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NESA NEWSLETTER

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY

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April 2020



22nd April,
World Earth Day

7th April, World Health Day



14th April, B.R. Ambedkar Remembrance Day



25th April, World Malaria Day



28th April, World Veterinary Day



30th April, Ayushman Bharat Diwas



NESA Annual Award 2020 Notification No. 1

APPLICATIONS ARE INVITED

31st May 2020

(1) NESA FELLOWSHIP AWARD

AGE 45 and above. The recipients shall get Citation, Certificate, Memento and a Gold plated medal, and can suffix F.N.E.S.A. after their names.

(2) NESA EMINENT SCIENTIST AWARD

AGE 40 and above. The recipient shall get Citation, Certificate, Memento and a Gold plated medal.

(3) NESA SCIENTIST OF THE YEAR AWARD

AGE 35 and above. The recipient shall get Citation, Certificate, Memento and a Gold plated medal.

(4) NESA ENVIRONMENTALIST AWARD

AGE Up to 35 and above. The recipients shall get Citation, Certificate, Memento and a Gold plated medal.

(5) NESA GREEN TECHNOLOGY INNOVATIVE AWARD

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(7) NESA JUNIOR SCIENTIST AWARD

AGE : Below 35. The recipients shall get Citation, Certificate, Memento and a Gold plated medal. a Gold plated medal.

PRESCRIBED APPLICATION FORMS

The application forms could be downloaded from www.nesa-india.org

Separate application form should be submitted for separate awards. The application forms are non-transferable and it can also be obtained by sending a bank draft of **Rs. 1000/- only** (per form). Drawn in favour of **NATIONAL ENVIRONMENTAL SCIENCE ACADEMY** payable at NEW DELHI.

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EARTH DAY RELEVANCE ON EACH DAY

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We all know that Earth Day is celebrated on 22nd April every year to save mother earth from anthropogenic disturbances. It first started from 22nd April 1970 in United States of America by Gaylord Nelson and till 1989 was celebrated in the United States of America. From 1990 onwards it is celebrated worldwide in all the countries.

Earth is a source of natural resources for sustaining the life. It took millions of years to form natural resources and natural features but human is destroying for fulfilling its greedy needs. In the present scenario, Earth resources are under stress in the form of excessive exploitation and pollution like water pollution, air, noise pollution, soil degradation and ecological destruction in fragile regions like Himalaya and forest areas.

Earth Day relevance on each day

Each year Earth Day is celebrated in organizations more or less as a formality and forgets its objectives 364 days and we remember it only on 22nd April and again forget. But the relevance of celebration of Earth Day is only when efforts are made to achieve objectives on each day. The theme for Earth Day 2020 is **climate action**. The enormous challenge but also holds vast opportunities to take action on climate change. This way 50th anniversary of Earth Day will be celebrated in 2020.

Some of the common suggestions that can be adopted by human to make the relevance of Earth day on regularly basis:

- ❖ Use wisely each natural resource as per requirement and do not deteriorate its quality for self benefits.



Synoptic view of Earth
(Acknowledgement: Google)

- ❖ Trees are absorber of polluted air, water, noise and soil therefore, plant more trees and also save the pre-existing.
- ❖ Do not use excessive petroleum fuel products. Use bio-fuels, bio-energy, solar energy, hydro-energy and wind energy to reduce consumption of petroleum fuels and help pollution free environment.
- ❖ Use bicycle and foot for small distances instead of vehicle. Use pollution free vehicle for medium/long distances.
- ❖ Use bio-fertilizers and reduce use of pesticides and artificial manures. Adopt crop rotations to improve soil fertility.
- ❖ Use water efficiently as per crop requirement as well as in day to day use.
- ❖ Avoid excessive use of loud speakers, vehicle horn and other noise pollution sources.
- ❖ Avoid religious myths like pouring religious materials in rivers and water bodies. Minimize anthropogenic pollution of rivers, water bodies, glaciers and oceans.
- ❖ Convert liquid and solid wastes into useable products like manure, recycling of plastic and other wastes into reuse.
- ❖ Save mountains/hills and geomorphic and geologic monuments to sustain other natural processes on the Earth.
- ❖ Maintain natural food chain, natural habitat and ecosystem.
- ❖ Reduce greenhouse gases to reduce anthropogenic climate change.
- ❖ Stop unplanned infrastructure developmental activities and maintain natural beauty.

