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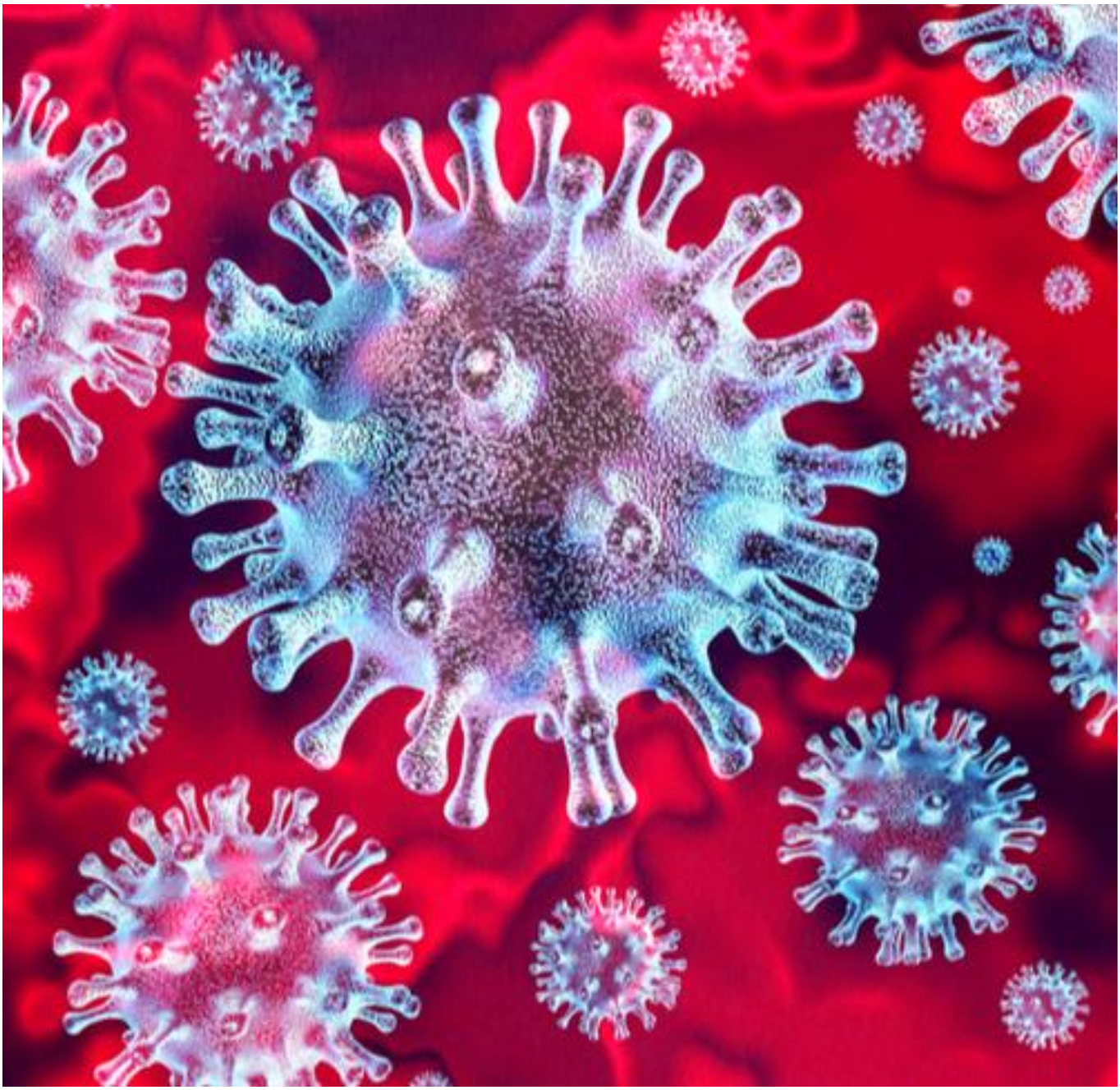

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ENVIS Newsletter on 'Microorganisms and Impact on Public Health', a quarterly publication, brings out original research articles, reviews, reports, research highlights, news-scan etc., related to the thematic area of the ENVIS Centre. In order to disseminate the cutting-edge research findings to user community, ENVIS Centre on Microorganisms and Impact on Public Health invites original research and review articles, notes, research and meeting reports, details of forthcoming conferences / seminars / symposia / trainings / workshops for publication in the newsletter.

The articles and other information should be typed in double space with a maximum of 8 - 10 typed pages. Photographs/line drawings and graphs need to be of good quality with clarity for reproduction in the newsletter. For references and other details, the standard format used in the newsletter may be followed.

Articles should be sent to:

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Cover page : Graphical image of coronavirus, a kind of common virus that causes an infection in your nose, sinuses, or upper throat. Most coronaviruses aren't dangerous. (Source: members.physio-pedia.com)

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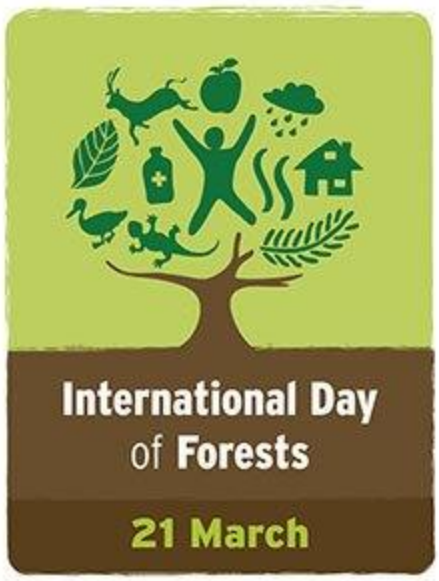

From the Coordinator's Desk!

Dear Readers,

Greetings!

