID Suraksha, the Indian COVID-19 vaccine development mission, implemented by BIRAC.

Website link:

<https://dbtindia.gov.in/pressrelease/dbt-birac-supported-nation%E2%80%99s-first-mrna-based-vaccine-found-be-safe-gets-nod-drugs>

National Institute of Animal Biotechnology, Hyderabad notified as Central Drugs Laboratory for testing and batch release of vaccines

In public interest, it is necessary to establish more facilities to regulate the testing of COVID-19 vaccines for quick release of vaccine batches for prevention and treatment of COVID-19 infection. For this, the Government of India has identified two autonomous institutes of DBT, viz., National Institute of Animal Biotechnology (NIAB), Hyderabad and National Centre for Cell Science (NCCS), Pune, for upgradation as Central Drug Laboratories (CDLs). The funding support for the same was provided under the PM-CARES funds.



DBT continues its support to scale up vaccine development and manufacturing ecosystem. The setting up of facilities for vaccine testing at NCCS, Pune and NIAB, Hyderabad, is a step in this direction.

The two facilities are expected to test approximately 60 batches of vaccines per month. Considering that the facilities are located in proximity to the vaccine manufacturing hubs of the nation, logistics for vaccine manufacturing and supply are expected to ease up. The generous support through PM-CARES fund and the relentless efforts of the two institutes have enabled the rapid upgradation and setting up of the state-of-the-art, modern GLP compliant vaccine testing facilities and contribute to the national requirement. This would further strengthen the vaccine supply chain and boost the massive vaccination drive in India.

Website link:

<https://dbtindia.gov.in/pressrelease/national-institute-animal-biotechnology-hyderabad-notified-central-drugs-laboratory>

Mission Sagar INS Airavat arrives at Thailand with COVID-19 relief supplies

As part of the ongoing Mission SAGAR (Security and Growth for All in the Region), INS Airavat arrived at Sattahip, Thailand with COVID-19 relief material on 3 September 2021. The ship is delivering 300 oxygen concentrators based on the requirement projected by the Government of Thailand in its fight against the ongoing COVID-19 pandemic.



INS Airavat has been deployed to deliver COVID-19 relief to friendly foreign nations in South East Asia who are battling the COVID-19 pandemic under the aegis of Mission SAGAR initiated by the Government of India.

In the current deployment, the ship has delivered COVID-19 relief material to Indonesia, Vietnam prior to arriving in Thailand.

Website link:

<https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1751779>

DBT's 'Mission COVID Suraksha' supported Biological E Limited's novel COVID-19 vaccine candidate, CORBEVAX receives DCGI approval for two clinical trials

DBT has taken myriads of initiatives to increase investments in research and development (R&D) and manufacturing of COVID-19 vaccines. 'Mission COVID Suraksha' is one such endeavour for COVID-19 vaccine development to reinforce and streamline available resources towards accelerated vaccine development, to bring in safe, efficacious, affordable and accessible COVID-19 vaccine for the citizens at the earliest under the aegis of *Atmanirbhar Bharat*.

The DBT and its PSU, Biotechnology Industry Research Assistance Council (BIRAC) have supported Biological E's COVID-19 vaccine candidate from the pre-clinical stage to phase III clinical studies. In addition to receiving financial assistance under 'Mission COVID Suraksha', this vaccine candidate has also obtained financial support under COVID-19 research consortia through National Biopharma Mission, BIRAC.

Biological E. has received DCGI approval for conducting phase III comparator safety and immunogenicity trial in adults after Subject Expert Committee's (SEC) review of phase I and II clinical trials data. Additionally, Biological E. also received approval on 1 September 2021 to initiate phase II/III study to evaluate safety, reactogenicity, tolerability and immunogenicity of CORBEVAX™ vaccine in children and adolescents. The candidate is a RBD protein sub-unit vaccine.

Website link:

<https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1751664>

ICMR invites expression of interest for validation of rapid antigen detection assays for COVID-19

ICMR invites applications for validation of rapid antigen detection tests for COVID-19 from all manufacturers who have developed rapid antigen test (RAT) kits. Requirements for validations are based on various categories, like first-time validation, revalidation, and validation with alternate sample types. The gold standard RT-PCR diagnostic test for COVID-19 has limitations in terms of widespread availability. In view of this, there is urgent requirement for reliable and convenient rapid point of care antigen detection assays with high sensitivity and specificity. Such assays could be used as potential diagnostic tests in all possible public and private health care settings and made available for mass testing.

Deadline: Open till next announcement

Contact info:

guptanivedita.hq@icmr.gov.in, drneetu.vijay@icmr.gov.in

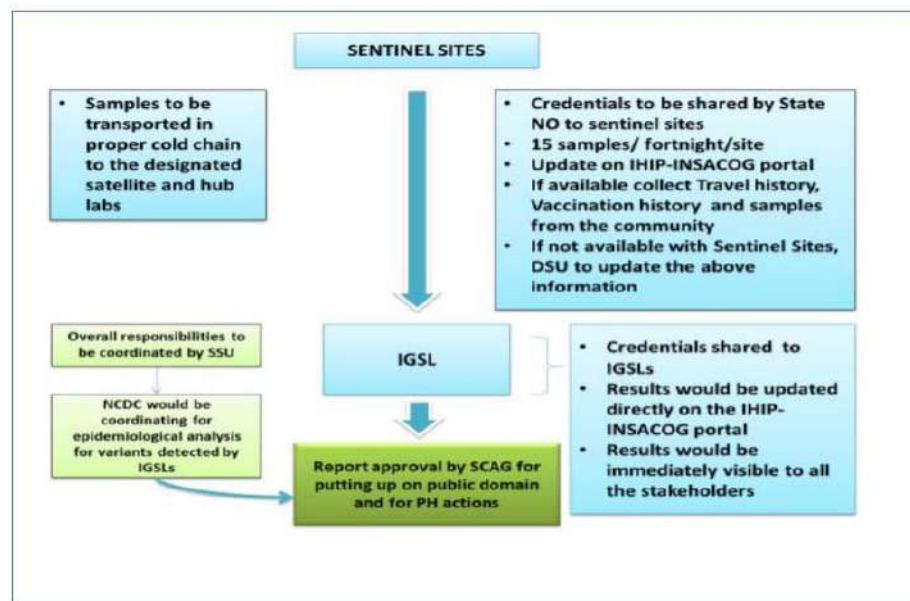
Website link:

https://www.icmr.gov.in/pdf/tender/Revised_EOI_for_Ag_kit_validation_13082021.pdf

Genomic surveillance for SARS-CoV-2 in India: Indian SARS-CoV-2 Genomics Consortium (INSACOG)

DBT along with Ministry of Health & Family Welfare (MoH&FW), ICMR, and CSIR, has issued updated guidelines and SOPs on genomic surveillance for SARS-CoV-2 in India – Indian SARS-CoV-2 Genomics Consortium (INSACOG). INSACOG has been launched and coordinated by different departments and organisations. The strategy and roadmap of INSACOG have also been prepared. The overall aim of INSACOG is to monitor genomic variations in SARS-CoV-2 on a regular basis through a multi-laboratory network. The mandate of INSACOG has evolved with time and the focus has shifted from primarily tracking variants among international passengers to early detection of variants that may emerge within the country. In the present scenario, genomic surveillance of SARS-CoV-2 has the following objectives:

1. Early detection of genomic variants of public health implication through sentinel surveillance
2. To determine the genomic variants in unusual events/trends (vaccine breakthrough, super spreader events, high mortality/morbidity trend areas, etc.)
3. To correlate the genome surveillance data with epidemiological data
4. To suggest public health actions based on the analysis of genomic and epidemiological surveillance data.



Website link:

<https://www.mohfw.gov.in/pdf/INSACOGGuidanceDocumentdated15July2021final.pdf>

Guidelines for domestic travel (flight/train/ship/bus inter-state travel) by MoH&FW

There is a declining trajectory of cases across the country after a peak in reported cases during mid-May as part of the second wave. With a view to facilitating inter-state travel, while observing required precautions, MoH&FW issued guidelines for domestic travel (flight/train/

ship/bus inter-state travel) are revised so as to have a uniform protocol for domestic travel across the country.

These guidelines are applicable to all states/UTs so as to facilitate inter-state travel. Based on the evolving scenario of COVID-19, including evidence of mutant variants within India or outside, the guidelines may warrant a suitable revision to institute appropriate public health measures also.

Website link:

<https://www.mohfw.gov.in/pdf/Guidelinesfordomestictravelflighttrainshipbusinterstatetravel.pdf>

SOP for involvement of private sector laboratories for genome sequencing

The Indian SARS-CoV-2 Genomic Consortia (INSACOG) established for genomic surveillance in the country was set-up in January 2021 with initial participation of 10 national research laboratories. These laboratories have carried out genome sequencing of 60,000 positive cases from different states of India. Sometime later, 18 more research laboratories were included in the network for enhancing sequencing effort in the country. These 28 laboratories operate on a hub and spoke model where the 10 RGSLs provide handholding for the new laboratories and act as hubs.

A need was felt to further increase sequencing efforts and target sequencing about 80,000 samples in a month to identify variants of concern (VoC) and variants of interest (VoI) in the Indian samples, so as to advice the policy makers for effective management of COVID-19. To enhance the sequencing efforts, involvement of private sectors was considered as one of the options.

Based on the proven expertise and experience of the private sector laboratories it was thought prudent to involve private sector laboratories for genome sequencing of COVID-19 virus. It was also decided to have a standard operating procedure for involvement of private sector laboratories.

Website link:

https://dbtindia.gov.in/sites/default/files/INSACOG_Aproved%20Guidelines%20for%20Public%20and%20Private%20Labs.pdf

National Health Authority and Indian Institute of Technology Delhi join hands to scale high-potential health care innovations

Recognising the role of innovations to strengthen India’s response to the COVID-19 crisis and preparedness for emerging health care needs, National Health Authority (NHA) has signed a Memorandum of Understanding (MoU) with the Indian Institute of Technology Delhi (IIT Delhi). Through this partnership, NHA and IIT Delhi will support innovative solutions to address the needs and priorities of the AB PM-JAY ecosystem. This collaboration will be crucial to support the rapid scaling and absorption of health innovations across more than 23,000 PM-JAY empanelled hospitals. The innovations supported through the SAMRIDH facility will improve the health infrastructure, build the capacity of health care providers, and build effective COVID-19 mitigation 0150 all in the pursuit to achieve ‘health for all’ in India. SAMRIDH’s initiative is addressing the challenges of the pandemic and bringing health care services to

those who need them most. Their combined network and expertise will help ensure that high impact market-based solutions are available to address the COVID-19 pandemic and future health crises.



Website link:

https://home.iitd.ac.in/show.php?id=38&in_sections=Press





2

RESEARCH SUPPORTS

The scientific approach has driven the ways the country is mitigating the pandemic. Here is an effort to sew up the significant contributions made by STI communities to humankind. The information is most suitable for the research fraternity, for whom the contact information is also provided to communicate further and up-skill the research.

SECTION GUIDELINES

IIT, BHU to use drug repurposing strategy to target SARS-CoV-2 main protease for treating COVID-19

National Research Centre on Equines (NRCE) to develop host-directed antivirals for COVID-19 patients

Stem cell derived exosome therapy for clinical management of lung damage in critically-ill corona viral pneumonia patients

Artificial intelligence in COVID-19 drug repurposing

In-silico analysis of COVID-19 genome sequences of Indian origin for identification of genetic variability and molecular targets

A network optimisation-based prediction model for COVID-19 outbreak developed by IIT Kharagpur

DECOVID: Data-assimilation and error correction of viral infectious disease models – study by IISc, Bengaluru

A mathematical framework for estimating risk of airborne transmission of coronavirus

The epidemiology and clinical information about COVID-19: A study by IIT Bombay

The spatiotemporal estimation of the risk and the international transmission of COVID-19: A domestic and global perspective

Modeling geographical spread of COVID-19 in India using network-based approach

A collaborative study by the labs of NCBS, DBT and CSIR on the entry of Coronavirus into cells and leveraging existing drugs to combat viral entry and infections

Study on alternations in immune, inflammatory and endocrine responses in Indian diabetic patients infected with SARS-CoV-2 and its clinical consequences

COVID-19 lung ultrasound database: A study by IIT Palakkad

Understanding the efficacy of existing drug molecules on COVID-19 through an interactive pathway: A deep learning-based predictive model

Study on SARS-CoV-2 Delta variant replication and immune evasion mechanism

IIT Delhi, AIIMS New Delhi and Addverb co-develop telerobotic ultrasound system during COVID-19 pandemic times

Study on the impact of environmental indicators on the COVID-19 pandemic in Delhi

COVID-19 pandemic: Insights into molecular mechanisms leading to sex-based differences in patient outcomes

IIT Palakkad made a roadmap for investigation on the long-term effects of COVID-19 in the context of airways diseases

Second round statewide survey for estimation of the burden of active infection and anti-SARS-CoV-2 IgG antibodies in the general population of Karnataka, India

Identification of COVID-19 prognostic markers and therapeutic targets through meta-analysis and validation of Omics data from nasopharyngeal samples

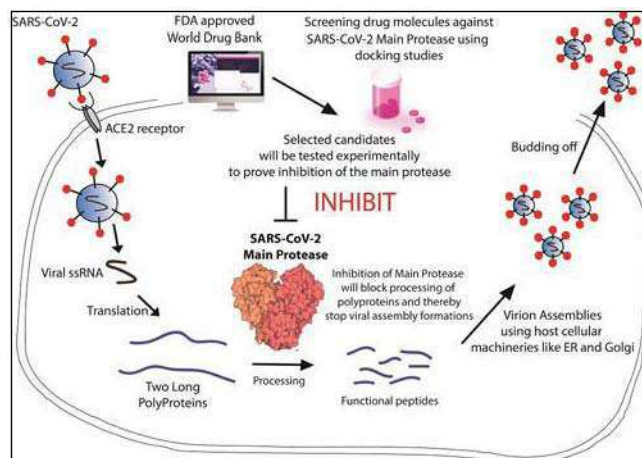
Fighting COVID-19 viral variants with a heat-tolerant vaccine

IIT, BHU to use drug repurposing strategy to target SARS-CoV-2 main protease for treating COVID-19

The research group of Prof. Vikash Kumar Dubey from IIT, BHU, is working on developing new drug candidates against SARS-CoV-2 by exploring DrugBank (DrugBank is a database of FDA approved drug compounds) database compounds as an inhibitor of SARS-CoV-2 main protease, a key enzyme required for SARS-CoV-2 assembly and multiplication.

Taking advantage of available crystal structure of the SARS-CoV-2 main protease, a structure-based inhibitor design will be made by the researchers from the available FDA approved drugs compounds in the DrugBank database.

Subsequently, experimental validation of the designed inhibitor(s) on recombinant SARS-CoV-2 Mpro Protein will be carried out. Various inhibitor parameters will be calculated to establish



the effectiveness of the inhibition of the SARS-CoV-2 Mpro enzyme function. As the enzyme SARS-CoV-2 Mpro, is key for processing and polyprotein for virus assembly, the inhibition of this key protein can have an antiviral effect. As most of DrugBank database compounds are characterised in terms of pharmacokinetics and toxicity, the identified molecule could be brought to the market rapidly.