These are some of the suggestions that can help to maintain the beauty of earth and in real meaning the celebration of Earth Day.

A PANDEMIC VIRUS, 2019 nCoV, SARS CoV-2, HCoV-19, CoV19 ARE DIFFERENT NAMES OF SAME CORONA VIRUS

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A virus pathogen was reported from Wuhan, China in the month of December 2019. Subsequently, a corona virus, 2019 nCoV was assigned to the causative agent. In the month of January, 2020, a large number of patients were found to be positive living near to Wuhan animal market and adjoining hotels as well. There are reports that 4 Lakh and 70 thousand positive cases are all over the globe and more than 21 thousand had died so far (March 26, 2020).

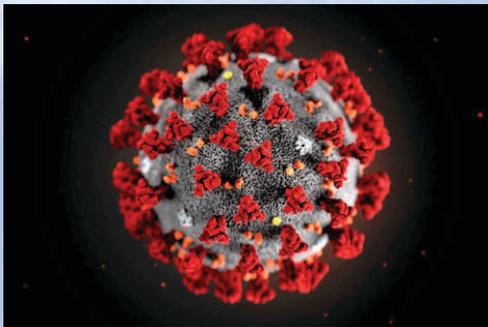
However, major casualties have been reported from Italy and Spain after China. Cases of infected patients are growing day by day in USA also.

All infected people are showing high fever, throat infection and fatigue similar to influenza virus infected patients. Now, this virus has been routed to the most continents of the globe. Viral load of the virus remain in the body almost up to 35 days.

Phylogenetic studies were carried out to establish its resemblance & pathological behavior to other corona viruses in short period of its emergence.

The 2019 n CoV has been described by different name in science, as SARS- CoV-2 or HCoV-19, CoVID-19. It was found that it is similar to bat corona viruses i.e., bat SL-CoVZC45 & bat SL-CoVZXC21 with 99% similarity. It resembles to SARS-CoV (79%) and MERS-CoV (50%) respectively. It was also revealed that CoVID 19 has similar receptor binding domain (RBD) as SARS-CoV but to different amino acid residue of the domain (6 amino

acids are important in variability of binding). RBD binds to angiotensin-converting enzyme 2 receptor (ACE2) in human. A similar Corona virus has also been reported from Pangolin, a mammal was also there in Wuhan market of China.



CoV19 is single strand RNA containing, positive strand virus of almost 100 nm in size (mostly Corona viruses have 100-120 nm size and 28-32 kb genome). All ACE2 bearing cells may receive this virus within

short period therefore, human lungs and kidneys were found to be damaged on autopsy in majority of death. It is also responsible for killing NK cells & T cells of the patient immune system. Scientists are trying to block ACE2 receptor by chemotherapeutic interventions, replication package block, also trying to develop a suitable vaccine but the vaccine may take 12 -18 months. Obviously, It is difficult to fix a time frame for the effective vaccine by now, unless, we have knowledge of the immunological parameters of the virus.

Corona viruses infecting to human with mild symptoms, are: HKU1, OC43, NL 63 & 229E. They have been isolated from various avian hosts and animals like camel, mice, dog & civets. Some

corona viruses inflict mild symptoms to human whereas SARS-CoV (2002) & MERS (2012) were responsible for a substantial numbers of mortality.

Despite resemblance to bat corona viruses, a longer spike protein is coded by CoVID19 as compared to spike protein of bat corona, SARS & MERS corona viruses. RNA dependent RNA polymerase (RRP) gene of CoVID19 is also different from SARS-CoV. RRP.

Spike protein is crucial for determining host tropism & transmission. Spike region has two regions S1& S2. S1 region is responsible for receptor binding whereas S2 region helps in cell fusion. S1 protein of the CoVID19 resembles 68% to bat corona viruses whereas S2 protein 93 percent. Receptor binding region of CoVID19 was closer to SARS-CoV binding region in the receptor sequence. This indicates that ACE2 receptor is being used by CoVID19 like to SARS-COV, whereas CD26 is the receptor for MERS CoV.