In view of developments regarding Covid-19, I would like to quote the proverb "Prevention is better than cure" to insist in having good personnel hygienic habits and follow social distancing to stay safe during this global crisis of Covid-19. These are disturbing times and COVID-19 is clearly impacting our personal and professional lives including those of our loved ones too. Please take care, stay positive and find sometime for having fun and smiling. I am confident we will get through this, together. COVID-19 is the infectious disease caused by the most recently discovered coronavirus. The disease spreads mainly through respiratory droplets expelled by someone who is coughing. It is possible to catch it from someone with mild symptoms. The time between catching the virus and beginning to have symptoms of the disease range from 1-14 days, most commonly around five days. To protect yourself and others, wash your hands with alcohol-based hand rub or soap and water as frequently as possible. Cover your mouth and nose with a bent elbow or tissue when you cough or sneeze. Dispose of used tissues immediately and wash hands regularly. Stay home if you feel unwell. If you have a fever, cough and difficulty breathing, seek medical attention and call in advance.

Keeping the above things in mind this newsletter covers a mini review on the facts and figures of novel coronavirus 2019 along with reports on harnessing supercomputers to unpack the coronavirus spike protein, water problems around the world due to Covid-19, gene targeting to breakthrough Covid-19, Odds of edible insects transmitting coronavirus and many interesting topics.

Dr. C. Arulvasu

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REVIEW ARTICLE

NOVEL CORONAVIRUS 2019: FACTS AND FIGURES

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Abstract

It is a known fact that there is no easy method to combat toxic air. Air is polluted by physical, chemical and biological particulates. These particulates can easily reach our respiratory system and in turn the blood circulation. Toxic air can affect anybody and there is no privilege in reaching people. When studying the pollutants, the Particulate Matter below the size range of 10µm (PM_{10}) and below 2.5µm ($PM_{2.5}$) alone are given importance among physical pollutant. Chemical pollutants are mostly considered as a local phenomenon occurring due to industrial accidents. Among them emphasis has been given to monitor CO, CO_2, O_3, NO_2, NH_3, SO_2 and Benzene. The biopollutants include viruses, bacteria, fungal spores, pollen grains, fern spores, insect wings, protein and amino acids of biological origin. However the impact of biological pollutants was not given much importance in India until it becomes epidemic or pandemic in nature. As such no biological parameters are monitored by Pollution Control Boards (PCBs) in India.

Keywords: Coronavirus, 2019-nCoV, Wuhan, Zoonotic, Bat

Introduction

Coronaviruses (CoV) causes illness starting from mere cold to adverse respiratory diseases like Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). On 31st December 2019, cases of pneumonia of unknown etiology (unknown cause) were detected in Wuhan City, Hubei Province of China. This was a symptom of attack belonging to a type of coronavirus, which was declared officially by the Chinese authorities on 7th January. The virus was a new strain of coronavirus family which was not reported in humans before. Hence named as "novel coronavirus" (2019-nCoV). The 2019-nCoV is still under surveys to know about its source of the outbreak, mode(s) of transmission as well as the extent of infection. The studies on the 2019-nCoV virus and previous experience with the MERS-CoV and SARS-CoV suggested that they could be zoonotic (Chen *et al.*, 2020).

Structure of coronaviruses

The CoVs are spherical, coated with particles having single-stranded (positive-sense) RNA. These RNAs are mostly associated with the nucleoproteins having a capsid encompassed of matrix protein (Fig.1). The envelope abides club-shaped glycoprotein projections (Tyrrell and Myint, 1996).

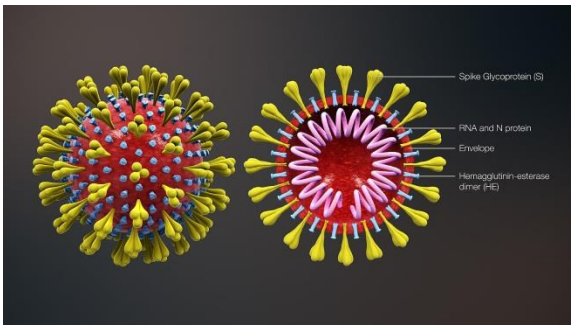

Fig. Structure of novel coronavirus
Source: wiki-images

Multiplication of viruses

The virus after entering the host cell gets transcribed with the host genome and gets translated. The translated mRNAs share a common 3′ end, through which new virions get budded from the host cell membranes.

Pathogenesis

Transmission is through airborne droplets viz, nasal mucosa and replicates locally in the ciliated epithelium leading to cellular damage and inflammation (Tyrrell and Myint, 1996).

Host Defenses

The host mainly develops an antibody that circulates in the serum followed by the resolution of infection. The developed immunity diminishes by a year.

Epidemiology

Incidence peaks in the winter, taking the form of local epidemics lasting a few weeks or months. The same serotype may return to an area after several years (Tyrrell and Myint, 1996).

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Symptoms

Common signs of infection mainly include respiratory symptoms, cough, fever, and shortness of breath. In more severe cases, it results in severe acute respiratory syndrome/pneumonia, kidney failure and even death (Fig. 2) The virus can be even asymptomatic until 14 days. It can get expressed in the host body even at day one of DNA invasion as well. Normally the fever lasts from first day till a week. People who recover usually would not get to the stage of pneumonia and respiratory syndrome, which would be developed on 4th or 5th day of infection (Chen *et al*., 2020 and Huang *et al*., 2020).

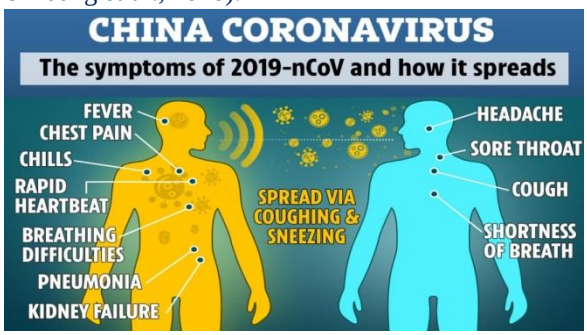

Fig. 2. Symptoms of disease
Source: https://www.siasat.com/

Diagnosis

Laboratory diagnosis is on the basis of antibody titers in paired sera. The presence of 2019-nCoV in respiratory specimens are analyzed by the next generation sequencing or real-time RT-PCR methods. The primers 5′-ACTTCTTTTTCTTGCTTTCGTGGT-3′ (forward) and 5′-GCAGCAGTACGCACACAATC-3′ (reverse) are probed with the target 5′CY5-CTAGTTACACTAGCCATCCTTACTGC-3′BHQ1 to envelope gene of CoV for diagnosing (Lu *et al*., 2019).