Contact info:

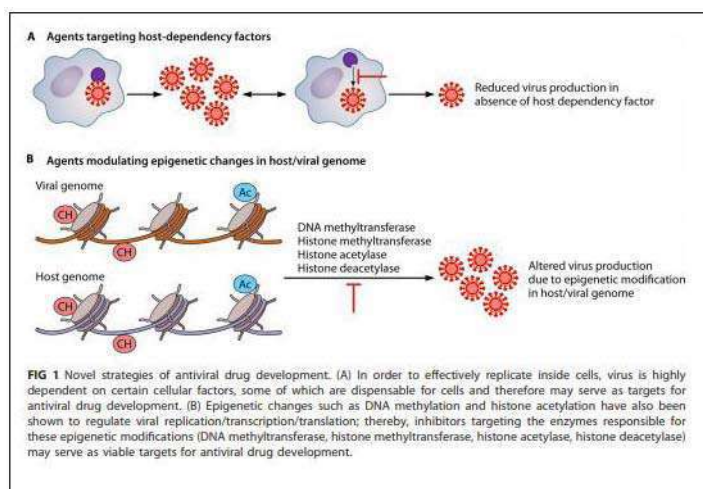
vkdubey.bce@iitbhu.ac.in

National Research Centre on Equines (NRCE) to develop host-directed antivirals for COVID-19 patients

The Department of Science & Technology (DST) has approved support for a study by the ICAR-NRCE from Hisar in Haryana, which will screen their library of 89 small molecule chemical inhibitors for antivirals against coronaviruses.

Classically, antiviral drugs are developed by directly targeting viral proteins. However, this approach has been unsuccessful due to rapid generation of drug resistant escape variants. Being intracellular parasites, viruses are highly dependent on cellular factors. Therefore, the cellular factors that are dispensable for the host but are essential for virus replication can be targeted for antiviral drug development. They collected 89 small molecule chemical inhibitors that are known to target cellular kinases, phosphatases and epigenetic modifiers. This library of chemicals has been screened to identify potential candidates with antiviral activity against the family members of Poxviridae, Paramyxoviridae, Orthomyxoviridae, Herpesviridae and Arenaviridae.

This study aims to screen the entire library of small molecule chemical inhibitors for their antiviral action against coronavirus-infectious bronchitis virus (IBV). The selected candidates with antiviral activity against IBV will be subjected to study their molecular mechanism of action, besides examining generation of potential drug resistant virus variants. Targeting host factors could have a significant impact on multiple virus genotypes and provide broad spectrum inhibition against different families of viruses, which might use the same cellular pathway(s) for replication. Therefore, the drug candidates active against IBV may be repurposed for antiviral drug development against COVID-19.



Contact info:

naveenkumar.icar@gmail.com

Stem cell derived exosome therapy for clinical management of lung damage in critically-ill corona viral pneumonia patients

A recent study by Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), hypothesises to explore the Mesenchymal Stem Cell (MSC)-derived extracellular vesicles, otherwise called exosomes, as a potential regenerative regime for lung regeneration in ARDS mice models.

They hypothesise that the immuno-modulatory and the reparative properties of MSC-derived exosomal fractions will aid in controlling the cytokine storm and lung tissue regeneration in critically ill COVID-19 patients. In this project, they first isolate MSCs from Wharton's jelly of umbilical cord (WJ-MSCs) from healthy donors after taking informed consent. Subsequently, sub-confluent WJ-MSCs in culture will be grown in serum-free medium, the used medium will be collected and subjected to ultra-centrifugation to obtain exosomal fraction. Surface marker (CD63, CD81 and TSG101), total particle number, size and total protein content analysis of resultant exosome fraction will be characterised as per reported protocols. To assess the regenerative potential of this exosomal fraction, they will develop an acute lung damage model in SD rats (n=6/group) and treat the animals with exosome based inhalation formulation. One group provided with WJ-MSCs and another group without any treatment would be considered for comparison. The extent of lung vascular remodeling, alveolarisation and pulmonary hypertension will be assessed. Further, one of the challenges in MSC-based therapies is the limited number of availability at source and requirement of large number of cells for clinical application. In this project, they will also work on development of ex-vivo expansion system using novel cell carriers. Overall, the project aims to offer WJ-MSC-exosomal-based therapy for lung regeneration in critically-ill patients suffering from pneumonia caused by SARS-CoV-2 in particular and any other lung damage with similar pathophysiology.

Contact info:

naresh.kasaju@gmail.com

Artificial intelligence in COVID-19 drug repurposing

Drug repurposing or repositioning is a technique whereby existing drugs are used to treat emerging and challenging diseases, including COVID-19. Drug repurposing has become a promising approach because of the opportunity for reduced development timelines and overall costs. In the big data era, artificial intelligence (AI) and network medicine offer cutting-edge application of information science to defining disease, medicine, therapeutics, and identifying targets with the least error.

They want to develop a model harnessing AI and ML approaches that can be able to select and prioritise drugs according to descriptor properties in a lesser time. The drug target selection involves two way strategies: one to identify targets in virus, and other to identify proteins or enzymes in human that are required for virus attachment and entry inside the host cell. Virtual screening and docking approaches will be preferred to find correct orientation of ligand at the active site. Nowadays molecular dynamics simulations allow the observation of unsupervised ligand–target binding, assessing how these approaches help in optimising target affinity and drug residence time toward improved drug efficacy. Their main advantage is in explicitly treating structural flexibility and entropic effects. This allows a more accurate estimate of the thermodynamics and kinetics associated with drug-target recognition and binding. So, they want to monitor and analyse the dynamics of drug-receptor interaction in real time using molecular

dynamics simulations. Their proposed machine learning-based models can be able to promote data-driven decision making and has the potential to speed up the drug discovery process and reduce failure rates in drug discovery and development. The identified potential repurposed drugs from this project will aid in facilitating the hunt of anti-COVID-19 drug discovery. Dr Manoj Kumar Yadav from SRM University, Sonapat, Haryana has successfully identified 75 compounds with an accuracy range of 70-100 per cent as active compounds against SARS-CoV-2 spike protein.

All the screened compounds will be further investigated using molecular docking protocols and MD simulation in the next part of their work.

Contact info:

manojiids@gmail.com

In-silico analysis of COVID-19 genome sequences of Indian origin for identification of genetic variability and molecular targets

A researcher group from National Institute of Technical Teachers' Training and Research, Kolkata was working on 'in-silico analysis of 10,000 genomic sequences of COVID-19 around the world, including India to identify genetic variability and potential molecular targets in virus and humans'. The primary objectives of this project were to: (a) identify the genetic variability in SARS-CoV-2 genomes around the globe including India; (b) identify the number of virus strains using single nucleotide polymorphism (SNP) data; (c) identify the putative epitopes as candidates of synthetic vaccine, based on genomic conserved regions that is highly immunogenic and antigenic; and (d) identify the potential target proteins of the virus and human host, based on protein-protein interactions as well as by integrating the knowledge of genetic variability. In addition to these, other objectives like prediction of coronavirus from other pathogenic viruses using machine learning; and identification of virus miRNAs that are also involved in regulating human mRNA or vice-versa were also considered to explore the challenges of COVID-19 from multiple directions to give best possible answer to combat the spread of SARS-CoV-2.

This project addresses such needs by developing a pipeline for systemic analysis of virus genomes. Multiple sequence alignment of 10664 SARS-CoV-2 sequences/genomes from 73 countries including India was performed. Thereafter, a consensus sequence was built to analyse each genome to identify mutations points as substitutions, deletions, insertions and SNPs, thereby resulting in 7209, 11700, 119 and 53 such points, respectively in coding regions. Subsequently, hierarchical clustering was used on SNP data to identify virus strains. As a result, five major clusters or virus strains were identified. Furthermore, using entropy values corresponding to the genomic coordinates of the aligned sequences, conserved regions were also identified. After filtration of these conserved regions, on the basis of length, one conserved region was identified as target in the NSP6 gene and its primers and probes were identified to detect SARS-CoV-2. These refined conserved regions were then considered to identify highly immunogenic and antigenic T-cell and B-cell epitopes.

As a result of this project, 30 MHC-I and 24 MHC-II restricted T-cell epitopes with 14 and 13 unique HLA alleles and 21 B-cell epitopes were identified for the 17 filtered conserved regions.

Contact info:

indrajit@nitttrkol.ac.in

A network optimisation-based prediction model for COVID-19 outbreak developed by IIT Kharagpur

Dr Goutam Sen from IIT-Kharagpur is working on network optimisation-based prediction model for COVID-19 outbreak. The project is supported by the Science and Engineering Research Board (SERB), a statutory body under DST, Government of India, under the MATRICS scheme for studying mathematical modelling and computational aspects to tackle the COVID-19 pandemic.

Modelling of COVID-19 spread and other similar infectious diseases is a significantly challenging task due to the inherently stochastic contagion process. The Arogya Setu app developed by MeITY, Government of India, is a significant step forward to create a mechanism of location tracking of registered mobile numbers.

The epidemiological problem can be modelled as a constrained Steiner tree problem, which is NP-hard. So, an efficient heuristic algorithm is proposed to design to solve the underlying optimisation model and test its performance using a contagion simulation episode. A SIR-based agent simulation model has been developed to create benchmark dataset. The model's inputs are carefully constructed from the features of COVID-19. For generating test dataset, a contagion episode is simulated following a stochastic contagion process. In this simulation, the transmission probabilities are estimated from the link level data (i.e. date and duration of contact, and some other demographic factors). The performance of the optimisation model and heuristic algorithm will be tested using these simulated datasets. Further, an optimisation model is developed to identify the most influential contacts in a network so that they can be targeted for testing and isolation. The validation of the model is in process.

In the network analysis and agent-based simulation, it has been observed that there are a handful number of people who are responsible for the explosive growth of the number of cases. These people are known as super spreaders and can be easily detected as hubs in the contact network. So, under limited resources, the model helps to target very specific people to testing and isolation, thus containing the spread of the disease.

Contact info:

ggen@iem.iitkgp.ac.in

DECOVID: Data-assimilation and error correction of viral infectious disease models – study by IISc, Bengaluru

A team of researchers from Indian Institute of Science (IISc), Bengaluru, is working on a project that will study the new data assimilation and error correction theory for infectious disease models, numerical schemes and scalable computational systems to implement Bayesian data assimilation.

Several dynamical models are available for forecasting the spread of infectious diseases such as SIR, SEIR, SIS. These are differential equation based models that seek to model a complex phenomenon with several unknowns. The goal of the present project is to develop numerical schemes and algorithms for a Bayesian data assimilation methodology to rigorously correct forecast errors of differential equation-based viral infectious disease dynamical models, and to improve their prediction skill. The technology will be used to correct model errors due to uncertainty in any forward infectious disease model that is used in practice.

Contact info:

deepakns@iisc.ac.in

A mathematical framework for estimating risk of airborne transmission of coronavirus

COVID-19 has posed severe challenges to public health responses across countries. Mitigation and containment tactics have largely relied on the initially held belief that COVID-19 is a respiratory infectious disease that relies on droplet transmission not airborne transmission.

The current study will model the aerosolised transmission of pathogens via turbulent expiratory events – coughing, sneezing and even exhaling. Many body hydrodynamics of a droplet cluster, mimicking a cough/sneeze will be simulated, to obtain a better understanding of droplet-airborne transmission of diseases. The role of polydispersity, hydrodynamic interactions, background turbulence, preferential concentration and droplet wake dynamics on the ‘cough cloud’ will be studied.

Contact info:

anubhab@iitm.ac.in

The epidemiology and clinical information about COVID-19: A study by IIT Bombay

The research group of Dr. Mandar M Inamdar from Indian Institute of Technology (IIT) Bombay is working on the development of a general, cell-based model of 2D viral spread in a tissue in which cells are mechano-chemical entities that can deform, move, divide, and die. An additional layer of SARS-CoV-2 related kinetics will be provided for each cell that includes virus load per cell and the intensity of immune response. By modulating cell division rate, cellular motility diffusion rate of free virus, rate of cell-cell virus transfer, cell-lysis rate, and initial infection seeding, a landscape of infection patterns will be generated to understand the intensity of viral infection. Not surprisingly, the tissue-spread model is the in-host analog of infection spread in a population, where each cell within the tissue is the counterpart of an individual agent in an epidemiological model.

The long-term goal of this project is to extend the knowledge from this project to gain multi-level insights into the COVID-19 pandemic by studying the connection between in-host viral spread (immediate goal), population-level epidemiology, and the underlying molecular evolution.

Contact info:

minamdar@iitb.ac.in

The spatiotemporal estimation of the risk and the international transmission of COVID-19: A domestic and global perspective

The study proposed to investigate three key aspects. First, spatial propagation is a key aspect behind the spread of COVID-19. Understanding the propagation mechanism is of paramount importance for preventive and corrective actions to be effective. It is proposed to combine the two critical components, namely temporal and spatial, into a single modelling framework of hierarchical models. While random effects models for such scenarios exist in literature, the study aims to extend them in two directions to facilitate the following: (a) allow to model nested nature of the data (such as districts within states); and (b) enable incorporation of covariates (for instance, climatic variables, mobility, economic factors, population size/density, biological variables). Second, the natural propagation of the epidemic is affected by implementations of (non-pharmaceutical) interventions. Successful implementation of such measures can favourably

alter the path of the epidemic. The study proposes to implement such a model after adding extra features that are pertinent to the Indian subcontinent. A third aspect of COVID-19 is predicting the aftermath of the pandemic.

These models have been applied to Indian state-level data to describe and predict domestic COVID-19 situation and these developed models will help to train other scientists for capacity building for future problems.

Contact info:

mbsm@uohyd.ernet.in

Modeling geographical spread of COVID-19 in India using network-based approach

Most of the existing epidemiological models consider a closed environment. There is hardly any approach that considers network dynamics that happen between the geographic locations that are encountered by the model.

The project is aimed to predict the spread of COVID-19 in India under the assumption that migration happens between States. The objective is to model the spread of COVID-19 in the different States of India with inter-State migration allowed. As there are limited such attempts and they do not provide any concrete mathematical model, so the contribution will be novel.

It is observed that the proposed model is more intuitive than being mathematically effective. The preliminary theoretical study suggested pursuing a more robust model for understanding disease progression. This model suggests weighting the population variables.

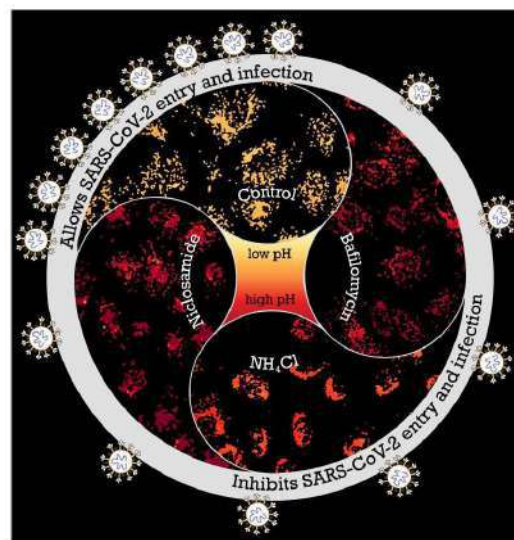
Contact info:

malaybhattacharyya@isical.ac.in

A collaborative study by the labs of NCBS, DBT and CSIR on the entry of Coronavirus into cells and leveraging existing drugs to combat viral entry and infections

In the wake of COVID-19, there was a pivot in the focus of several labs. Collaborations were born to apply the hard-won skills, techniques and knowledge from various labs to study the viral infection process and potential therapeutics.