RBD mutation and polybasic cleavage site in spike protein expand host tropism and transmission of the corona viruses.

Our detailed understanding of jumping of viruses to human being will help further to understand zoonotic infections. We are supposed to explore an intermediate host of CoVID19 from reservoir bat to reaching terminal host -human beings.

It is also very difficult to predict when this virus will leave human from its clutches in days to come. Social distancing, hand washing with detergents, use of mask are some of the basic requirements to ward of virus pathogen.

“Only prevention is cure”

CORONA VIRUS DISEASE 2019 (COVID-19): A 21st CENTURY PANDEMIC

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Coronavirus disease 2019 (COVID-19) first emerged in late 2019, when a mysterious illness was reported in Wuhan, China. The cause of the disease was soon confirmed as a new kind of corona virus. The infection has since spread to all countries around the world and become a pandemic. On 11 February the World Health Organization (WHO) announced that the official name would be COVID-19, a shortened version of coronavirus disease- 2019. The WHO referred to the specific virus as the COVID-19 virus. However, this is not the formal name for the new mutated strain of coronavirus. The International Committee on Taxonomy of Viruses calls it the “severe acute respiratory syndrome coronavirus 2”, or SARS-CoV-2, because it is related to the virus that caused the SARS outbreak in 2003. Coronaviruses (CoVs) belong to the subfamily Orthocoronavirinae in the family of Coronaviridae in the order Nidovirales, and this subfamily including α -coronavirus, β -coronavirus, γ -coronavirus, and

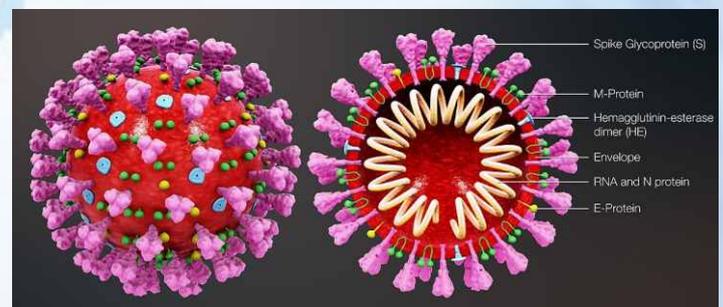


Figure 1: 3D medical illustration of 2019 Novel Coronavirus, derived from a CDC released image. This virus has four surface proteins E, S, M & HE labelled in the image. The S protein gives the crown-like appearance, for which the virus is named. The cross-section shows the inner components of the virus. (Source: WHO official website)

deltacoronavirus. Coronaviruses primarily cause enzootic infections in birds and mammals and, in the last decades, have shown to be capable of infecting humans as well.

The genome size of corona viruses ranges from approximately 27 to 34 kilobases, the largest among known RNA viruses. The name coronavirus is derived from the Latin corona, meaning "crown" or "halo", which refers to the characteristic appearance reminiscent of a crown or a solar. Coronaviruses are large pleomorphic spherical particles with bulbous surface projections (Fig. 1). The diameter of the virus particles is around 120 nm. The envelope of the virus in electron micrographs appears as a distinct pair of electron dense shells. The viral envelope consists of a lipid bilayer where the membrane (M), envelope (E) and spike (S) structural proteins are anchored. Inside the envelope, there is the nucleocapsid, which is formed from multiple copies of the nucleocapsid (N) protein, which are bound to the positive-sense single-stranded RNA genome in a

continuous beads-on-a-string type conformation. The genome size for coronaviruses ranges from approximately 27 to 34 kilobases. The lipid bilayer envelope, membrane proteins, and nucleocapsid protect the virus when it is outside the host cell.

Diseases caused

The disease is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is primarily spread between people during close contact and via respiratory droplets from coughs and sneezes. A study investigating the rate of decay of the virus found no viable viruses after four hours on copper, 24 hr on cardboard, 72 hr on stainless steel, and 100 hr on plastic. The virus remained viable in aerosols throughout the time of the experiment (three hours). The virus has also been found in faeces, and transmission through faeces is being researched. The disease

spreads faster where people are in close contact or travel from one area to another. Travel restrictions can reduce the basic reproduction number from 2.35 to 1.05, allowing the epidemic to be more manageable.