How is it treated?

Scientists are still working hard to develop antivirals for the coronavirus. The present treatment includes use of some immune boosters which can accelerate the host immune power to fight against the disease (Wu *et al*., 2020).

What scientists worldwide are doing to solve the issue?

Genome sequencing of the virus

Genetic sequencing of the Wuhan coronavirus could add on to the origins and spread of the deadly virus. Various laboratories in China and Thailand have sequenced the genomes of more than 25 strains of infected people which are publicly available now. Scientist are using the data to find the emergence of the virus. This could identify any genetic studies that would have helped the virus to jump from animals to humans. And this could be the reason for enabling it to spread more efficiently in humans. Further, the phylogenetic sequencing analysis suggests that the Wuhan virus is related to coronaviruses that circulate in bats (Fig. 4), like SARS and its close relatives. But other mammals can also transmit these viruses, like mice (Source: asia.nikkei.com).

Virulence of the virus

High rates of pneumonia in initially infected people made researchers to conclude it as highly malignant. However, these regressed slightly, as milder cases have turned up. With the average death of 1 in 45, the virulence was found to be lesser and deady compared to SARS, which killed around 10% of the infected people (Source: asia.nikkei.com).

Transmission rate of the virus

Another question among scientists is how extensively asymptomatic people can be infectious to others. In a study by Chan *et al*. (2020) on a cluster of six infections in a family in Shenzhen identified a child who was asymptomatic carrying the virus. If such cases are common, control of the disease is tough. Moreover, the study revealed that the most favorable season for the coronavirus transmission is in winters.

R0 evaluation

R0 is defined as the average number of secondary cases generated by a single primary case in a large previously unexposed host population and its value tells us a great deal about the epidemiology of a pathogen. R0 = 0 indicates no spread in that population; this value would apply to zoonotic infections that do not spread between humans. For the Wuhan coronavirus, R0 is found to be 1.5-2.2, which could enhance the chance of spread of the disease (Chen *et al*., 2020).

Control of the viruses

Treatment of common cold is symptomatic but still, no specific drugs or vaccines are available for the ailment. Hygiene measures could reduce the rate of transmission. Standard recommendations to prevent the infection include regular hand washing, covering of mouth and nose while coughing and sneezing, usage of face protection masks, thoroughly cooking meat and eggs, Avoiding close contact

as coughing and sneezing.

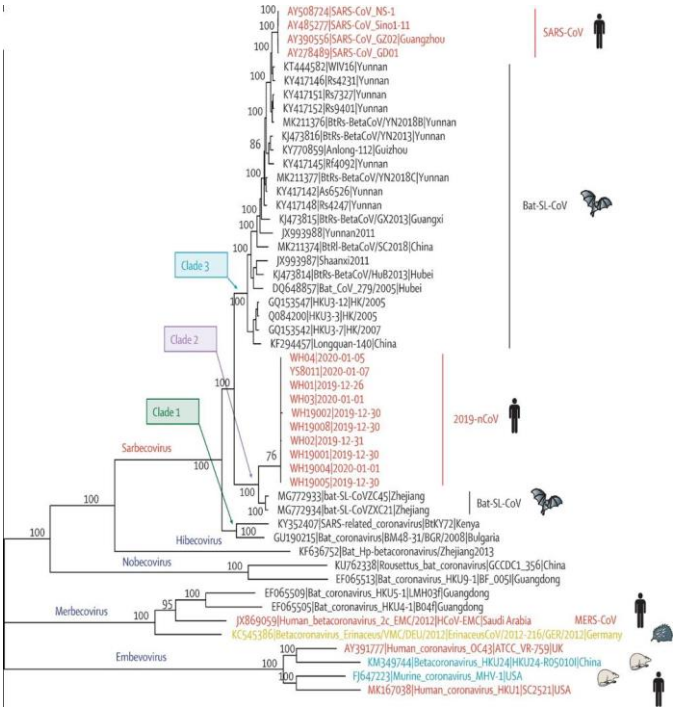

Fig.4. Phylogenetic tree showing the relationship of 2019-nCoV with bat and mice genomes (Lu *et al*., 2020)

Present Statistics

The whole of china has been infected drastically by the disease within a time gap of a month. The disease has spread worldwide as well. The epidemiology of the deadly novel coronavirus infection is worldwide and the WHO has categorized the viral attack as a "pandemic".

Conclusion

The review was to throw light on the novel coronavirus, its structure, symptoms, diagnosis and treatment and control measures. In scientific world though new drugs are developed there are still many diseases unable to cure. Despite many challenges faced by mankind there are still need for the development of novel drugs against the deadly diseases as at present for 2019-nCoV. Prevention is better than cure! People have to come together to fight against the novel coronavirus and spread awareness for such diseases.

References

Chan, J. F. W., Yuan, S., Kok, K. H., To, K. K. W., Chu, H., Yang, J and Tsoi, H. W. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The Lancet*, **395** (10223): 514-523.

Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y and Yu, T. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*, **395** (10223): 507-513.

Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., … and Cheng, Z. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, **395** (10223): 497-506.

Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H., … and Bi, Y. (2020). Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *The Lancet*, **395** (10224): 565-574..

Tyrrell, D. A and Myint, S. H. (1996). Coronaviruses. In Medical Microbiology. 4th edition. University of Texas Medical Branch at Galveston.

Wu, J. T., Leung, K. and Leung, G. M. (2020). Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. *The Lancet*, **395** (10225): 689-697**.**

Researcher harnessing supercomputers to unpack the coronavirus spike protein

Michael H. Peters, Ph.D., a professor in Virginia Commonwealth University (VCU), Department of Chemical and Life Science Engineering, is using powerful supercomputers at NASA's Ames Research Center in California to investigate the spike protein of the novel coronavirus that causes COVID-19.