Year 2020 saw the start of a large inter-institutional effort between labs on the campus, and the Indian Institute of Integrative Medicine (CSIR-IIIM), fuelled by the desire to combine the expertise of diverse scientists towards alleviating the global challenges of the pandemic we continue to face. In this effort, a large team came together to identify entry mechanisms of SARS-CoV-2 into cells and strategies to inhibit the infections by targeting those mechanisms.



The mechanism of entry into the cell, or 'endocytosis', happens through the formation of an 'endosome' or vesicle from the cell membrane. Investigating the pathway of entry showed them a requirement for viral entry: the acidified endosomes. This led them to the identification of agents to inhibit acidification of endosomes and thus affect viral infection.

The experiments began with the simplest probe, and the probes' complexity grew. With their experience in endocytic work, researchers focused on the cell entry process using the receptor binding domain (RBD) of SARS-CoV-2 spike protein. They found that both endocytic pathways utilised by the RBD (with and without ACE2 receptor) converge on acidified endosomes. This, therefore, may be a requirement for virus entry. They also used this pseudovirus to test ways to inhibit viral entry. The experiments with the RBD protein and pseudovirus entry into the cells offered many insights, including controlling the acidification of the endosome to prevent viral entry. The testing of the efficacy of Niclosamide and other inhibitors on the real SARS-CoV-2 was possible once approvals and transfers were in place for clinical samples to be used in the investigation.

Website link:

<https://news.ncbs.res.in/research/experimenting-during-pandemic>

Study on alternations in immune, inflammatory and endocrine responses in Indian diabetic patients infected with SARS-CoV-2 and its clinical consequences

Dr. Saroj Kumar Sahoo from Sanjay Gandhi Postgraduate Institute of Medical Sciences is conducting a study on the immune and endocrine stress response in COVID-19 patients with and without diabetes. The purpose of the study is to estimate whether a higher viral load contributes to poor prognosis in patients with Diabetes Mellitus (DM). This study will also provide new information on the endocrinological spectrum of manifestations of COVID-19 such as new-onset DM, pituitary, adrenal, and thyroid disorders. Some of the disorders like adrenal insufficiency, if detected in a timely manner can be lifesaving when treated adequately. This study will help in understanding the pathophysiology of severe illness in patients with DM and thus will help in designing a strategy for better monitoring, risk-stratification, and management in patients with DM infected with SARS-CoV-2.

Contact info:

drsarojsahoo21@gmail.com

COVID-19 lung ultrasound database: A study by IIT Palakkad

Dr. Mahesh Raveendranatha Panicker and his team from the Indian Institute of Technology (IIT) Palakkad, has done a study on the COVID-19 lung ultrasound (LUS) of 1500 data with the help of a lightweight algorithm. This algorithm 'you look only once' version 5 (YOLO5) and single-shot detection (SSD) has the capability of providing quality images based on the identification of various LUS landmarks, prediction of severity of lung infection, and so on. Also there is the possibility of active learning through this database based on the feedback from clinicians.

Contact info:

mahesh@iitpkd.ac.in

Understanding the efficacy of existing drug molecules on COVID-19 through an interactive pathway: A deep learning-based predictive model

The faculty of Indian Statistical Institute, Kolkata, Prof. Rajat Kumar De has done a study to identify the potential bioactive drug candidates and allow further investigation of the molecular mechanisms of action. In this research, the role of artificial intelligence (AI) in the identification, diagnosis and spread of SARS-CoV-2 virus has been studied. It is observed that AI-based image processing techniques had a colossal application in the detection of COVID-19 pneumonia in patients, based on chest X-ray, chest computed tomography (CT) and chest high resolution computed tomography (HRTC) images. Further, AI-based predictive models had shown potential in the identification of effective drugs molecules, repurposing of which might help in the treatment of COVID-19 disease. Based on literature reviews and an auto-encoder-based deep learning methodology, Mozenavir, Oseltamivir and Di-hydro-artemisinin has been identified as probable drug molecules that might be effective in the treatment of SARS-CoV-2 virus. The available structure of SARS-CoV-2 virus has also been analysed and through knowledge-based docking, probable binding sites for vitamin D3 and ivermectin identified. It thus opens up new avenues for repurposing of these drug molecules as potential drugs against SARS-CoV-2 viral infection.

Contact info:

rajat@isical.ac.in

Study on SARS-CoV-2 Delta variant replication and immune evasion mechanism

In an international collaboration involving CSIR-IGIB and INSACOG consortium and others, a group of researchers examined the underlying mechanisms for SARS-CoV-2 B.1.617.2 Delta variant replication and immune evasion.

The SARS-CoV-2 B.1.617.2 (Delta) variant was first identified in Maharashtra in late 2020 and spread throughout India, outcompeting pre-existing lineages including B.1.617.1 (Kappa) and B.1.1.7 (Alpha). The study suggests that the Delta variant is six-fold less sensitive to serum neutralising antibodies from recovered individuals, and eight-fold less sensitive to vaccine-elicited antibodies as compared to wild type (WT) Wuhan-1 bearing D614G.

The Delta variant demonstrated higher replication efficiency in both airway organoid and human airway epithelial systems compared to Alpha variant. The Delta variant spike protein was able to mediate highly efficient syncytium formation that was less sensitive to inhibition by neutralising antibody as compared to WT spike. Additionally, it was observed that Delta variant had higher replication and spike mediated entry as compared to Kappa variant, which explains the dominance of Delta variant mediated infections. The study has been published in Nature.

Website link:

https://www.nature.com/articles/s41586-021-03944-y_reference.pdf

IIT Delhi, AIIMS New Delhi and Addverb co-develop telerobotic ultrasound system during COVID-19 pandemic times

Research collaboration between IIT Delhi and AIIMS New Delhi, jointly developed a telerobotic ultrasound system.



The system allows remote ultrasound access through a robotic arm. In the routine ultrasound setting, the doctor (radiologist) stands in close contact with the patient for the entire duration of the scan. However, cross-sectional imaging is preferred instead in the current pandemic scenario with stringent social distancing requirements – a more expensive and less dynamic technique. Ultrasonography is a non-invasive, non-ionizing, cost-effective, rapid, bedside, and readily available modality with immense use in point-of-care and follow-up examinations.

The research team at IIT Delhi was led by Prof. Chetan Arora and Prof. Subir Kumar Saha. Dr. Chandrashekhara from AIIMS made this system. Mr. Suvayan Nandi was the lead contributor from Addverb Technologies.

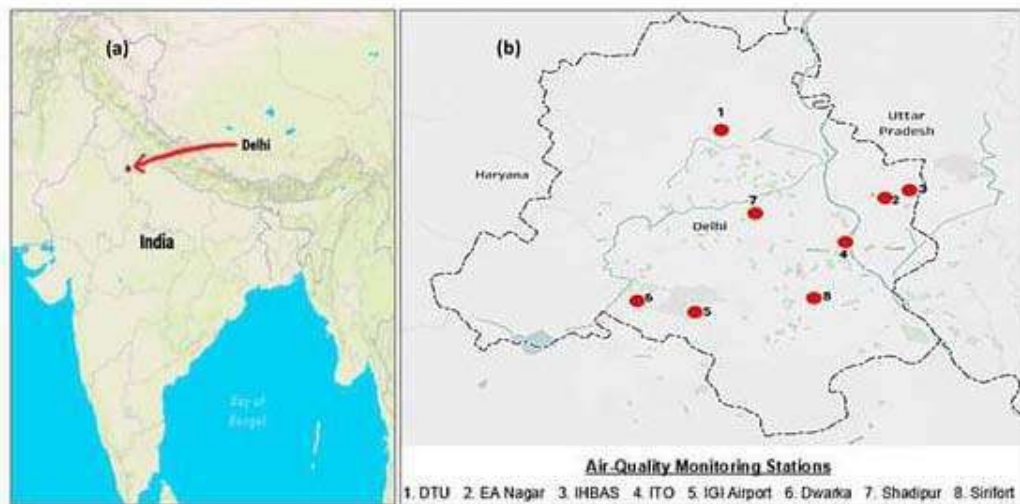
This system will promote health care and make the system more prepared for further pandemics. Besides its role in the pandemic, it will allow a better outreach of ultrasound imaging to remote rural areas of India. The radiologist manipulates the ultrasound probe remotely from a remote location, acquires the ultrasonographs, and then transmits them to the monitors at the doctor's end through a Wi-Fi network. Sitting at a remote location, the doctor can view all the images and assess the patient, similar to a clinical setting. The facility can also be extended for global outreach.

Website link:

https://home.iitd.ac.in/show.php?id=37&in_sections=Press

Study on the impact of environmental indicators on the COVID-19 pandemic in Delhi

Currently, there is a massive debate on whether meteorological and air quality parameters play a crucial role in the transmission of COVID-19 across the globe. With this background, an IIT Indore study aims to evaluate the impact of air pollutants (PM2.5, PM10, CO, NO, NO₂, and O₃) and meteorological parameters (temperature, humidity, wind speed, and rainfall) on the spread and mortality due to the COVID-19 outbreak in Delhi from 14 March 2020 to 3 May 2021. The Spearman's rank correlation method employed on secondary data shows a significant correlation between the COVID-19 incidences and the PM2.5, PM10, CO, NO, NO₂, and O₃ concentrations. Amongst the four meteorological parameters, temperature is strongly correlated with COVID-19 infections and deaths during the three phases, i.e.,



(a) Map showing the location of the study area of Delhi, India. (b) Map showing the outline of the study area and the location of eight air quality and weather monitoring stations in Delhi, India.

pre-lockdown (14 March 2020 to 24 March 2020) ($r = 0.79$), lockdown (25 March 2020 to 31 May 2020) ($r = 0.87$), and unlock (1 June 2020 to 3 May 2021) ($r = -0.75$), explaining the variability of about 20-30 per cent in the lockdown period and 18-19 per cent in the unlock period. NO₂ explained the maximum variability of 10 per cent and 7 per cent in the total confirmed cases and deaths among the air pollutants, respectively. A generalised linear model could explain 80 per cent and 71 per cent of the variability in confirmed cases and deaths during the lockdown and 82 per cent and 81 per cent variability in the unlock phase, respectively. These findings suggest that these factors may contribute to the transmission of COVID-19 and its associated deaths. The study results would enhance the ongoing research related to the influence of environmental factors. They would be helpful for policymakers in managing the outbreak of COVID-19 in Delhi, India.

Contact info:

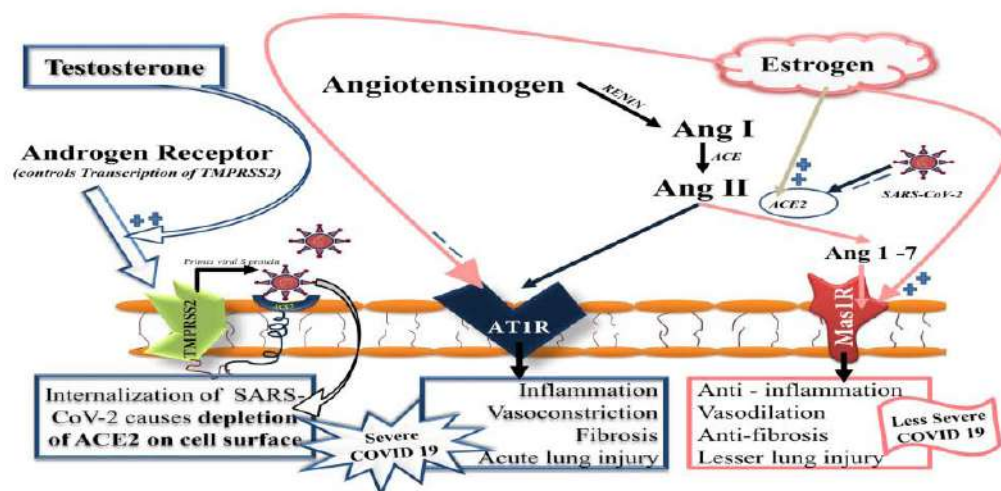
sherry@iipsindia.ac.in; doyell1111996@gmail.com

Website link:

<https://www.mdpi.com/2076-0817/10/8/1003/htm>

COVID-19 pandemic: Insights into molecular mechanisms leading to sex-based differences in patient outcomes

Recent epidemiological studies analysing sex-disaggregated patient data of coronavirus disease 2019 (COVID-19) across the world revealed a distinct sex bias in the disease morbidity as well as the mortality – both being higher for the men. Similar antecedents have been known for the previous viral infections, including from coronaviruses, such as severe acute respiratory syndrome (SARS) and middle-east respiratory syndrome (MERS). A sound understanding of molecular mechanisms leading to the biological sex bias in the survival outcomes of the patients in relation to COVID-19 will act as an essential requisite for developing a sex-differentiated approach for therapeutic management of this disease. Recent studies that have explored molecular mechanism(s) behind sex-based differences in COVID-19 pathogenesis are scarce.



Virus-mediated modulation of RAS in COVID-19 patients and influence of sex hormones

However, existing evidence, for other respiratory viral infections, viz. SARS, MERS and influenza, provides important clues in this regard. In an attempt to consolidate the available knowledge on this issue, a group of researchers from Etiologically Elusive Disorders Research Network (EEDRN), AIIMS Patna, and IIT Gandhinagar conducted a systematic review of the existing empirical knowledge and recent experimental studies following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The qualitative analysis of the collected data unravelled multiple molecular mechanisms, such as evolutionary and genetic/epigenetic factors, sex-linkage of viral host cell entry receptor and immune response genes, sex hormone and gut microbiome-mediated immune-modulation, as the possible key reasons for the sex-based differences in patient outcomes in COVID-19.

Contact info:

drashutoshkumar@aiimspatna.org

Website link:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8353216/pdf/SI462399421000090a.pdf>

IIT Palakkad made a roadmap for investigation on the long-term effects of COVID-19 in the context of airways diseases

As we all know the long-term effects of COVID-19 in the recovered patients are not yet elaborated. Prof. Jagadeesh Bayry is a part of the international consortium to identify research priorities to understand the long-term sequelae of COVID-19 in the population with pre-existing and new on-set airways diseases including chronic obstructive pulmonary disease and asthma. The consortium has identified the prognosis scores as the main area of future investigation. Emphasis was also laid on the prevalence and severity of post-COVID-19 fatigue, anxiety, depression, and risk of cardiovascular complications in such patients.