Case History:

A 57-year-old female shrimp seller in China's Wuhan city, the originating point of the coronavirus pandemic, has been identified as one of the first victims of coronavirus and identified as a 'Patient Zero'

A 61-year-old woman, known as "Case 31," tested positive. She had attended 9 and 16 February services at the Shincheonji megachurch in Daegu, South Korea. She is identified as a super spreader of COVID-19 and known as a 'Patient-31'.

CORONAVIRUS DISEASE OUTBREAK IN 2019 AS COVID-19

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Coronaviruses (CoVs) is an RNA virus consisting of positive-sense single-stranded RNA. They are relatively large viruses of approximately 27-32 kb, encapsulated within a membrane envelope. The viral membrane is studded with glycoprotein spikes that give coronaviruses their crown like appearance. While coronaviruses infect both humans and animals, certain types of animals such as bats that host the largest variety of coronaviruses appear to be immune to coronavirus-induced illness. There are

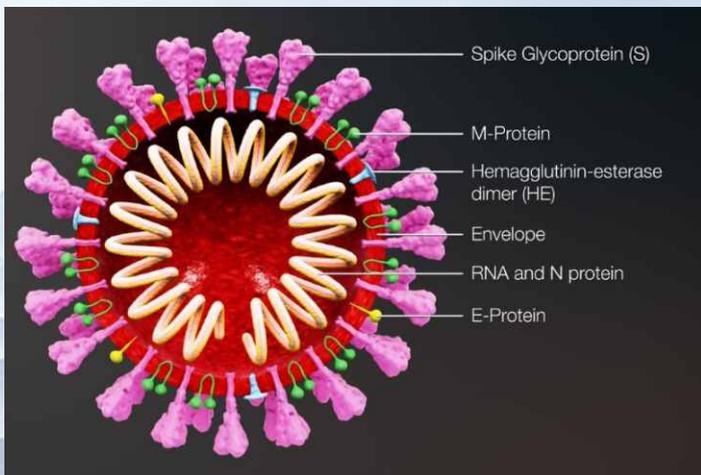
nCoV) but has subsequently been officially named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) by the WHO and named this novel strain of corona as COVID-19. On 30 January 2020, the WHO declared the outbreak of SARS-CoV-2 a Public Health Emergency of International Concern. Compared with the SARS-CoV that caused an outbreak of SARS in 2003, SARS-CoV-2 has a stronger transmission capacity. The rapid increase in confirmed cases makes the prevention and control of COVID-19 extremely serious. Although the clinical manifestations of COVID-19 are dominated by respiratory symptoms, some patients have severe cardiovascular damage. In addition, some patients with underlying cardiovascular diseases (CVDs) might have an increased risk of death. Therefore, understanding the damage caused by SARS-CoV-2 to the cardiovascular system and the underlying mechanisms is of the greatest importance, so that treatment of these patients can be timely and effective and mortality reduced.

General Information:

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. The virus is known to infect a wide range of hosts including humans, other mammals, and birds. Infected hosts exhibit different clinical courses, ranging from asymptomatic to severe symptoms in their respiratory, digestive, and genital organs. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. As per WHO guidelines, we may protect ourselves and others from infection by washing the hands or using an alcohol based rub frequently and not touching the face. It is important to know that 80.9% of infections are mild (with flu-like symptoms) and can recover at home, 13.8% are severe, developing severe diseases including pneumonia and shortness of breath. About 4.7% as critical and can include: respiratory failure, septic shock, and multi-organ failure, in about 2% of reported cases the virus is fatal, risk of death increases the older you are, relatively few cases are seen among children (www.who.int/health-topics/coronavirus, 2020, www.worldometers.info/coronavirus/2020). Symptoms of COVID-19 may appear in as few as 2 days or as long as 14 (estimated ranges vary from 2-10 days, 2-14 days, and 10-14 days, see details), during which the virus is contagious but the patient does not display any of the symptoms.