Through advanced computer simulations, he hopes to determine the mechanistic action of the spike protein, which plays an important role in attaching to human cells and infecting the body. He has identified a possible factor that may be able to restrict an important action of this key protein and is trying to more fully understand how this protein functions.

Peters conducts experimental and theoretical research in the field of protein engineering with a former graduate student, Oscar Bastidas, Ph.D., now a postdoctoral research fellow at the University of Minnesota's College of Biological Sciences. Together, they are studying the dynamics of how the spike protein changes between active and inactive states. The protein's receptor binding domain has an "up" position, in which it can bind to epithelial cell molecules. But in the "down" position, it appears to be incapable of binding.

Peters said it was remarkable that the up domain configuration is molecularly tethered to the main structure of the protein like a tethered balloon. He added, there were two molecular tethers that are stabilized or 'tied down' by so-called beta strand structural motifs in the central part of the protein and that is why he calls this virus the "It' virus" referring to the shape-shifting creature in author Stephen King's horror tale

He said that, they have mapped the all-atom biomolecular dynamics of the entire spike protein and believe they have discovered a possible molecular "latch" that helps to keep the spike protein down.

Peters is able to access the supercomputers as part of the COVID-19 High Performance Computing Consortium through the Extreme Science and Engineering Discovery Environment, a virtual system that scientists can use to interactively share computing resources. The consortium is a private-public partnership that includes the White House Office of Science and Technology Policy and major tech corporations.

"The spike protein is a true giant among proteins and difficult to attack without the best computers out there" he said and added "We need to move as fast as possible gathering intelligence and planning attacks." difficult to attack without the best computers out there" he said and added "We need to move as fast as possible gathering intelligence and planning attacks.“

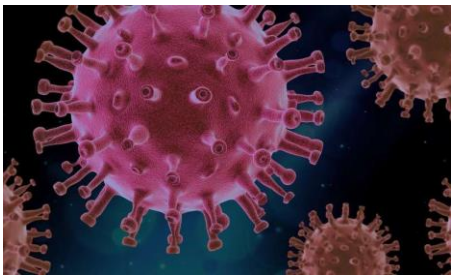

Image credit: CC0 Public Domain
Source: www.phys.org

COVID-19 heightens water problems around the world

COVID-19 will unquestionably delay achievement of the Sustainable Development Goals (SDGs), the latest global attempt to improve the quality of life of billions of people around the world by 2030.

Increasing access to clean water and sanitation are among the 17 SDGs. During normal times, and even more during the present pandemic, access to clean water and proper sanitation is essential.

But we must now rethink how we achieve the goals laid out in the SDGS. First, we should stop looking at access to safe water as the problem of developing countries alone, it is a global problem that worsens under extreme conditions like the current pandemic.

How COVID-19 heightens water problems

During the current pandemic, lack of clean water for drinking and proper hygienic practices has become a major concern for cities in the developing world, especially in slums, peri-urban areas and refugee camps.

Countries in Africa and South Asia, with some 85% of the world's people live, face particularly daunting challenges to access clean, drinkable water. But the problem is not confined to these areas. Developed countries are increasingly facing similar concerns. After catastrophic experiences with water utilities in Flint in 2014 in the US, and in 2000 in Walkerton, Canada, which seriously affected the health of a large number of people, millions in these two countries are now using point of treatment systems in their homes to further purify city water. They are also buying bottled water because they perceive it to be cleaner and safer. In overwhelming percentage of cases of people in developed countries, from Japan and Singapore to western Europe and the US, are doing this out of choice and not because they have to.

But the financial impact of lockdown and growing unemployment means that spending extra on safe water has become a problem for many households and millions are struggling to pay their utilities bills, including for water.

In the US, some 57 million people in several states have been allowed to continue receiving water from their utilities even if they cannot currently pay for it. But there are still many poor and disadvantaged people who did not have access to water services before the pandemic, and still do not have them.

In the European Union (EU), most member states need to increase their annual water supply and sanitation expenditure by more than 25% to comply with EU Drinking Water and Urban Wastewater Treatment Directives. This will also contribute towards reaching the SDGs. But in these uncertain

times, the EU will have to rethink how best to make use of scarce financial resources to achieve their goals.

The pandemic has further worsened the living conditions and health of millions of people in both developed and developing countries, and it is unclear when this situation might improve. Even in the world's richest country, U.S., at least two million people still do not have access to piped water.

The need for leadership

From the late 1970s, the United Nations have advocated for improved source of water. But this term does not mean clean and safe water, even though UN organisations use these terms interchangeably.

COVID-19 has focused global attention to clean water for frequent handwashing, drinking and personal hygiene. Political leaders will now have to give increasing attention not only to access to water but also to its quality. It will be an even more daunting task, in both developed and developing countries, to regain the trust of their people that water they are receiving is safe to drink and for personal hygiene because of extensive past mismanagement in most countries of the world.

The world needs leadership, long-term sustainable policies, robust legal and regulatory systems, strong institutions, and services that are reliable and provided irrespective of the circumstances. For example, Singapore ensured all these conditions were fulfilled from 1965 onwards. As a result, its water management is now one of the best in the world.

The absence of enlightened political leadership in nearly all countries of the world, both developed and developing, will exacerbate the problem in the coming decades because of increasing uncertainties due to both expected events like climate change and unexpected ones like COVID-19.

Water affects all aspects of life, economic activity and ecosystems. As the British-American poet, W.H. Auden wrote: "Thousands have lived without love but none without water.“

Fig: Water is now a more precious, strategic and scarcer than ever before in human history.

Image Credit: www.shutterstock.com/greenaperture.

Source: www.phys.org

Scientists aim gene-targeting breakthrough against COVID-1

A team of scientists from Stanford University is working with researchers at the Molecular Foundry, a nanoscience user facility located at the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), to develop a gene-targeting, antiviral agent against COVID-19.

Stanley Qi, an assistant professor in the departments of bioengineering and chemical and systems biology at Stanford University and his team had begun working on a technique called PAC-MAN or Prophylactic Antiviral CRISPR in human cells that uses the gene-editing tool CRISPR to fight influenza.