Website link:

<https://iitpkd.ac.in/news/roadmap-investigation-long-term-effects-covid-19-context-airways-diseases>

Second round statewide survey for estimation of the burden of active infection and anti-SARS-CoV-2 IgG antibodies in the general population of Karnataka, India

The second round of the serial cross-sectional sentinel based population survey to assess active infection, sero-prevalence, and their evolution in the general population across Karnataka was conducted. Additionally, a longitudinal study among participants identified as COVID-19 positive in the first survey round was conducted to assess the clinical sensitivity of the testing kit used. Methods: The cross-sectional study of 41,228 participants across 290 health care facilities in all 30 districts of Karnataka was done among three groups of participants (low, moderate, and high risk). Consenting participants were subjected to real time reverse transcription-polymerase chain reaction (RT-PCR) testing, and antibody (IgG) testing. Results: Overall weighted adjusted seroprevalence of IgG was 15.6 per cent (95% CI: 14.9 to 16.3), crude IgG prevalence was 15.0 per cent and crude active prevalence was 0.5 per cent. Statewide infection fatality rate (IFR) was estimated as 0.11 per cent, and COVID-19 burden was estimated between 26.1 to 37.7 per cent (at 90% confidence). Clinical sensitivity of the IgG ELISA test kit was estimated as equal or more than 38.9 per cent. Conclusion: The sentinel-based population survey helped identify districts that needed better testing, reporting, and clinical management. The State was far from attaining natural immunity during the survey and hence must step up vaccination coverage and enforce public health measures to prevent the spread of COVID-19.

Contact info:

rajeshs@iisc.ac.in

Website link:

<https://covid19.iisc.ac.in/second-round-statewide-survey-for-estimation-of-the-burden-of-active-infection-and-anti-sars-cov-2-igg-antibodies-in-the-general-population-of-karnataka-india/>

Identification of COVID-19 prognostic markers and therapeutic targets through meta-analysis and validation of Omics data from nasopharyngeal samples

While vaccine development for COVID-19 has progressed rapidly, the discovery of prognostic markers and antiviral drugs has been lagging behind. Several research groups have examined the host response in the respiratory tract to SARS-CoV-2 infection using OMICs technologies and large amounts of big data have been generated. Careful analysis of these data can provide insights required for COVID-19 prognosis and antiviral development.

A recent study, led by Shashank Tripathi from the Centre for Infectious Diseases Research and published in *EbioMedicine*, reports two novel findings: a specific gene signature in nasal swabs, which can predict COVID-19 severity, and the potential offered by an FDA-approved drug (Auranofin) for COVID-19 therapy.

Current methods of assessing COVID-19 severity involve drawing blood or imaging the chest, both of which require a hospital visit. In the study, the researchers conducted a meta-analysis of COVID-19 OMICs data from nasopharyngeal samples, which revealed host factors that are consistently upregulated during infection. They were able to identify specific genes belonging to the S100 family (S100A6, S100A8, S100A9, and S100P), which could serve as prognostic

markers of severe COVID-19. This gene signature can be detected by RT-PCR in the nasal swabs, which are collected for COVID-19 diagnosis.

In the study, the researchers also identified multiple host processes, which may be involved in virus replication and disease progression, and may serve as targets for host-directed therapy. Crucially, a redox regulatory protein called Thioredoxin (TXN) was found to be consistently upregulated in COVID-19 patients. Auranofin, an FDA-approved drug that targets the enzyme thioredoxin reductase and blocks the thioredoxin pathway, was found to mitigate SARS-CoV-2 replication in cell culture as well as in the preclinical Syrian hamster model. Auranofin is a safe and economical drug used for arthritis treatment. The study, therefore, suggests that it could serve as a promising COVID-19 antiviral.

Contact info:

shashankt@iisc.ac.in

Website link:

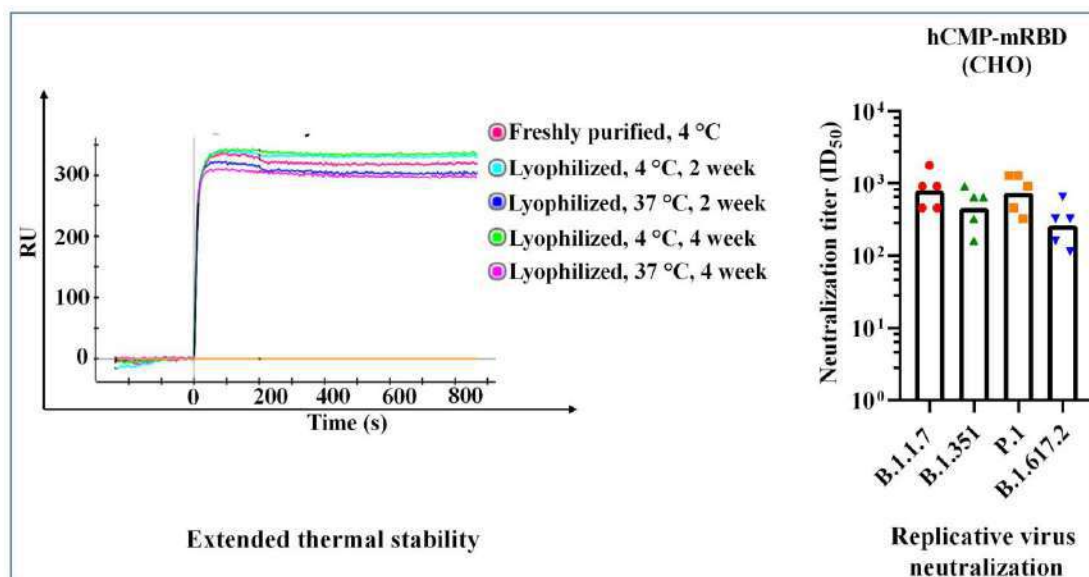
<https://iisc.ac.in/leads-for-covid-19-prognosis-and-therapy-from-nasal-swabs/>

Fighting COVID-19 viral variants with a heat-tolerant vaccine

A ‘warm’ COVID-19 vaccine candidate being developed by an Indian Institute of Science (IISc), Bengaluru and Mynvax team was found to trigger a strong immune response and protection in mice and hamster models, in results published recently in ACS Infectious Diseases. Crucially, the vaccine formulation also triggered neutralising antibodies – those that bind to the virus and prevent infection – against all four current SARS-CoV-2 variants of concern: Alpha, Beta, Gamma and Delta.

The vaccinated sera (blood) samples from animal models were tested for their neutralising ability against the variants by researchers at CSIR-IMTech, Chandigarh and the Australian Centre for Disease Preparedness, run by CSIRO, Australia’s national science agency.

The vaccine candidate has been designed by genetically engineering a domain of the surface spike glycoprotein of SARS-CoV-2, called the Receptor Binding Domain (RBD), which plays a



key role in facilitating viral entry and infection. Most of the neutralising antibodies produced by our body, target the RBD.

In previous reports, an earlier version of the vaccine candidate was found to be stable at 37°C for a month without losing its shape, and withstand transient exposure to temperatures as high as 100°C. This was also true of the current, improved versions. Such vaccines are especially useful in countries like India where cold storage and transportation are expensive and challenging. One of the improved formulations is being rapidly moved to clinical development.

Contact info:

varadar@iisc.ac.in

Website link:

<https://iisc.ac.in/fighting-covid-19-viral-variants-with-a-heat-tolerant-vaccine/>





COVID COMMUNICATIONS

The section contains information about various aspects of the COVID-19 pandemic communicated by different reliable media houses, like Press Information Bureau (PIB). Also, the efforts made by multiple agencies and institutions in compiling the information and releasing the knowledge products in print or digital form are gathered here for one point, ready-to-use evidence.

SECTION GUIDELINES

Priya Abraham, National Institute of Virology Director speaks on scientific developments on COVID-19

Digital COVID-19 vaccination certificates provided to clinical trial participants of Covishield and Covaxin through Co-WIN

Vice President urges medical fraternity to educate people on the safety of COVID-19 vaccine to make it a people's movement

FAQs on COVID-19 vaccines and vaccination programme

Priya Abraham, National Institute of Virology Director speaks on scientific developments on COVID-19

For the last one year, ICMR-National Institute of Virology (NIV) in Pune has been working on a war footing. “2021 was a difficult but rewarding year for us,” said Ms. Priya Abraham, Director of ICMR-NIV, which has been at the forefront of scientific research on SARS-CoV-2 in the country, in an interview with *India Science*, the OTT channel of the Department of Science & Technology.



Here are some excerpts from the interview on the scientific developments related to COVID-19, an analysis on the future of the pandemic and some common queries related to the virus.

In which stage is the trial of Covaxin on children and by when can we expect to have vaccine for children?

Presently, phase II and III trials of Covaxin are going on for children in the age group of 2-18 years. Hopefully, the results will be available very soon. The results will be presented to the regulators. So, by September or just after that, we may have COVID-19 vaccines for children. This apart, Zydus Cadila’s vaccine trial is also going on. This can also be applied for children and will be made available.

Apart from these, what other vaccines can be made available for our citizens?

Zydus Cadila’s vaccine will be the first DNA vaccine, which will be available for use. Besides, there is Genova Biopharmaceuticals Ltd.’s m-RNA vaccine, Biological-E vaccine, Serum Institute of India’s Novovax and, another interesting one – an intra-nasal vaccine developed by Bharat Biotech International Limited. This vaccine does not require a jab and can be delivered through the nostrils.

Will any of the presently available vaccines be effective on the Delta-plus variant?

First of all, the Delta-plus variant is less likely to spread than the Delta variant itself. Mainly Delta variants are present in over 130 countries. It has spread all over the world and it is this variant, which is highly transmissible. In NIV, we have done studies on this variant. We have studied the antibodies produced in the bodies of vaccinated people and checked it against this variant. It has been found that efficacy of antibodies against this variant has been reduced two to three folds. Yet, the vaccines are still protective against the variants. They may show a little less efficacy, but vaccines are very important to prevent serious forms of disease due to which patients may get hospitalised and even die. So, whatever the variant, vaccine is till now protective against all, including the Delta variant. So, there should not be any hesitancy at all.

Are we going to require a booster dose in the coming times? Is any study being conducted on this matter?

Studies on the booster dose have been going on overseas and at least seven different vaccines have been tried out for booster dose. Now, WHO has put a stop to it till more countries catch up with vaccination. This is because there is an alarming vaccine gap between high-income and low-income countries but, in future, recommendations for boosters will definitely come.

Are studies also on for mix and match of vaccines? Will it be beneficial for us?

There was a situation where inadvertently two different vaccines were given in two doses. We have tested those samples at NIV and found that the patients who received different vaccines in two doses were safe. No adverse effect was noted and immunogenicity was a little better. So, it is definitely not something which will cause a safety issue. We are studying this phenomenon and will be able to give more details in a few days' time.

Has any new COVID-19 testing method emerged that gives better results and can be trusted more?

Hospitals and laboratories were overwhelmed by the huge number of cases during the second wave. Many of their staff members were infected. So, efficiency of testing had reduced during that time. There was a shortage of reagents also. All these affected the efficacy of testing. RT-PCR testing method is by itself only about 70 per cent sensitive but it is still recommended by the WHO. In future, we may see easier and quicker 'point-of-care' tests where we need not send samples to labs.

Please tell us about ICMR developed RT-LAMP test.

RT-LAMP assay produced by ICMR is a cost-effective assay. It does not require expensive equipment or extensive training and can also be done at primary health centres in districts. These kinds of quick and fast tests, which can be done in technologically not so advanced places will become more popular in the future.

Self-testing kits have also come in the market now. Will it further pace testing?

Self-testing kits are antigen testing kits and so, their sensitivity is inferior to RT-PCR method. The sensitivity is likely to be more in symptomatic patients but, for asymptomatic patients, the sensitivity will be less.

Can people infected by Bird-Flu or Zika Virus become susceptible to SARS-CoV-2 infection?

Bird Flu and Zika Virus are unrelated to Coronavirus. One commonality between H1N1 Bird Flu or Swine Flu Virus and SARS-CoV-2 is that their spread is prevented by good use of masks, physical distancing, hand hygiene and cough etiquette. All these viruses spread through the respiratory route. Thus, by following COVID-19 appropriate behaviour, we can limit the spread of all these viruses. However, Zika Virus spreads through mosquito bites.

Do chances of COVID-19 infection increase during monsoon?

Yes, viral infections like Dengue, Chikangunya and Zika Virus that spread through mosquito bites are going to increase during monsoon. Accumulated water should not be kept in the surroundings as mosquitoes breed in it. It will be worse to have Corona infection on top of these infections, which spread through mosquito bites.

Many images of crowded places are circulating in the media. How much harm can this irresponsible behaviour cause?

Definitely, this will be a problem and we will be ‘inviting’ the next wave. Dr Tedros A Ghebreyesus, DG of WHO says, “The pandemic will end when we choose to end it. It is in our hands.” It means that we have to be careful. Especially in the upcoming festival season, we should not indulge in crowding because that is how the virus will spread.

Is it possible that no other wave will come?

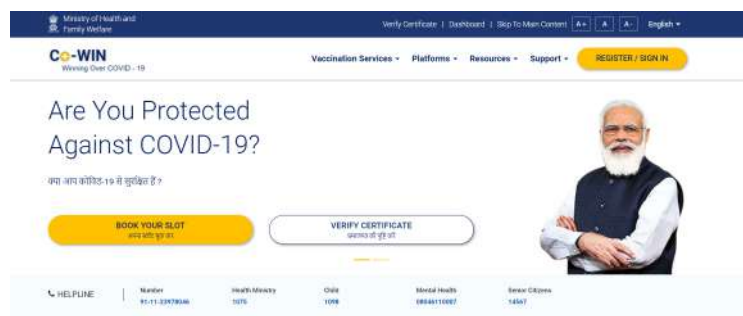
New variants will keep coming. We have two weapons, which are the biggest protection. These are: wearing mask properly and actively encouraging everyone to get vaccinated. Then even if a wave comes, it will not be a big one.

Watch full video:

<https://www.indiascience.in/videos/corona-ko-harana-hai-with-prof-priya-abraham-director-icmr-national-institute-of-virology-pune>

Digital COVID-19 vaccination certificates provided to clinical trial participants of Covishield and Covaxin through Co-WIN

Indian Council of Medical Research (ICMR) in partnership with Serum Institute of India (SII) conducted phase II/III bridging studies of Covishield from August 2020. Phase III efficacy clinical trials for Covaxin were also conducted by Bharat Biotech International Limited (BBIL)



from November 2020. The Union Ministry of Health and Family Welfare had received several requests from the trial participants for digital vaccination certificates through Co-WIN.

It was decided that vaccination certificates may be issued to such participants who were administered the vaccines during these trials/studies, after the trials/studies were unblinded. ICMR was designated by the Union Health Ministry as the nodal agency for collection of vaccination data for such participants. ICMR had provided the data for 11,349 such persons to the MoHFW. Digital vaccination certificates have now been issued through Co-WIN, to such persons who participated in these studies/trials of Covishield and Covaxin.

Website link:

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1748301>

Vice President urges medical fraternity to educate people on the safety of COVID-19 vaccine to make it a people’s movement

The Vice President, Shri M Venkaiah Naidu urged the medical fraternity in general and the Indian Medical Association, in particular, to take up special awareness campaigns to educate people about the safety and importance of getting vaccinated against COVID-19.

Inaugurating ‘Vaccinate India Programme’, on 24 August 2021, an initiative of Sustainable Goals Coordination Center, Government of Karnataka in collaboration with Give India Foundation, the Vice President said, there appears to be hesitancy in some quarters to get vaccinated. It is absolutely essential to educate and create awareness among those who are still harbouring doubts, he added.

Calling for turning COVID-19 vaccination drive into a jan-andolan, Shri Naidu exhorted all people’s representatives to ensure that everyone is vaccinated in their constituencies. He also urged the media to educate people on the need to shed vaccine hesitancy. “False beliefs need to be dispelled by providing accurate information,” he stressed.

Observing that vaccination is the most effective shield against COVID-19, the Vice President said that it would help in preventing hospitalisation and lessen the severity of the disease. “In other words, even if infected by the virus, the disease will be mild,” he added.

Emphasising that the fight against Coronavirus cannot be won without people’s cooperation, Shri Naidu appealed to everyone to wear mask, wash hands frequently, observe safe distancing and lead a disciplined and healthy lifestyle. He asked youngsters to avoid junk food and eat properly cooked traditional Indian food, which is more suited to our bodily and climatic conditions.

The Vice President said the pandemic has brought into sharp focus the need to fill the gaps in our health infrastructure from urban centres to rural hinterlands on a priority. Stressing the need to bestow special attention on backward and remote areas in this regard, he urged the private sector to join hands with the government to give a major boost to the health infrastructure.

Pointing out that even the most advanced nations with modern and better medical facilities could not effectively cope with the magnitude of the crisis created by COVID-19, the Vice President said that concerted action by the Government of India, all the State Governments and Union Territories has enabled the country to contain COVID-19 in a fairly satisfactory manner.

Website link:

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1748500>

FAQs on COVID-19 vaccines and vaccination programme

Many people have questions about the development, safety, access, cost, amid other common concerns regarding the COVID-19 vaccines. In view of this, MoH&FW has released a document on FAQs on the COVID-19 vaccines and vaccination programme. This document comprises questions and answers related to different issues such as general issues, vaccine attributes, efficacy and protection, side effects, precautions, follow-up and booster, COVID-19 vaccination programme, COVID-19 vaccination in pregnant and lactating women, etc.

Website Link:

<https://www.mohfw.gov.in/pdf/FAQsCOVID19vaccinesvaccinationprogramWebsiteupload.pdf>





4

COVID RESOURCES AND OUTREACH

The efforts made by multiple agencies and institutions in compiling the information, releasing the knowledge products in print or digital form, and reaching out to multiple target audiences are gathered here for one point, ready-to-use evidence. These include resource books, newsletters, magazines, exclusive editions, and so on.

SECTION GUIDELINES

NIDM releases report on COVID-19 third wave preparedness and children's vulnerability and recovery

INSACOG releases weekly bulletin on COVID-19 sequencing

Kernel – IISc, Bengaluru's research newsletter covers latest research on COVID-19

CSIR bulletin on COVID news and updates about the pandemic

COVID-19: Science & Technology Efforts in India – An information resource on the pandemic

Outreach initiatives through India Science, Technology and Innovation (ISTI) Web Portal

Press Information Bureau releases daily bulletin on COVID-19

Government of India presents a regular COVID-19 India factsheet and immunisation programme

Outreach initiatives by India Science Channel

myGOV reaches out to citizens by inviting blogs for the largest vaccination drive

Initiative by myGOV to engage the general public in thanking the healthcare workers

NIDM releases report on COVID-19 third wave preparedness and children’s vulnerability and recovery

The COVID-19 pandemic in India has caused an unprecedented level of devastation, leaving no sector, no aspect of our lives untouched by its deadly consequences. During the second wave beginning in March 2021, India went through unimaginable levels of collective misery and grief, effects of which will be seen through generations.

Barely had the second wave ebbed that the leading experts of the nation sounded alarm bells for a possible third wave and its possible disproportionate impact on vulnerable groups like children. Hence, before the third wave, the country needs to be prepared to minimise the impact of the pandemic among our future generations. Therefore, National Institute of Disaster Management (NIDM) proposed a working group committee and organised a series of webinars that covered issues related to the ‘Preparedness of the Third Wave in India’.

This was done as it has been found important to discuss beforehand the preparedness for the third wave and the actions and plans to prevent the exponentially large loss of life that accompanied the second wave.

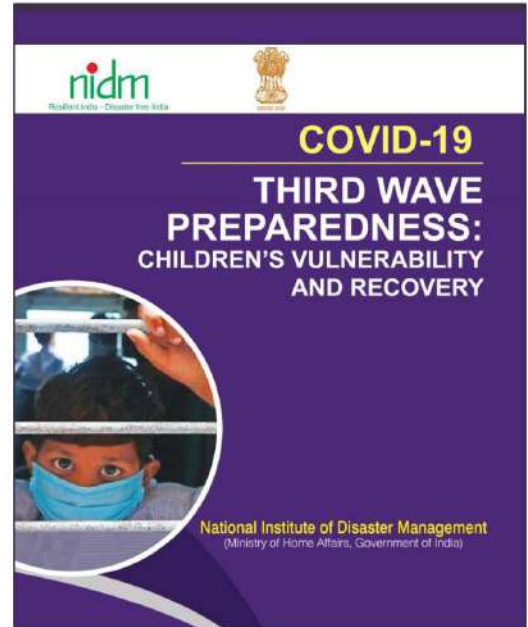
The study report, has delved into the likelihood of COVID-19 affecting children and the required strategies to deal with the pandemic. Drawing lessons from the first and the second wave, through deliberations by leading experts during these meetings, they have been able to produce, in the form of a final outcome, recommendations for preparedness of the third wave on the issues related to children and women and their well-being.

The objective of this document is also to make available, one easy-to-access document for NIDM faculty and professionals, policy-makers, programme managers and health professionals on the recommendations on third wave preparedness. NIDM as the nodal training and research institution for disaster management in the country can harness its resources to contribute in the preparedness efforts for the third wave in the following manner.

- NIDM can work towards capacity building, human resource development, training of trainers and policy advocacy.
- Known for being at the forefront in capacity building for disaster risk reduction, NIDM will play an important role in risk communication, community engagement and sensitisation of people from varying backgrounds.
- The special cooperation with the Ministry of Women and Child Development, NDMA, NDRF, Department of Social Justice and Empowerment and Department of Public Relations will play a vital role in documentation, management, development and dissemination of national level policies and guidelines relating to the current pandemic situation.

Website link:

https://nidm.gov.in/PDF/pubs/TWPCVR_2021.pdf



INSACOG releases weekly bulletin on COVID-19 sequencing

INSACOG, jointly initiated by the Union Ministry of Health, and Department of Biotechnology (DBT) with Council for Scientific & Industrial Research (CSIR) and Indian Council of Medical Research (ICMR), is a consortium of 28 national laboratories to monitor the genomic variations in SARS-CoV-2. INSACOG is a multi-laboratory, multi-agency, pan-India network to monitor genomic variations in SARS-CoV-2 by a sentinel sequencing effort.

The network carries out whole genome sequencing of SARS-CoV-2 virus across the nation, aiding in understanding how the virus spreads and evolves, and provides information to aid public health response. Initially, 10 RGLs spread across the country were identified to carry out genome sequencing of positive samples from different states. In view of the possibility of a third wave, it was decided to increase the sequencing efforts in the country. INSACOG also aims to focus on sequencing of clinical samples to understand the disease dynamics and severity.



A summary of the cumulative data of INSACOG and other state sequencing initiatives can be accessed through the INSACOG data portal (<http://clingen.igib.res.in/covid19genomes/>) or the weekly bulletin released by INSACOG (<https://dbtindia.gov.in/insacog>).

Kernel – IISc, Bengaluru’s research newsletter covers latest research on COVID-19

The IISc is India’s premier destination for science and engineering. Research at IISc spans six divisions and is distinctively interdisciplinary. *Kernel* is a monthly magazine that showcases the institute’s significant research contributions, and is published as a monthly digest in its new avatar, providing snapshots of recent research and initiatives.

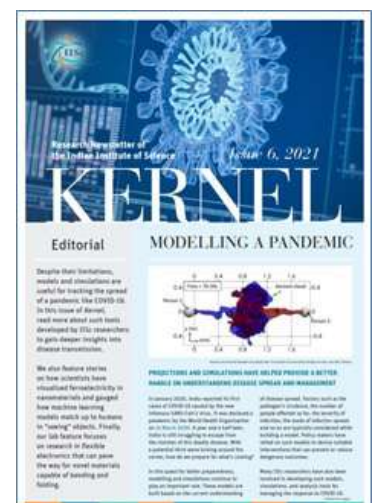
Despite their limitations, models and simulations are useful for tracking the spread of a pandemic like COVID-19. In this issue of *Kernel*, read more about such tools developed by IISc researchers to gain deeper insight into disease transmission.

Contact info:

kernel.ooc@iisc.ac.in

Website link:

<https://kernel.iisc.ac.in/wp-content/uploads/2021/07/Kernel-Issue-6-2021.pdf>



CSIR bulletin on COVID news and updates about the pandemic

CSIR was at the forefront of the battle against COVID-19 pandemic. It also put in place measures to counter the infodemic. *CSIR-In-Media* is a weekly newsletter published by CSIR magazine that showcases the institute's significant research contributions.



Website link:

<https://www.csir.res.in/news-bulletin>

COVID-19: Science & Technology Efforts in India – An information resource on the pandemic

Effective communication is in its own right a non-pharmaceutical intervention for any epidemic that can increase adherence to protective behaviours necessary to mitigate its spread. There is no 'best practice' for communication during a complex public health emergency, but past experiences have led to several principles that contribute to a successful strategy. India is fighting the second wave of the COVID pandemic with a lot of resilience and grit. A very encouraging and precise trend is now visible as the positivity rate is declining rapidly. In 2020, India dealt with the first wave of the COVID-19 pandemic with collective measures, scientific approaches, and awareness. The intelligent use of technology and well-planned resource allocation to tackle the new wave of the pandemic has been dealt with at a war footing. The newsletter – COVID-19: Science & Technology Efforts in India – is being compiled to inform our readers and strengthen the usefulness of any published information.



To bridge the gap between scientific contributions, leadership and administrative efforts, and the general public’s perspective, Vigyan Prasar is continuously reaching out to its audiences by way of a regular e-newsletter, taking its mandate of science communication, popularisation and extension to the next level. Our effort is firmly based on the fact that “Science gathers knowledge faster than society gathers wisdom.” The steady increase in the number of recoveries and the significant and continuous decrease in positivity rate provide us with the much-needed assurance that this may be the outcome of improving the health infrastructure and making health the cornerstone at the policy level. The e-Newsletter aims to be a handy guide to scientists, researchers, and scholars, especially those interested.

The latest edition was digitally published on 26 August 2021.

Contact info:

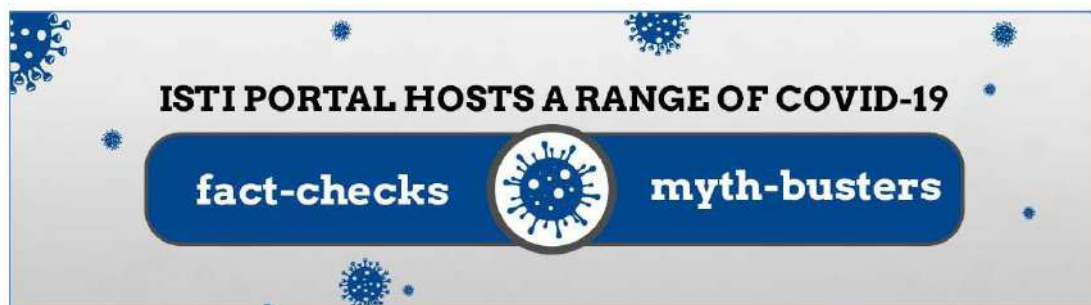
covidnewsletter@vigyanprasar.gov.in

Website link:

<https://www.indiascienceandtechnology.gov.in/covid-19-the-pandemic/newsletter-archive>

Outreach initiatives through India Science, Technology and Innovation (ISTI) Web Portal

The India Science, Technology and Innovation Portal (ISTI) is a one-stop window for information about developments in India on science, technology, and innovation. The vision is to provide a single-window source of information on a web portal about all data related to the Indian STI ecosystem by aggregating data on scientific inputs and outputs, bringing stakeholders together and disseminating science, technology and innovation content. The portal focusses on bringing



all stakeholders and Indian STI activities on a single online platform; helping efficient utilisation of resources; highlighting functioning of scientific organisations, laboratories and institutions; aggregating information on science funding, fellowship and award opportunities spanning from school to faculty level; pooling together conferences, seminars and events; and projecting science in India with its significant achievements. The ISTI web portal has been developed by Vigyan Prasar, an autonomous organisation of the DST.

In the critical times of the outbreak of the COVID-19 pandemic, the web portal serves as a one-stop online information guide to bring together a collection of resources in response to COVID-19. These resources are generated by efforts made by numerous initiatives and schemes taken up by several departments and ministries of the Government of India and numerous institutions spread across the country. The content presented here relies on the best available scientific understanding of the disease and its transmission.

The web portal provides all information related to COVID-19, from presenting symptoms to vaccine science, distribution strategy, and preventive measures initiated for envisaged future waves. It contains content on fact-checks and myth-busters in question and answer format, contributions from the research fraternity, start-up spotlights, industry collaborations, communications and resources, reaching out to society and so on. A dedicated focus has been given to exhibiting funding opportunities catering to the second wave of the COVID-19 pandemic.

Contact info:

kdgm@vigyanprasar.gov.in

Website link:

<https://www.indiascienceandtechnology.gov.in/>

Press Information Bureau releases daily bulletin on COVID-19

Press Information Bureau (PIB), Government of India releases a daily bulletin on COVID-19, starting from the early days of the COVID-19 outbreak. The bulletin contains press releases concerning COVID-19, issued in the last 24 hours, inputs from PIB field offices, and fact checks undertaken by PIB. These bulletins are published in 14 languages: Hindi, English, Urdu, Marathi, Telugu, Tamil, Punjabi, Bangla, Kannada, Oriya, Gujarati, Assamese, Malayalam and Manipuri. The following data points are released on 08 September 2021.



70.75 Cr. vaccine doses have been administered so far under Nationwide Vaccination Drive
 37,875 new cases in the last 24 hours
 Active cases account for 1.18% of total cases
 India's Active caseload stands at 3,91,256
 Recovery Rate currently at 97.48%
 39,114 recoveries in the last 24 hours increases Total Recoveries to 3,22,64,051
 Weekly Positivity Rate (2.49%) less than 3% for last 75 days
 Daily positivity rate reported to be 2.16% less than 3% for last 9 days
 53.49 crore Total Tests conducted so far

Website link:

<https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1753276>

Government of India presents a regular COVID-19 India factsheet and immunisation programme

Government of India has provided, through the free-of-cost category and direct-state procurement category, more than 70 crore vaccine doses (70,75,43,018) to States/UTs.

India's coronavirus cases have crossed three crores, and as of 8 September 2021, 08:00 AM, it stands at 3,30,96,718 cases, of which 3,22,64,051 have recovered. The recovery rate stands at 97.48 per cent while the case fatality rate stands at 1.33 per cent.