But that all changed in January, when news of the COVID-19 pandemic emerged. Qi and his team were suddenly confronted with a mysterious new virus for which no one had a clear solution. Hence, they thought, why don't they try using our PAC-MAN technology to fight it?

Since late March, Qi and his team have been collaborating with a group led by Michael Connolly, a principal scientific engineering associate in the Biological Nanostructures Facility at Berkeley Lab's Molecular Foundry, to develop a system that delivers PAC-MAN into the cells of a patient.

Like all CRISPR systems, PAC-MAN is composed of an enzyme in this case, the virus-killing enzyme Cas13 and a strand of guide RNA, which commands Cas13 to destroy specific nucleotide sequences in the coronavirus's genome. By scrambling the virus's genetic code, PAC-MAN could neutralize the coronavirus and stop it from replicating inside cells.

It's all in the delivery

Qi said that the key challenge to translating PAC-MAN from a molecular tool into an anti-COVID-19 therapy is finding an effective way to deliver it into lung cells. When SARS-CoV-2, the coronavirus that causes COVID-19 invades the lungs, where the air sacs in an infected person can become inflamed and fill with fluid thereby causing difficulty in the patient's ability to breathe. But his lab doesn't work on delivery methods. Hence, they published a preprint of their paper, and even tweeted, in the hopes of catching the eye of a potential collaborator with expertise in cellular delivery techniques.

Soon after, they learned of Connolly's work on synthetic molecules called lipitoids at the Molecular Foundry. Lipitoids are a type of synthetic peptide mimic known as a "peptoid" first discovered 20 years ago by Connolly's mentor Ron Zuckermann. In decades since, Connolly and Zuckermann have worked to develop peptoid delivery molecules such as lipitoids. And in collaboration with Molecular Foundry users, they have demonstrated lipitoids effectiveness in the delivery of DNA and RNA to a wide variety of cell lines.

Today, researchers studying lipitoids for potential therapeutic applications have shown that these materials are nontoxic to the body and can deliver nucleotides by encapsulating them in tiny nanoparticles just one billionth of a meter wide, the size of a virus. Now Qi hopes to add his CRISPR-based COVID-19 therapy to the Molecular Foundry's growing body of lipitoid delivery systems.

In late April 2020, the Stanford researchers tested a type of lipitoid, Lipitoid 1 that self-assembles with DNA and RNA into PAC-MAN carriers in a sample of human epithelial lung cells. According to Qi, the lipitoids performed very well. When packaged with coronavirus-targeting PAC-MAN, the system reduced the amount of synthetic SARS-CoV-2 in solution by more than 90%. "Berkeley Lab's Molecular Foundry has provided us with a molecular treasure that transformed our research," he said.

The team next plans to test the PAC-MAN/lipitoid system in an animal model against a live SARS-CoV-2 virus. They will be joined by collaborators at New York University and Karolinska Institute in Stockholm, Sweden. If successful, they hope to continue working with Connolly and his team to further develop PAC-MAN/lipitoid therapies for SARS-CoV-2 and other coronaviruses, and to explore scaling up their experiments for preclinical tests.

"An effective lipitoid delivery, coupled with CRISPR targeting, could enable a very powerful strategy for fighting viral disease not only against COVID-19 but possibly against newly viral strains with pandemic potential," said Connolly.

"Everyone has been working around the clock trying to come up with new solutions" said Qi, whose preprint paper was recently peer-reviewed and published in the journal Cell. He added, "It's very rewarding to combine expertise and test new ideas across institutions in these difficult times.“

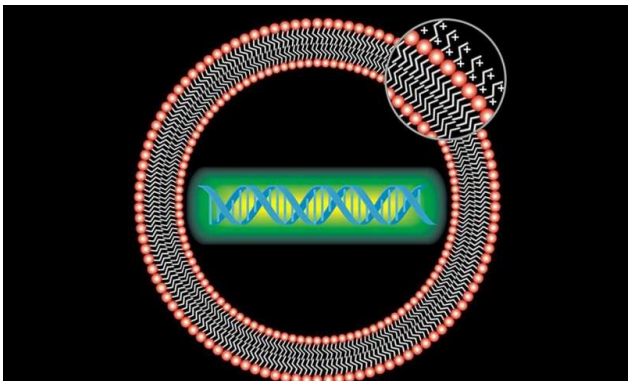

Fig. Lipitoids, which self-assemble with DNA and RNA, could serve as cellular delivery systems for antiviral therapies that prevent COVID-19 and other coronavirus infections.

Image Credit: R.N. Zuckermann

Source: www.phys.org

ONLINE REPORTS

Odds of edible insects transmitting coronavirus SARS-CoV-2 is negligible

The odds of insects that are produced for food or feed transmitting COVID-19 is negligible. That is the conclusion drawn by a team of entomologists, virologists and insect disease experts of Wageningen University & Research (WUR) in collaboration with colleagues from the University of Groningen (UG) and the University of Copenhagen (UC).

Insects are a sustainable and innovative source of proteins. Crickets, mealworms and fly larvae are increasingly produced as food for humans or feed for livestock. Just like any other food ingredient, insects produced for food or feed also need to comply with the regulations developed by the European Food Safety Authority (EFSA). Such compliance is controlled by national food safety authorities such as the Dutch Food Safety Authority. The scientists of WUR, UG and UC execute ongoing research programmes on insects as a sustainable source of feed for a circular agriculture and on the diseases that insects may contract during their production. The scientists carried out an analysis of the risks that edible insects could transmit COVID-19. Their conclusion is that such a risk is negligible. The fact that insects are evolutionarily distant from humans is an advantage in terms of food safety. The scientific analysis has been published in the international scientific journal, Journal of Insects as Food and Feed.

The virus that is responsible for COVID-19, SARS-CoV-2 requires living cells to replicate. For this, the virus needs to bind to these living cells to gain entrance to the cell. The virus originates from bats and can replicate in a limited number of mammalian species, including the pangolin and humans. Such hosts of the virus have receptors (ACE2) on the outside of the cell, that can bind the virus. In humans, cells high in the nostrils, in lungs and in the colon express an ACE2 receptor that can bind SARS-CoV-2. This ACE2 receptor is the same receptor that also binds other coronaviruses, including the SARS virus that caused an epidemic in 2003.