Website link:

<https://www.mygov.in/covid-19>

Outreach initiatives by India Science Channel

India Science is an Internet-based Over-The-Top (OTT) science TV channel. It is an initiative of the Department of Science and Technology (DST), Government of India, implemented and managed by Vigyan Prasar (VP), an autonomous organisation of the DST. This 24x7



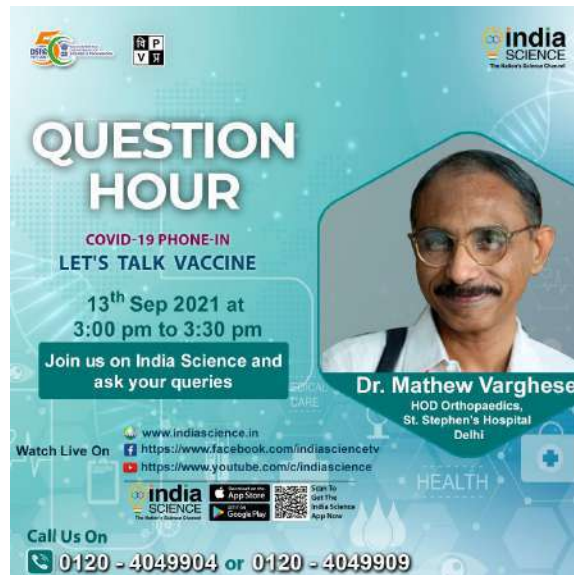


video platform is dedicated to science and technology knowledge dissemination, with a strong commitment to spreading scientific awareness, especially with Indian perspectives, ethos and cultural milieu. The initiative is supported by the National Council of Science and Technology Communication (NCSTC), DST.

Science and technology are the main driving forces of the nation and fundamental to progress and growth. So, the advantages of science and technology must reach all sections of the society through popular media of communication. India's large Internet user base of 500 million is split between 305 million urban Indians and 195 million rural Indians, all of whom need to be reached with authentic science and technology content. And to do so, the Internet is fast becoming the most accessible and preferred media for content delivery.

Since the occurrence of COVID-19, India Science has been working tirelessly to connect with the people, in the form of regular bulletins, documentaries, interviews, bytes and live sessions of scientists, doctors, experts, science administrators and policymakers. The following is a brief account of the information products produced by India Science.

1. Weekly COVID-19 video bulletin: Produced in both Hindi and English on a weekly basis from 7 July 2020, COVID-19 bulletin appraises the audience about the latest developments happening in the S&T scenario in India that are helping in managing and overcoming the challenges thrown up by the pandemic. Vigyan Prasar produced a daily COVID-19 bulletin from 11 April to 6 July 2020. Thereafter, a weekly bulletin is being produced, which provides details about the most important S&T updates from the country related to COVID-19. From January 2021 onwards the COVID-19 bulletin carried news about the vaccination drive initiated by the Government of India.
2. COVID-19 Explained: Short films to explain the important research findings related to COVID-19 and COVID-19 vaccination in layman's language are produced on a weekly



basis. The topics chosen for COVID-19 Explained cater to the curiosity of the common man towards COVID-19.

3. Facebook live sessions on interviews of various stakeholders on COVID-19 vaccination programme.
4. Facebook and India Science live sessions on interviews with experts on COVID-19 vaccination.
5. Live phone in programme: A live phone in programme on COVID-19 vaccination is telecast from India Science on every Monday and Tuesday. Experts from the field give answers to the questions related to COVID-19 vaccination received from the audience.
6. India Science started 'Corona Ko Harana Hai' from April 2021. In this programme, India Science team conduct interviews on COVID-19-related different issues with top medical professionals of the country.
7. India Science makes infographics on COVID-19-related different issues regularly. 8. COVID-19 vaccine: Fact File also telecast every Saturday from India Science.

Contact info:

kapil@vigyanprasar.gov.in

Website link:

<https://www.indiascience.in/>

myGOV reaches out to citizens by inviting blogs for the largest vaccination drive

myGOV is inviting blogs from Indian citizens for the largest vaccination drive in India. It is inviting citizens from all walks of life to share a blog write-up of 500 words. The topics are as follows:

1. Overcoming vaccine hesitancy
2. Getting Covaxinated (COVID vaccine) is important
3. Key to a successful COVID-19 inoculation drive

The blog write-up should be in any of the two formats – word/pdf and the writer should not imprint or watermark the entry. Entries are to be submitted online only. Any other medium/ mode will not be considered for evaluation.

Last date: 31 December 2021.



Website link:

<https://www.mygov.in/task/inviting-blogs-mygov-citizens-largest-vaccination-drive/?target=inapp&type=task&nid=309211>

Initiative by myGOV to engage the general public in thanking the healthcare workers

As the second wave of COVID-19 once again tests India's strength and dedication in defeating coronavirus, doctors, nurses and frontline workers have isolated themselves away from their families and have been working day and night to battle the atrocities of the raging pandemic. To make their job easier and help them, people can support them by following Covid appropriate behaviour and take out time to say a heartfelt thank you.

To make them feel valued, myGOV has started an initiative for healthcare workers, for which you have to first join the Thank You Healthcare Workers Initiative and share your appreciation message.

Last date: 31 December 2021.



Website link:

https://www.mygov.in/group-issue/lets-thank-our-healthcare-workers/?target=inapp&type=group_issue&nid=309871





5

COVID FACT-CHECKS

This section attempts to answer frequently asked questions (FAQs) on various aspects of the COVID-19 disease, variants and mutants, associated illnesses and diseases, riding the second wave, assumptions on future waves, and subsequently busting the myths spread in the society.

SECTION GUIDELINES

1. SARS-CoV-2 surveillance in India
2. Delta and Delta Plus variants
3. COVID-19 vaccination for pregnant women
4. The third wave of COVID-19 in India and protecting children
5. COVID-19 and White Fungus infection
6. Related to use of oxygen during current COVID-19 pandemic
7. Related to drugs and medications to fight the disease
8. Related to Black Fungus and COVID-19 disease
9. Related to indoor air and COVID-19 disease

I. SARS-CoV-2 surveillance in India

Q. What is INSACOG?

A. The Indian SARS-CoV-2 Genomics Consortium (INSACOG) is a national multi-agency consortium of Regional Genome Sequencing Laboratories (RGSLs) established by the Government of India on 30 December 2020. Initially, this consortium had 10 laboratories. Subsequently, the scope of laboratories under INSACOG was expanded and at present there are 28 laboratories under this consortium, which monitor the genomic variations in SARS-CoV-2.

Q. What is the objective of INSACOG?

A. The SARS-CoV-2 virus, commonly known as COVID-19 virus posed unprecedented public health challenges globally. To fully understand the spread and evolution of the SARS CoV-2 virus, its mutations and resulting variants, the need for in-depth sequencing and analysis of the genomic data was felt. Against this backdrop, INSACOG was established to expand whole genome sequencing of SARS-CoV-2 virus across the nation, aiding understanding of how the virus spreads and evolves. Any changes to the genetic code, or mutations in the virus, can be observed based on the analysis and sequencing of samples done in the laboratories under INSACOG. INSACOG has the following specific objectives:

- To ascertain the status of variants of interest (VoI) and variants of concern (VoC) in the country
- To establish sentinel surveillance and surge surveillance mechanisms for early detection of genomic variants and assist in formulating effective public health response
- To determine the presence of genomic variants in samples collected during super-spreader events and in areas reporting increasing trend of cases/deaths, etc.

Q. When did India start SARS-CoV-2 viral sequencing?

A. India started sequencing SARS-CoV-2 viral sequencing of genomes in 2020. Initially, NIV and ICMR sequenced samples of international passengers who arrived in India from UK, Brazil or South Africa or transited through these countries, as these countries reported a sudden surge in cases. RTPCR positive samples from states reporting sudden surges in cases were sequenced on priority. This was further expanded through the efforts of Council of Scientific and Industrial Research (CSIR), Department of Biotechnology (DBT) and National Centre for Disease Control (NCDC), as well as individual institutions.

The initial focus of India was on restricting the spread of global variants of concern in the country – Alpha (B.1.1.7), Beta (B.1.351) and Gamma (P.1) – which had high transmissibility. The entry of these variants was carefully tracked by INSACOG. Subsequently, the Delta and Delta Plus variants were also identified based on whole genome sequencing analysis conducted in the INSACOG laboratories.

Q. What is the strategy for SARS-CoV-2 surveillance in India?

A. Initially, genomic surveillance was focused on the variants carried by international travellers and their contacts in the community through sequencing three to five per cent of the total RTPCR positive samples.

Subsequently, the sentinel surveillance strategy was also communicated to the States/UTs in April 2021. Under this strategy, multiple sentinel sites are identified to adequately represent

the geographic spread of a region, and RTPCR positive samples are sent from each sentinel site for whole genome sequencing. Detailed SOPs for sending samples from the identified sentinel sites regularly to the designated RGSLs were shared with States/UTs. The list of INSACOG RGSLs tagged to States was also communicated to the States. A dedicated nodal officer was also designated by all States/UTs for coordinating the activity of whole genome sequencing.

1. Sentinel Surveillance (for all States/UTs/): This is an ongoing surveillance activity across India. Each State/UT has identified sentinel sites (including RT-PCR labs and tertiary health care facilities) from where RT-PCR positive samples are sent for whole genome sequencing.
2. Surge Surveillance (for districts with COVID-19 clusters or those reporting a surge in cases): A representative number of samples (as per the sampling strategy finalised by a state surveillance officer/central surveillance unit) are collected from the districts, which show a surge in the number of cases and are sent to RGSLs.

Q. What is the standard operating procedure (SOP) for sending samples to INSACOG laboratories?

A. The SOPs for sending samples to INSACOG laboratories and subsequent action based on genome sequencing analysis is as follows:

1. The Integrated Disease Surveillance Programme (IDSP) machinery coordinates sample collection and transportation from the districts/sentinel sites to RGSLs. The RGSLs are responsible for genome sequencing and identification of VoCs/Vols, potential Vols, and other mutations. Information on VOCs/ VOIs is submitted to the Central Surveillance Unit, IDSP to establish clinico-epidemiological correlation in coordination with state surveillance officers.
2. Based on discussions in the Scientific and Clinical Advisory Group (SCAG) established to support the INSACOG, it was decided that upon identification of a genomic mutation, which could be of public health relevance, RGSL will submit the same to SCAG. SCAG discusses the potential Vols and other mutations and, if felt appropriate, recommends to the Central Surveillance Unit for further investigation.
3. The genome sequencing analysis and clinico-epidemiological correlation established by IDSP is shared with MOH&FW, ICMR, DBT, CSIR and States/UTs for formulating and implementing requisite public health measures.
4. The new mutations/VoCs are cultured, and genomic studies are undertaken to see the impact on vaccine efficacy and immune escape properties.

Source:

<https://dbtindia.gov.in/pressrelease/qa-indian-sars-cov-2-genomics-consortium-insacog>

2. Delta and Delta Plus variants

Q. Why are frequent mutations seen in SARS-CoV-2 virus? When will the mutations stop?

A. SARS-CoV-2 can mutate due to the following reasons:

- Random error during replication of virus

- Immune pressure faced by the viruses after treatments such as convalescent plasma, vaccination or monoclonal antibodies (antibodies produced by a single clone of cells with identical antibody molecules)
- Uninterrupted transmission due to lack of Covid appropriate behaviour. Here the virus finds an excellent host to grow and becomes more fit and transmissible.

The virus will continue to mutate as long as the pandemic remains. This makes it all the more crucial to follow Covid appropriate behavior.

Q. What are variants of interest (Vols) and variants of concern (VoCs)?

A. When mutations happen – if there is any previous association with any other similar variant, which is felt to have an impact on public health – then it becomes a variant under investigation (Vul).

Once genetic markers are identified, which can have an association with a receptor binding domain or which have an implication on antibodies or neutralising assays, we call them variants of interest (Vols).

The moment we get evidence for increased transmission through field-site and clinical correlations, it becomes a variant of concern (VoC). VoCs are those that have one or more of the following characteristics:

- Increased transmissibility
- Change in virulence/disease presentation
- Evading diagnostics, drugs and vaccines

The first VoC was announced by the UK where it was found. Currently there are four VoCs identified by the scientists – Alpha, Beta, Gamma and Delta.

Q. What are Delta and Delta Plus variants?

A. These are the names given to variants of SARS-CoV-2 virus, based on the mutations found in them. The World Health Organization (WHO) has recommended using letters of the Greek Alphabet, i.e., Alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1), Delta (B.1.617), etc., to denote variants, for easier public understanding.

Delta variant, also known as SARS-CoV-2 B.1.617, has about 15-17 mutations. It was first reported in October 2020. More than 60 per cent of cases in Maharashtra in February 2021 pertained to Delta variants.

It is the Indian scientists who identified the Delta variant and submitted it to the global database. The Delta variant is classified as a VoC and has now spread to 80 countries, as per the WHO.

The Delta variant (B.1.617) has three subtypes B1.617.1, B.1.617.2 and B.1.617.3, of which B.1.617.1 and B.1.617.3 have been classified as Vol, while B.1.617.2 (Delta Plus) has been classified as a VoC.

Compared to the Delta variant, the Delta Plus variant has an additional mutation. This mutation is called the K417N mutation. ‘Plus’ means an additional mutation has happened to the Delta

variant. It does not mean that the Delta Plus variant is more severe or highly transmissible than the Delta variant.

Q. Why has the Delta Plus variant (B.1.617.2) been classified as a VoC?

A. It has been classified as a VoC because of the following characteristics:

- Increased transmissibility
- Stronger binding to receptors of lung cells
- Potential reduction in monoclonal antibody response
- Potential post vaccination immune escape

Q. How often are these mutations studied in India?

A. Indian SARS-CoV-2 Genomics Consortium (INSACOG) coordinated by the Department of Biotechnology (DBT) along with the Union Health Ministry, ICMR, and CSIR monitor the genomic variations in SARS-CoV-2 on a regular basis through a pan India multi-laboratory network. It was set up with 10 national labs in December 2020 and has been expanded to 28 labs and 300 sentinel sites from where genomic samples are collected. The INSACOG hospital network looks at samples and informs INSACOG about the severity, clinical correlation, breakthrough infections and re-infections.

More than 65,000 samples have been taken from states and processed, while nearly 50,000 samples have been analysed of which 50 per cent have been reported to be VoCs.

Q. On what basis are the samples subjected to genome sequencing?

A. Sample selection is done under three broad categories:

1. International passengers (during the beginning of the pandemic)
2. Community surveillance (where RT-PCR samples report CT value less than 25)
3. Sentinel surveillance where samples are obtained from labs (to check transmission) and hospitals (to check severity)

When there is any public health impact noticed because of genetic mutation, then the same is monitored.

Q. What is the trend of VoCs circulating in India?

A. As per the latest data, 90 per cent of samples tested have been found to have Delta variants (B.1.617). However, B.1.1.7 strain, which was the most prevalent variant in India in the initial days of the pandemic, has decreased.

Q. Why is action regarding public health not taken immediately after noticing mutations in the virus?

A. It is not possible to say whether the mutations noticed will increase transmission. Also, until there is scientific evidence that proves a correlation between the rising number of cases and

variant proportion, we cannot confirm there is a surge in the particular variant. Once mutations are found, it is analysed every week to find out if there is any such correlation between the surge of cases and variant proportion. Public health action can be taken only if scientific proofs for such correlation are available.

Once such correlation is established, it will help greatly to prepare in advance when such a variant is seen in another area/region.

Q. Do Covishield and Covaxin work against the variants of SARS-CoV-2?

A. Yes, Covishield and Covaxin are both effective against the Alpha, Beta, Gamma and Delta variants. Lab tests to check vaccine effectiveness on Delta Plus variants are ongoing.

Delta Plus variants: The virus has been isolated and is now being cultured at ICMR’s National Institute of Virology, Pune. Laboratory tests to check vaccine effectiveness are ongoing and the results will be available in 7 to 10 days. This will be the first result in the world.

Q. What are the public health interventions being carried out to tackle these variants?

A. The public health interventions needed are the same, irrespective of the variants. The following measures are being taken:

- Cluster containment
- Isolation and treatment of cases
- Quarantining of contacts
- Ramping up vaccination

Q. Do public health strategies change as the virus mutates and more variants arise?

A. No, public health prevention strategies do not change with variants.

Q. Why is continuous monitoring of mutations important?

A. Continuous monitoring of mutations is important to track potential vaccine escape, increased transmissibility and disease severity.

Q. What does a common man do to protect self from these VoCs?

A. One must follow Covid appropriate behaviour, which includes wearing a mask properly, washing hands frequently and maintaining social distancing. The second wave is not over yet. It is possible to prevent a big third wave provided individuals and society practice protective behaviour. Further, test positivity rate must be closely monitored by each district. If the test positivity goes above 5 per cent, strict restrictions must be imposed.

Source:

<https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1730875>

3. COVID-19 vaccination for pregnant women

Q. Why is COVID-19 vaccine being recommended for pregnant women?

A. Pregnancy does not increase the risk to COVID-19 infection. Most pregnant women will be asymptomatic or have mild disease, but their health may deteriorate rapidly and that might affect the foetus too. It is important that they take all precautions to protect themselves from COVID-19, including taking the vaccination against the same. It is, therefore, advised that a pregnant woman should take the COVID-19 vaccine.

Q. Who are at higher risk of getting infected with COVID-19?

A. Higher risk of infection involves with:

- A healthcare worker or a frontline worker
- A community with high or increasing rate of COVID-19 infections
- Those frequently exposed to people outside the household
- Those who have difficulty in complying with social distance if living in a crowded household

Q. How does COVID-19 affect the health of a pregnant woman?

A. Although most (>90 per cent) infected pregnant women recover without hospitalization, rapid deterioration in health may occur in a few. Symptomatic pregnant women appear to be at increased risk of severe disease and death. In severe disease, like all other patients, pregnant women may also need hospitalisation. Pregnant women with underlying medical conditions for example, high blood pressure, diabetes, obesity, age over 35 years are at higher risk of severe illness due to COVID-19.

Q. How does COVID-19 infection of pregnant women affect the baby?

A. Most (over 95 per cent) of newborns of COVID-19 positive mothers have been in good condition at birth. In some cases, COVID-19 infections in pregnancy may increase the possibility of a premature delivery, the baby's weight may be less than 2.5 kg and in rare situations, the baby might die before birth.

Q. Which pregnant women are at a higher risk of developing complications after COVID-19 infection?

A. Pregnant women who are:

- Older than 35 years of age
- Obese
- Have an underlying medical condition such as diabetes or high blood pressure
- Have a history of clotting in the limbs

Q. If a pregnant woman has already had COVID-19, when should she be vaccinated?

A. In case a woman is infected with COVID-19 during the current pregnancy, then she should be vaccinated soon after the delivery.

Q. Are there any side effects of the COVID-19 vaccines that can either harm the pregnant woman or her foetus?

A. The available COVID-19 vaccines are safe and the vaccination protects pregnant women against COVID-19 like other individuals. Like any medicine a vaccine may have side effects, which are normally mild. After getting the vaccine, she can get mild fever, pain at the injection site, or feel unwell for 1-3 days. The long-term adverse effects and safety of the vaccine for the foetus and the child born is not established yet. Very rarely, (one in one to five lakh people) the beneficiary may, after the COVID-19 vaccination, experience some of the following symptoms within 20 days after getting the injection, which may need immediate attention.

Q. When should the vaccine be given to the pregnant woman?

A. The COVID-19 vaccination schedule can be started any time during pregnancy.

Q. What other precautions should the pregnant woman take after vaccination?

A. Counsel the pregnant woman and her family members to continue to practice Covid appropriate behaviour: wearing double masks, frequent hand washing, maintaining physical distance, and avoiding crowded areas, to protect themselves and those around from spreading the COVID-19 infection.

Q. How does a pregnant woman register herself for the Covid-19 vaccination?

A. All pregnant women need to register themselves on the Co-WIN portal or may get themselves registered on-site at the COVID-19 vaccination centre. The process of registration for pregnant women remains the same as of the general population and as per the latest guidelines provided by the Ministry of Home and Family Welfare (MoHFW) from time to time.

Source:

<https://www.mohfw.gov.in/pdf/OperationalGuidanceforCOVID19vaccinationofPregnantWoman.pdf>

4. The third wave of COVID-19 in India and protecting children

Q. What is the possibility of a third wave of COVID-19 in the coming months?

A. Pandemics are likely to occur in multiple waves, and each wave could vary in the number of cases and its duration. Eventually, most of the population may get immune by asymptomatic or symptomatic infections (herd immunity). Over time, the disease may die out or may become endemic in the community with low transmission rates.

Key Message: There is a possibility of a third wave, but it is difficult to predict its timing and severity.

Q. Are children at greater risk if the third wave strikes?

A. In the first wave, primarily the elderly and individuals with co-morbidities were affected with severe disease. In the current (second) wave, a large number of younger population (30-45 years) have developed severe disease as also those without co-morbidities. After the second

wave is over, if we do not continue following COVID appropriate behaviour, the third wave, if it occurs, is likely to infect the remaining non-immune individuals and that may include children also. The latest sero survey (December 2020 to January 2021) showed that the percentage of infected children in the age group of 10-17 years was around 25 per cent, the same as adults. This indicates that while children are being infected like adults, they are not getting the severe disease.

Key Message: Children are as susceptible as adults and older individuals to develop an infection but not a severe disease. It is highly unlikely that the third wave will predominantly or exclusively affect children.

Q. Are children likely to suffer from severe disease as being witnessed in the adult population in the current wave?

A. Fortunately, children have been relatively less affected so far due to several factors. The most important reason is the lesser expression of specific receptors to which this virus binds to enter the host and also the immune system of the children. A very small percentage of infected children may develop moderate to severe disease. If there is a massive increase in the overall numbers of infected individuals, a larger number of children with moderate to severe disease may be seen. Apart from the infection, parents should watch out for mental health issues in children and keep a watch to prevent child abuse and violence. Also, it is worth limiting screen time and prepare children for safe school reopening as per the Indian Academy of Pediatrics (IAP) guidelines.

Key Message: Almost 90 per cent of the infections in children are mild/asymptomatic. Therefore, the incidence of severe disease is not high in children.

Q. Can we rule out the possibility of severe infections in children in the third wave?

A. As explained, the spectrum of illness is likely to be much less severe in children than adults; there is only a remote possibility of children being more severely affected than adults in the next wave. As per data collected during the first and second waves, severe COVID-19 infections in children were not reported and only in few cases they were admitted to ICU. However, we need to be watchful about how the mutant strains will behave. The dictum here is better be ready and prepared for the worst and hope for the best!

Key Message: Severe COVID-19 cases in children are rare. Further, there is no evidence indicating that children will have severe disease in the third wave.

Q. Severe disease due to COVID-19 is already occurring in children. Why it is so?

A. Yes, a severe illness related to COVID-19 is known to occur in children. This includes pneumonia and Multisystem inflammatory syndrome in children (MIS-C). However, COVID-19 pneumonia in children is uncommon as compared to adults. In some cases, after 2-6 weeks of asymptomatic or symptomatic COVID-19 infection, MIS-C may be seen due to immune dysregulation with the incidence of 1-2 cases per 100,000 population; some of these cases also may be severe. It's a treatable condition with a good outcome if diagnosed early. Also, most children suffering from MIS-C cannot transmit the infection to others.

Key Message: Children occasionally get the severe disease and may need ICU care, both during the acute illness and after 2-6 weeks due to MIS-C caused by COVID-19. But the majority are likely to recover if treated on time.

Q. What preparations are being made in case the third wave comes and affects the children?

A. Most affected children get a mild disease with fever and need supervised home care with monitoring. We have learned a lot about COVID-19 illness from our shared experiences in adult medicine in the last 15 months. IAP guidelines on the management of COVID-19 in children are in place, and paediatricians have been sensitised and trained on its management. We need to be ready for a more significant number of patients seeking consultations; educating the parents on different platforms regarding illness and warning signs; and arranging more COVID-19 wards for children with more special wards such as high-dependency units (HDU) and intensive care units (ICU). The preventive behaviours are the same for children. Parents should also be ideal role models for their children regarding mask etiquette, hand hygiene, and social distancing. Children above the age of two to five years can be trained to use a mask; however, the adults have to follow the COVID-appropriate behaviour. IAP has also set guidelines for the safe reopening of schools for the safety of the children.

Key Message: We need to be prepared with more in-patient beds and intensive care beds for children. IAP has already developed the management protocol for disease categories in children. There is no reason to panic. Our preparations are in full swing.

Q. What is the plan for vaccinating children?

A. So far, the global data show that compared to children, older adults are a thousand times more likely to die from COVID-19 disease. So, it has been a priority to vaccinate the high-risk elderly age group first. Thereafter, the emphasis should be on adults who also have more severe diseases as compared to children. When there is the remote possibility of children getting affected, some countries consider vaccinating children and adolescents. The same vaccines being used in adults can be used in children only after adequate trials. One of the India-made vaccines will soon undergo trials in children, and if proven immunogenic and safe, it could be fast-tracked for mass vaccination in children.

Key Message: Children do get the severe disease, even if the number is small. Thus, there is no harm in considering vaccination for them. The safety and efficacy, however, are being assessed in trials for this age. The national expert group on vaccine administration for COVID-19 will develop a plan as and when new scientific data emerge.

Source

https://iapindia.org/pdf/hA5Gnpt_IQv63Bk_IAP%20view%20point%20for%203rd%20wave%20Covid%2022%20May%202021.pdf

5. COVID-19 and White Fungus infection

Q. What is White Fungus?

A. White Fungus, also known as candidiasis, is an opportunistic infection, which could spread fast to various body parts and if not treated could be serious. According to the Centre for Diseases Control and Prevention (CDC), White Fungus or invasive candidiasis can affect the blood, heart, brain, eyes, bones, or other parts of the body.

Q. Who are at high risk to get White Fungus infection?

A. White Fungus is all around us as it is found naturally in the environment. It primarily affects people with low immunity, who come in contact with objects that contain these fungal spores.

For instance, COVID-19 patients on oxygen support can come in contact with these fungal spores if their ventilators and oxygen support equipment are not sanitised properly. Further, overuse of steroids and use of tap water in the humidifier attached to an oxygen cylinder can also heighten the risk of contracting White Fungus.

Q. Who can get infected by white fungus?

A. Invasive candidiasis is caused by a yeast (a type of fungus) called Candida. Candida can normally live inside the body, in areas like the mouth, throat, gut, and vagina, without causing any problems. However, individuals with low immunity, like patients recovering from a serious COVID-19 infection, are particularly at risk of contracting this fungal infection. In their bodies, the fungus can enter the bloodstream or internal organs to cause an infection.

People who are at high risk for developing this infection include those who:

- Have been admitted in the intensive care unit (ICU) for a prolonged period.
- Have weakened immune system (for example, people on cancer chemotherapy, people who have had an organ transplant, and people with low white blood cell counts).
- Have recently had surgery, especially multiple abdominal surgeries.
- Have recently received lots of antibiotics or steroids in the hospital.
- Receive total parenteral nutrition (food through a vein).
- Have kidney failure or are on hemodialysis.
- Have diabetes.
- Have a central venous catheter.

Q. Is White Fungus contagious?

A. White Fungus is not contagious in most cases, as it cannot spread directly from person to person. However, there exist some species of fungus that cause this infection on the skin. In such instances of external infection, the fungus can possibly be transferred from the patient to another individual who is at risk.

Q. What are the symptoms of White Fungus?

A. Only CT scans or X-rays can reveal and completely confirm the White Fungus infection. Health experts report that it is more dangerous than Black Fungus, as it affects the lungs as well as other parts of the body like the nails, skin, stomach, kidney, brain, private areas, and mouth.

Moreover, the White Fungus can also infect the lungs the same way COVID-19 does. In fact, patients who get infected with White Fungus displayed COVID-19-like symptoms despite having tested negative for the virus. According to some reports, the oxygen saturation level of one of the four patients infected with White Fungus dropped from normal levels. However, the oxygen levels became normal after the antifungal medication was administered.

Q. How can White Fungus be treated?

A. Patients infected with White Fungus should be examined carefully, perhaps with a fungus culture test of their phlegm or mucus, to detect the extent of fungal infection in their body. After detection of the infection, antifungal medications can be used to treat the patients. Such medications have led to an improvement in their condition. The type and dose of antifungal medication used to treat White Fungus will depend on the patient’s age, immune status, location, and severity of the infection.

6. Related to use of oxygen during current COVID-19 pandemic

Q. What is the normal respiratory rate of a healthy adult person?

A. Standard respiratory rates for a healthy adult range from 12 to 20 breaths per minute.

Q. Are 8 breaths per minute normal?

A. No. A patient needs to be evaluated medically.

Q. How many litres of oxygen per minute do we breathe?

A. The average tidal volume, i.e., the average amount of air inhaled and exhaled per breathing cycle, is 0.5 litre (500 ml). Minute ventilation (VE) is the total volume of air entering the lungs in a minute, which is 6 litres per minute.

Q. What should be the normal oxygen saturation as recorded by a Pulse Oximeter?

A. The normal oxygen saturation level in the blood (SpO_2) should be 95 per cent or higher. Some people with chronic lung disease, such as Chronic Obstructive Pulmonary Disease (COPD) or sleep apnea, may have normal levels of around 90 per cent. The ' SpO_2 ' reading on a pulse oximeter shows the percentage of oxygen in the blood. If your home SpO_2 reading is lower than 94 per cent, call your healthcare provider.

Q. How do I check my oxygen level at home without a Pulse Oximeter?

A. If you do not have a portable finger pulse oximeter in your home, you can also learn how to assess signs and symptoms of low oxygen levels. Two classic signs of a low oxygen level are a rapid heart rate and a fast breathing rate. An average heart rate is 60–100 beats per minute and an average breathing rate is 12–20 breaths per minute. However, under low oxygen conditions, body responses include an increase in heart rate and breathing rate. Another sign of a low blood oxygen level is cyanosis or a bluish colour change on your lips, nose, or fingertips. As your body loses oxygen, the blood cells in your body change colour in your bloodstream to a dark blue, which can be seen from the outside of your skin if it is severe. Cyanosis is typically a late sign of low oxygen levels and is considered a medical emergency. If you notice this bluish discolouration, you should immediately visit the nearest hospital.