Insects are no host

Just like other animals, insects also have ACE proteins, but insects are evolutionarily so distant from mammals that their ACE proteins are so different from mammalian ACE2 that it is highly unlikely that these ACE proteins of insects can bind the coronavirus SARS-CoV-2. Moreover, extensive analyses of the micro-organisms present in insects, that have been executed in recent years have never recorded a virus from the wider group of coronaviruses.

Can insects transmit SARS-CoV-2 passively? Just like in the production of any other food, this could happen when the insects come in contact with an infected host such as humans that take care of the insects. However, if the virus contaminates an insect in this way, the virus cannot replicate because the insect is no host to the virus. As a result the chance of transmission of the virus from insect to human is many times smaller than when the virus would infect a mammal that can serve as a host in which the virus could replicate.

Production of insects

The production of insects as food and feed takes place in closed facilities. These facilities are subjected to strict hygienic measures and the processes in the facilities are highly automated. As a result, contact of humans with the insects is negligible, thus strongly reducing the chance of passive transmission.

Fig: Acheta domesticus.

Image Credit: Hans M. Smid

Source: www.phys.org

An important new tool for developing COVID-19 treatments, vaccines

Biomedical scientists working with COVID-19 have a new tool to help them better understand the virus and feel confident about the structural models they are using in their research.

Wladek Minor, Ph.D., of the University of Virginia School of Medicine and other top structural biologists have led an international team of scientists to investigate the protein structures contained in the virus structures that are vital in developing treatments and vaccines. The team has created a Web resource that provides scientists an easy way to see the progress of the structural biology community in this area. It also includes the team's assessment of the quality of the individual models and enhanced versions of these structures, when possible.

"We have carefully analyzed the available models of SARS-CoV-2 proteins and presented the results with the aim of helping the broad biomedical community. Structural models are ultimately the interpretation of the original researchers and sometimes are suboptimal. This is why a second set of eyes to validate important structures is so crucial" said Minor, of UVA's Department of Molecular Physiology and Biological Physics. He added, "In most cases, only minor corrections could be suggested. However, in several cases, the revisions were significant, especially in the sensitive area of protein-ligand complexes that are critical for follow-up research, like drug discovery work. The current health crisis demands that all SARS-CoV-2 structures are of the highest quality possible".

Science at Lightning Speed

When the threat of the coronavirus became apparent, scientists worldwide responded at an unprecedented pace to determine the atomic structure of the virus and its protein constituents.

Researchers are using the resulting structural models in a variety of applications, ranging from structure-based drug design to planning a range of biomedical experiments. For that reason, it is essential that the atomic models are as accurate as possible. Because of the urgency of the pandemic, most of these structures are deposited in the Protein Data Bank (PDB), a global repository of macromolecular structures, before publication and peer review.

The members of the team, who are experts in structure validation and interpretation, noticed opportunities to improve several SARS-CoV-2 models using state-of-the-art refinement approaches. That led them to create the new web resource. It is updated with new structures weekly, in sync with the PDB.

In some cases, the team has worked with the researchers who generated the original structure to ensure that the site contains the most accurate models. This team has longstanding experience in correcting biomedically important structural models for instance, in the field of antibiotic resistance.

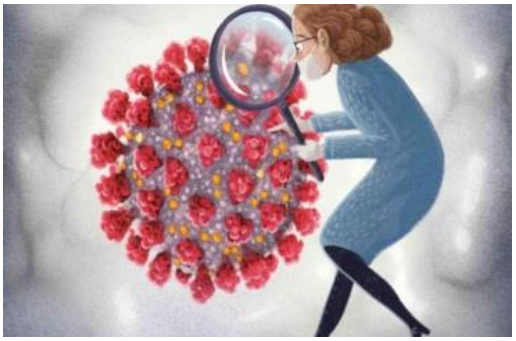

Fig: A new tool is helping scientists better understand COVID-19. Illustration by Marcin Minor. Credit: Marcin Minor

Source: www.phys.org

NEWS

Detecting methane emissions during COVID-19

While carbon dioxide is more abundant in the atmosphere and therefore more commonly associated with global warming, methane is around 30 times more potent as a heat-trapping gas. Given its importance, Canadian company GHGSat have worked in collaboration with the Sentinel-5P team at SRON Netherlands Institute for Space Research to investigate hotspots of methane emissions during COVID-19.

Carbon dioxide is generally produced by the combustion of fossil fuels, while fossil fuel production is one of the largest sources of methane emissions. According to the World Meteorological Organisation's State of the Global Climate report last year, current carbon dioxide and methane concentrations represent respectively 150% and 250% of pre-industrial levels, before 1750.

Owing to the importance of monitoring methane, SRON's and GHGSat's research teams have been working since early-2019 to detect methane hotspots. The SRON team uses data from the Copernicus Sentinel-5P satellite to detect emissions on a global scale. The GHGSat team then utilizes data from GHGSat satellites to quantify and attribute the emissions to specific facilities around the world.

Their work has led to several new hotspots being discovered in 2020, for instance over a coal mine in China. The team have also detected methane emissions over the Permian Basin, the largest oil-producing region in the

United States. The team observed concentrations from March-April 2020, compared to the same period as last year in an effort to evaluate the impact of COVID-19 activities on methane emissions.

GHGSat have worked in close collaboration with the Sentinel-5P team at SRON Netherlands Institute for Space Research to investigate hotspots of methane emissions. The team uses data from the Copernicus Sentinel-5P satellite to detect emissions on a global scale, and then utilizes data from GHGSat satellites to quantify and attribute emission to specific facilities around the world. This has led to several new hotspots being discovered including a coal mine in the Shanxi province, China.

An initial look at these data suggest a substantial increase in methane concentrations in 2020, compared to 2019. Claus Zehner, ESA's Copernicus Sentinel-5P mission manager, says, "An explanation for this could be that as a result of less demand for gas because of COVID-19, it is burned and vented leading to higher methane emissions over this area".

Ilse Aben, from SRON, commented that these results are inconclusive when using only Sentinel-5P data in the Permian Basin as the number of observations are limited.

The spatial distribution of Sentinel-5P concentrations in 2020 and in 2019 both indicates local enhancements of methane concentrations in the Delaware and Midland portions of the basin. But higher-resolution measurements, such as those provided by GHGSat, are needed to attribute these enhancements to specific facilities.

The joint analysis of GHGSat and Sentinel-5P regional methane data will continue to explore and quantify how COVID-19 is affecting emissions from the natural gas industry on a regional scale all the way down to the level of industrial facilities.

Stephane Germain, CEO of GHGSat said, "GHGSat continues to work closely with ESA and SRON's Sentinel-5P science team. We are advancing the science of satellite measurements of atmospheric trace gases while simultaneously providing practical information to industrial operators to reduce facility-level emissions. GHGSat's next satellites, scheduled to launch in June and December of this year, will help improve our collective understanding of industrial emissions around the world."

Eric Laliberté, Director General Utilization from the Canadian Space Agency said, "The Canadian Space Agency is committed to developing space technologies and supporting innovative missions to better understand and mitigate climate change. The results achieved by GHGSat are already having an impact and we are excited to continue working with GHGSat and ESA to better understand greenhouse gas emissions worldwide."

The Copernicus Sentinel-5P satellite, with its state-of-the-art instrument Tropomi, can also map other pollutants such as nitrogen dioxide, carbon monoxide, sulphur dioxide and aerosols all of which affect the air we breathe.

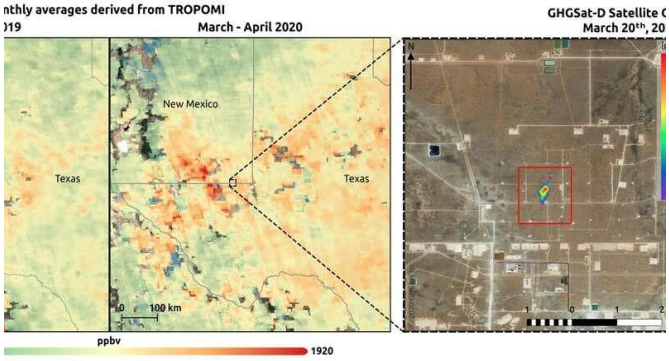

Fig. GHGSat uses data from the Copernicus Sentinel-5P satellite to detect emission hotspots in various regions including the Permian Basin. The image on the left shows the enhanced methane concentrations over the Permian basin, while the image on the right highlights the exact facility in the Permian Basin leaking methane.

Image Credit: GHGSat

Source: www.phys.org

Abstracts of Recent Publications

01. Clinica Chimica Acta, 506, 2020, Pages: 145-148

Thrombocytopenia is associated with severe coronavirus disease 2019 (COVID-19) infections: A meta-analysis.

Giuseppe Lippia, Mario Plebani and Brandon Michael Henry*

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Background

Coronavirus disease 2019 (COVID-19) is a novel infectious disease with lack of established laboratory markers available to evaluate illness severity. In this study, we investigate whether platelet count could differentiate between COVID-19 patients with or without severe disease. Additionally, we evaluate if thrombocytopenia is associated with severe COVID-19.

Methods

An electronic search in Medline, Scopus and Web of Science was performed to identify studies reporting data on platelet count in COVID-19 patients. A meta-analysis was performed, with calculation of weighted mean difference (WMD) of platelet number in COVID-19 patients with or without severe disease and odds ratio (OR) of thrombocytopenia for severe form of COVID-19.

Results

Nine studies with 1779 COVID-19 patients, 399 (22.4%) with severe disease, were included in the meta-analysis. The pooled analysis revealed that platelet count was significantly lower in patients with more severe COVID-19 (WMD −31 × 109/L; 95% CI, from −35 to −29 × 109/L). A subgroup analysis comparing patients by survival, found an even lower platelet count was observed with mortality (WMD, −48 × 109/L; 95% CI, −57 to −39 × 109/L. In the four studies (n = 1427) which reported data on rate of thrombocytopenia, a low platelet count was associated with over fivefold enhanced risk of severe COVID-19 (OR, 5.1; 95% CI, 1.8–14.6).

Conclusions

Low platelet count is associated with increased risk of severe disease and mortality in patients with COVID-19, and thus should serve as clinical indicator of worsening illness during hospitalization.

Keywords: Platelets, Thrombocytopenia, Coronavirus, COVID-19

02. Journal of Biomolecular Structure and Dynamics, 2020.

Peptide-like and small-molecule inhibitors against Covid-19.

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**Department of Medicinal Chemistry, National Institute of Pharmaceutical Education and Research Guwahati, Guwahati, Assam , India.*

Coronavirus disease strain (SARS-CoV-2) was discovered in 2019, and it is spreading very fast around the world causing the disease Covid-19. Currently, more than 1.6 million individuals are infected, and several thousand are dead across the globe because of Covid-19. Here, we utilized the in-silico approaches to identify possible protease inhibitors against SARS-CoV-2. Potential compounds were screened from the CHEMBL database, ZINC database, FDA approved drugs and molecules under clinical trials. Our study is based on 6Y2F and 6W63 co-crystallized structures available in the protein data bank (PDB). Seven hundred compounds from ZINC/CHEMBL databases and fourteen hundred compounds from drug-bank were selected based on positive interactions with the reported binding site. All the selected compounds were subjected to standard-precision (SP) and extra-precision (XP) mode of docking. Generated docked poses were carefully visualized for known interactions within the binding site. Molecular mechanics-generalized born surface area (MM-GBSA) calculations were performed to screen the best compounds based on docking scores and binding energy values. Molecular dynamics (MD) simulations were carried out on four selected compounds from the CHEMBL database to validate the stability and interactions. MD simulations were also performed on the PDB structure 6YF2F to understand the differences between screened molecules and co-crystallized ligand. We screened 300 potential compounds from various databases, and 66 potential compounds from FDA approved drugs. Cobicistat, ritonavir, lopinavir, and darunavir are in the top screened molecules from FDA approved drugs. The screened drugs and molecules may be helpful in fighting with SARS-CoV-2 after further studies.