Q. Do we see many cases of silent hypoxia in this wave? How can this be addressed?

A. Silent hypoxia or happy hypoxia is referred to as the early stage of COVID-19. As the oxygen level drops, one may start feeling shortness of breath, confusion, and other symptoms. Keep watching for these signs and do not ignore them. This is true for young people as well. If you monitor low oxygen level, change in lip colour from natural to blue or persistent sweating, consult the covid helpline or doctor. They could be the early sign of silent hypoxia.

Q. In brief, how can proning help enhance blood oxygen levels?

A. Proning is a medically accepted process to improve the distribution and exchange of oxygen in the lungs. A patient is safely placed from their back onto their abdomen (stomach), i.e., face

down to improve breathing and oxygenation. It has been shown as beneficial for COVID-19 patients with compromised breathing comfort, especially during home isolation.

Q. Is pure oxygen used in hospitals?

A. Medical oxygen contains high purity oxygen used for medical treatments and is developed for use in human body. Cylinders contain a compressed oxygen gas and no gases are allowed in the cylinder to prevent contamination.

Q. What is the use of medical oxygen?

A. Oxygen is used for treatment in hospitals. Hence, it is considered a drug or a pharmaceutical product.

Q. What is the need for medical oxygen?

A. The human body requires oxygen to survive, and typically, we breathe in from air. However, if you have lung disease or other medical conditions such as COVID-19, you may not get enough oxygen due to compromised lungs. That can leave you short of breath and cause problems with your heart, brain, and other parts of your body.

Q. Can breathing 100 per cent oxygen harm your body?

A. Yes. Breathing 100 per cent oxygen also eventually leads to collapse of the alveoli (atelectasis).

Q. Can you get excess (more than required) oxygen from an oxygen concentrator?

A. It is possible to get excess (more than required) oxygen from an oxygen concentrator. However, this is quite rare when oxygen concentrators are used as directed and prescribed. All supplemental oxygen requires a prescription from a doctor, who carefully chooses your oxygen requirement.

Q. What is the role of oxygen during COVID-19 disease?

A. The demand for medical oxygen increases in COVID-19 as the disease primarily affects the lungs and, in severe cases, causes death due to Acute Respiratory Distress Syndrome (ARDS) and pneumonia.

Q. When does a patient require medical oxygen in a COVID-19 positive case?

A. As per AIIMS/ICMR-Covid-19/National Task Force/Joint Monitoring Group (Dte.GHS), MoHFW, Government of India, Clinical Guidelines for Management of Adult COVID-19 Patient issued on 22 April 2021, moderate and severe cases of COVID-19 where the infection induces shortage of oxygen in the body due to its impact on lungs require medical oxygen and immediate oxygen therapy. Oxygen acts as a life-saver for COVID-19 patients.

Q. What is moderate COVID-19 cases?

A. In moderate COVID-19 cases a patient has upper respiratory tract symptoms (and/or fever) with shortness of breath. They have a respiration rate more than or equal to 24/minute and SpO₂ 90 per cent to 93 per cent with ambient air.

Q. What is severe COVID-19 cases?

A. In severe Covid-19 case, a patient has upper respiratory tract symptoms (and/or fever) with shortness of breath. They have a respiration rate more than 30/minute and SpO₂ less than 90 per cent in room air.

Q. When does a patient require mechanical ventilator support?

A. A patient may be put on a mechanical ventilator if it becomes very difficult to breathe or get enough oxygen into their blood. This condition is called respiratory failure. Mechanical ventilators are machines that act as bellows to move air in and out of the patient's lungs. The respiratory therapist and doctor sets the ventilator to control how often it pushes air into the lungs and how much air the patient gets. The patient may be fitted with a mask to get air from the ventilator into their lungs. Or they may need a breathing tube if their breathing problem is more serious.

Q. Can mechanical ventilation be given at home?

A. Mechanical ventilators are mainly used in hospitals and transport systems such as ambulances and medical evacuation by air transport, etc. In some cases, they can be used at home if the illness is long-term and the caregivers at home receive training and have adequate nursing and other resources at home. Being on a ventilator may make a patient more susceptible to pneumonia, damage to the vocal cords, or other problems.

Q. What is the six minute walk test for COPD?

A. The six minute walk test (6MWT) is an exercise test that measures functional status in chronic obstructive pulmonary disease (COPD) patients and provides information on oxygen desaturation. This test is also being used for COVID-19. In case of COVID-19 symptoms, SpO₂ level must be checked before taking a walk. Now, walk for six minutes without a break on an even surface and measure the SpO₂ level. It may fall 1-2 per cent, but consult a medical professional if it falls below 93 per cent.

Source:

<https://ndma.gov.in/sites/default/files/2021-03/FAQs-on-Use-of-oxygen-.pdf>

7. Related to drugs and medications to fight the disease

Q. Is Remdesivir effective in the treatment of COVID-19?

A. No study has conclusively been able to prove that Remdesivir is beneficial in the treatment of COVID-19. However, India has approved Remdesivir under the National Clinical Management Protocol for COVID-19, which was developed after many interactions by a committee of experts. The protocol acts as the guiding document for the treatment of COVID-19 patients in India. Remdesivir is listed as an investigational therapy in the protocol, i.e., where informed and shared decision-making is essential, besides noting contraindications mentioned in the detailed guidelines.

Q. What is Remdesivir? How does Remdesivir work?

A. Remdesivir is an investigational drug used to treat viral infections. It is classified as a broad-spectrum antiviral with potential antiviral activity against a variety of RNA viruses.

The drug works against the novel coronavirus by inhibiting replication of the virus in the body. Remdesivir functions as a pro-drug that is modified in the body before it becomes an active drug. It is classified as a nucleoside analog, one of the oldest classes of antiviral medications, and resembles the RNA base adenosine. In general, nucleoside and nucleotide analogues simulate the structure of a true nucleoside or nucleotide. The simulated structure may then be incorporated into the virus. Remdesivir works when the enzyme replicating the genetic material for the novel coronavirus – RNA polymerase – incorporates the adenosine analogue in place of the natural molecule into the growing RNA strand. By introducing the modified agent, Remdesivir, replication of the novel coronavirus is interrupted, and the virus ceases to multiply and cannot infect more cells in the body.

Q. When should a patient of COVID-19 take Remdesivir?

A. The timing of the drug, when it is administered, is most important. Taking it too early or too late could do more harm than good. Remdesivir is applicable only in hospitalised patients who showed very low oxygen saturation and infiltrated their chest X-ray or CT scan. The optimal timing for Remdesivir is usually after five to seven days of having the virus. Early to mild or asymptomatic patients should not take Remdesivir. Also, it is of no use if it's given very late because it would create a cytokine storm. A cytokine storm is when the immune system goes into overdrive. The body starts to attack its cells and tissues instead of just the virus.

Q. Can Remdesivir be taken at home?

A. Remdesivir comes in a vial and has to be injected only after prescription and in the presence of a health practitioner. It is for patients who are hospitalised and severe. Therefore, it should not be given at home. It is for patients who need to be admitted and need hospital care.

Q. Are steroids effective in the treatment of COVID-19?

A. There is no evidence to support the use of steroids in the treatment of COVID-19. World Health Organization (WHO) recovery trial showed that steroids do have a beneficial effect. But again, the timing is critical. The recovery trial clearly showed that if we give steroids too early, it showed a harmful effect before oxygen saturation. Steroids are most effective during the later part of the disease when there is more inflammation and oxygen saturation is falling. Steroids are only helpful for moderate or severe cases.

Q. Is plasma a good way to fight off COVID-19?

A. Convalescent plasma has been a therapy devised to passively transfer antibodies from a recovered person to a new patient. While the therapy has been received with different opinions by the medical community, the important aspect is timing. It's better if plasma therapy is used early before clinical worsening. Also, plasma with high titer neutralising antibodies would have better results. Hence, to achieve good results, correct patient selection, timing and a good quality plasma donor are needed for success in this form of treatment.

Q. Should a person with COVID-19 take Tocilizumab?

A. Tocilizumab is a drug of last resort. It should only be used when a COVID-19 infection in a patient is worsening despite steroids, Remdesivir and other treatments like anticoagulants. Tocilizumab is required in less than 2 per cent of COVID-19 patients. Very few patients need this drug because it's only for treating a cytokine storm and has a limited role.

Q. Is Favipiravir effective in treating COVID-19?

A. Favipiravir is another antiviral that is being promoted for the treatment of COVID-19. It was initially doled out as a treatment of influenza after the H1N1 pandemic. There is not enough evidence in robust studies to show that it is a good drug. Since it's not a proven treatment, India's national guidelines also don't recommend its use.

Q. Is it possible to treat COVID-19 without any of the drugs mentioned above?

A. People with mild COVID-19 or those who are asymptomatic will improve with just symptomatic treatment. Mild COVID-19 infection can be treated with paracetamol, good hydration and multivitamins – without any treatment. Giving treatment when it is not required may be doing more harm than good.

8. Related to Black Fungus and COVID-19 disease

Q. What is Black Fungus?

A. Black Fungus, also known as mucormycosis, is a rare fungal infection. It is called 'black' because of the colour of the fungal growth. It is caused by exposure to mucor mold found in soil, manure, and rotten/decaying fruits and vegetables. It is ubiquitous and even present in the nose/mucosa of healthy individuals. This disease usually affects the sinuses, eye orbit, and brain. That is why it is also called 'rhino-orbital-cerebral' mucormycosis. It may be life-threatening in immuno-compromised individuals (cancer patients, HIV/AIDS) and people with uncontrolled diabetes.

Q. What are the risk factors for acquiring Black Fungus infection?

A. Risk Factors are:

- Uncontrolled Diabetes Mellitus
- Treated for COVID-19 with corticosteroids
- Treated for COVID-19 with immunomodulators
- Treated for COVID-19 with mechanical ventilation
- Prolonged oxygen therapy
- Prolonged ICU stay
- Immuno-compromised state

Q. Why the sudden increase in Black Fungus cases?

A. It may be triggered by extensive use of steroids, which is a life-saving treatment for moderate to severe COVID-19 infection. Steroids lower the immunity and cause a sudden up-shooting of blood sugar levels in diabetes and non-diabetic patients. For patients on humidified oxygen, care should be taken to make sure there is no water leak to prevent the growth of the fungus.

Q. How serious is Black Fungus?

A. Black fungus infection causes a vision-threatening and life-threatening condition.

Q. Do all COVID-19 patients need to be worried about Black Fungus infection?

A. No. As discussed, high-risk patients need to be alert. Also, during COVID-19 recovery, everyone should watch out for early signs and symptoms.

Q. What are the precautions one can take to avoid this disease?

A. One can take the following precautions:

- Boost immune system with diet, hydration and exercise.
- Rational use of steroids by follow guidelines.
- Strict blood sugar monitoring and control in all patients who are on steroids.

Q. What are the early signs of Black Fungus?

A. Some of the early signs are:

- Facial pain
- Facial swelling/puffiness/discolouration
- Sinus headache
- Stuffy nose
- The blurring of vision/decreased vision
- Double vision
- Drooping of eyelid
- Blood-stained nasal discharge
- Dental pain

Q. Is Black Fungus treatable?

A. Yes. Early diagnosis and a prompt multi-speciality team of medical professionals can manage it.

Q. Which specialist should I visit for Black Fungus?

A. ENT and eye specialists are central to this disease. The team includes care coordination with neurosurgeon, endocrinologist and microbiologist.

Source:

<https://www.eyeqindia.com/frequently-asked-questions-on-covid-and-black-fungus/#toggle-id-9>

9. Related to indoor air and COVID-19 disease

Q. Will running an evaporative cooler help protect my family and me from COVID-19?

A. Evaporative coolers (or ‘swamp coolers’) can help protect people indoors from the airborne transmission of COVID-19 because they increase ventilation with outside air to cool indoor spaces. Evaporative coolers are used in dry climates. They use water to provide cooling and improve relative humidity in indoor microenvironments. When operating as intended (with open windows), these devices produce substantial increases in ventilation with outdoor air. Some evaporative coolers can be performed without using water when temperatures are milder to increase ventilation indoors. Avoid using evaporative coolers if air pollution outside is high and the system does not have a high-efficiency filter.

Q. Is ventilation important for indoor air quality when cleaning and/or sanitising for COVID-19 indoors?

A. When cleaning and disinfecting for COVID-19, ventilation is essential – in general, increasing ventilation during and after cleaning help to reduce exposure to cleaning and disinfection products and by-products. Increasing ventilation, for example, by opening windows or doors, can also reduce risks from particles resuspended during cleaning, including those potentially carrying SARS-CoV-2 (or other contaminants). Avoid ventilation with outdoor air when outdoor air pollution is high or when it makes your home too cold, hot, or humid.

Q. Will an air cleaner or air purifier help protect my family and me from COVID-19 in my home?

A. When appropriately used, air purifiers can help reduce airborne contaminants, including viruses, in a home or confined space.

Q. How can I increase ventilation at home to help protect my family from COVID-19?

A. Ensuring proper ventilation with outside air is a standard best practice for improving indoor air quality. To increase ventilation in your home, one can:

- Open the windows or screened doors, if possible;
- Operate an air conditioner that has an outdoor air intake or vent; and
- Operate a bathroom fan when the bathroom is in use and continuously, if possible.

However, the practices mentioned here are not enough to protect people from COVID-19. When used along with other best practices recommended by the Ministry of Health and Family Welfare, Government of India, the above methods can be part of a plan to protect yourself and your family.

Source:

<https://www.epa.gov/coronavirus/indoor-air-and-coronavirus-covid-19>



FEEDBACK FORM

COVID-19

Science & Technology Efforts in India

It has been more than a year since the COVID e-Newsletter started reaching you and we want to hear what you think about it. The information product is designed to keep you conversant about the services and efforts the country has put up on the face of the sudden eruption of the COVID-19 pandemic. Your opinion is vital so that we can make sure we are including what you want to read. Please fill in the form below and rest assured that the information you give will help shape future editions of your coveted newsletter.

I. How do you rate the following aspects of COVID 2021 e-Newsletter, focused on the second wave of the pandemic?

1. The overall appearance

😊 Very Good 😊 Good 😐 Average 😞 Poor 😡 Very Poor 😐 No Opinion

2. Ease to read and flow of information

😊 Very easy 😊 Fairly easy 😐 Not very easy 😞 Not at all easy



For suggestions and feedback, click on:

<https://www.indiascienceandtechnology.gov.in/covid-newsletter/feedback-form>

COVID-19

Science & Technology Efforts in India

VOL. IV | ISSUE 10 | 11TH SEPTEMBER 2021

**TOGETHER WE CAN
AND WE WILL BEAT
THE PANDEMIC OUT**

For suggestions and feedback, write to us at: covidnewsletter@vigyanprasar.gov.in



VIGYAN PRASAR

A-50, Institutional Area, Sector-62
NOIDA 201 309 (Uttar Pradesh), India

Phones: 0120-240 4430-35

Fax: 91-120-240 4437

E-mail: info@vigyanprasar.gov.in