Keywords: Covid-19, MD Simulations, Virtual Screening, Drug Repurposing.

03. Journal of Clinical & Experimental Investigations, 2020, Vol. 11 Issue 3, Pages: 1-2. 2.

Asymptomatic COVID-19 Infection Management: The Key to Stop COVID-19.

Addi, Rachid Ait; Benksim, Abdelhafid; Amine, Mohamed; Cherkaoui, Mohamed.

The COVID-19 disease, emerged in December 2019, has spread rapidly, with new cases confirmed in multiple countries. Many efforts to contain the virus are ongoing, such as containment, individual measures of protection, the authorization of use of some drugs as chloquorine in some countries. Also, it has been known that symptomatic and asymptomatic people whom are infected by COVID-19 have the same contagiousness which expose a far greater portion of the population to virus and increase the late diagnosis and thereafter enhance COVID-19 mortality. Thereafter, it is fundamental to review our COVID-19 screening approach and enlarge COVID-19 testing to the general population by using rapid testing appliances such as rapid SARS-CoV-2 IgG-IgM combined antibody since another appliance more efficient will be performed.

04. Journal of the Neurological Sciences, 2020, Vol. 413, Page: 116832.

Central nervous system manifestations of COVID-19: A systematic review.

Ali A.Asadi-Pooya* and Leila Simani.

**Epilepsy Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.*

Objective

In this systematic review, we will discuss the evidence on the occurrence of central nervous system (CNS) involvement and neurological manifestations in patients with COVID-19.

Methods

MEDLINE (accessed from PubMed) and Scopus from December 01, 2019 to March 26, 2020 were systematically searched for related published articles. In both electronic databases, the following search strategy was implemented and these key words (in the title/abstract) were used: “COVID 19” OR “coronavirus” AND “brain” OR “CNS” OR “neurologic”.

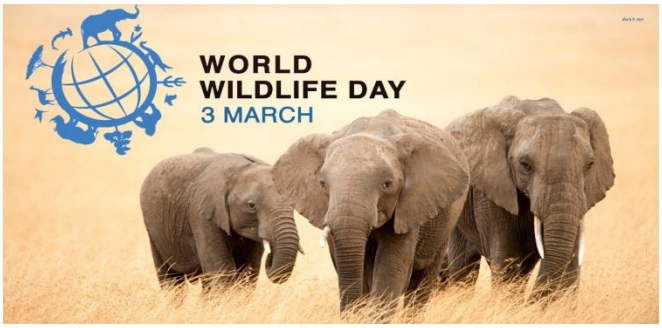
Results

Through the search strategy, we could identify two articles about neurological involvement by COVID-19. One of these publications was a narrative review and the other one was a viewpoint. However, the authors scanned the reference lists of the included studies and could identify multiple references. One study, specifically investigated the neurological manifestations of COVID-19 and could document CNS manifestations in 25% of the patients. Most of the studies investigated the manifestations of COVID-19 in general.

Conclusion

While neurological manifestations of COVID-19 have not been studied appropriately, it is highly likely that some of these patients, particularly those who suffer from a severe illness, have CNS involvement and neurological manifestations. Precise and targeted documentation of neurological symptoms, detailed clinical, neurological, and electrophysiological investigations of the patients, attempts to isolate SARS-CoV-2 from cerebrospinal fluid, and autopsies of the COVID-19 victims may clarify the role played by this virus in causing neurological manifestations.

Keywords: CNS, Coronavirus, COVID-19, Neurological, Seizure.



E - Resources

NATIONAL

Central Library, IIT Bhubaneswar

https://library.iitbbs.ac.in/online-e-resources.php

Consortium for e-Resources in Agriculture(CeRA), ICAR

http://cera.iari.res.in/index.php/en/

Delhi University Library System

http://crl.du.ac.in/sub.database/SUBS.E-RESOURCE.htm

Guindy Campus Library, University of Madras

http://libgc.unom.ac.in/

INTERNATIONAL

BASE (Bielefeld Academic Search Engine)

https://www.base-search.net/en/index.php

British Library web catalogs

https://www.bl.uk/catalogues-and-collections

Caltech Collection of Open Digital Archives (CODA)

https://libguides.caltech.edu/CODA

CiteSeerX

http://citeseerx.ist.psu.edu/index

EVENTS

Conferences / Seminars / Meetings 2020

887th International Conference on Medical and Biosciences. August 22 - 23, 2020. Madrid, Spain.

Website: http://researchworld.org/Conference2020/Spain/4/ICMBS/

6th International Conference On Water Resource And Environment. August 23 – 26. Tokyo, Japan.

Website: http://www.wreconf.org/

11th Drug Discovery Innovation Programme. September 15 - 16, 2020. Tel Aviv, Israel.

Website: https://worldbigroup.com/conference/eleventh-drug-discovery/

World Aquaculture And Fisheries Conference. October 26 - 27, 2020. Tokyo, Japan.

Website: https://www.worldaquacultureconference.com/

CREATING AWARENESS TO THE PUBLIC ON PREVENTION OF COVID-19 DISEASE

Green Skill Development Programme on Pollution Monitoring: Soil Pollution

Ministry of Environment, Forest and Climate Change

Government of India

CERTIFICATE OF COMPLETION

PRESENTED TO

Ms./Mr. SILVIA ESTHER ANBUMANI J GSDP UID Silv26101996

for successfully completing Certificate Course in
***Pollution Monitoring : Soil Pollution** (Level-6 of NSQF)*
under the Green Skill Development Programme of the
Ministry of Environment, Forest and Climate Change, Government of India, New Delhi

at DZUM - ENVIS, Chennai *from* 17.02.2020 *to* 20.03.2020 .

DATE: 20.03.2020

AUTHORIZED MoEFCC SIGNATORY