Current Status of COVID- 19 Pandemic Worldwide

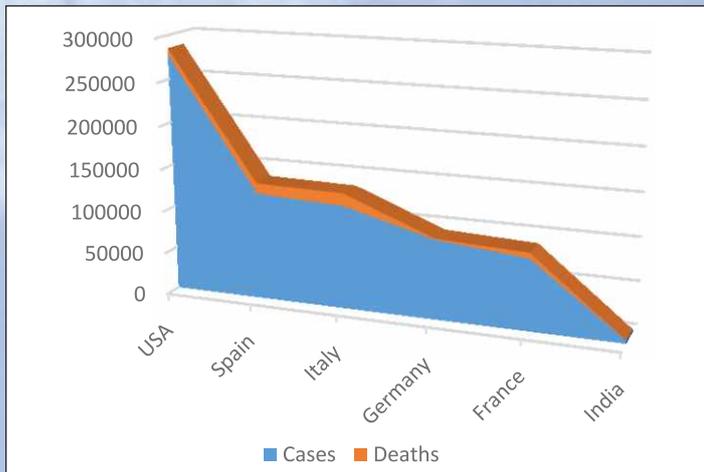
This disease has spread to more than 100 countries with over 1132 735 confirmed cases and over 60,355 confirmed deaths and 235992 recovered cases worldwide as of April 4, 2020. While in India 3082 confirmed cases and 86 deaths and 229 recovered



Structure of COVID 19: https://id.wikipedia.org/wiki/Berkas:3D_medical_animation_coronavirus_structure.jpg

four classes of coronaviruses designated as alpha, beta, gamma, and delta. The beta coronavirus class includes severe acute respiratory syndrome (SARS) virus (SARS-CoV), Middle East respiratory syndrome (MERS) virus (MERS-CoV), and SARS-CoV-2. Similar to SARS-CoV and MERS-CoV, SARS-CoV-2 attacks the lower respiratory system to cause viral pneumonia, but it may also affect the gastrointestinal system, heart, kidney, liver, and central nervous system leading to multiple organ failure. In December 2019, an outbreak of pneumonia caused by a novel coronavirus occurred in Wuhan and has spread rapidly throughout China, with an ongoing risk of a pandemic.

After virus identification and isolation, the pathogen for this pneumonia was originally called 2019 novel coronavirus (2019-



Cases and deaths by corona till 6th April, 2020.

cases reported. In addition, millions of people's lives have been affected as a result of mandatory isolations/quarantines. The ripple effect of the COVID-19 outbreak could potentially bring major challenges to worldwide health systems and have far-reaching consequences on the global economy if the spread of the virus is not effectively controlled. Current information indicates that SARS-CoV-2 is more transmissible/contagious than SARS-CoV.

Status of COVID 19 in India

On January 30, India reported its first case of COVID-19 in Kerala, and it rose to three cases by February 3; all were students who had returned from Wuhan, China. The transmission escalated in the month of March, after several cases were reported all over the

country, most of which were linked to people with a travel history to affected countries. On 12 March, a 76-year old man, returned from Saudi Arabia became the first victim of the virus in the country. Confirmed cases crossed 100 on 15 March, 1,000 on 28 March, 2,000 on 2 April, and 3,000 on 4 April. The death toll crossed 50 on 1 April and 100 on 5 April.

Conclusions

A concerted effort to develop effective drugs and vaccines against existing and potential future coronavirus infections and other highly pathogenic virus outbreaks is necessary to reduce overwhelming impacts on human life and worldwide healthcare systems. Given the costly and arduous process involved with clinical drug development, the outbreak of COVID-19 further highlights the value of developing relatively broad-spectrum antiviral drugs and the importance of applying innovative approaches such as artificial intelligence to facilitate drug discovery. Given the lengthy process of new drug development, the current strategy of drug repurposing has become one of the chosen solutions for immediate treatment of SARS-CoV-2 infected individuals. Long-term drug development goals for the pharmaceutical industry include identification of inhibitors aimed at the replication or infection processes associated with SARS-CoV-2 or other related coronaviruses, as well as the symptomatic results of their infections leading to severe disease and/or death. Recently Kim et al., 2020 reported the full genome sequencing of SARS-CoV-2 isolated from putative the 2019 novel coronavirus disease (COVID-19) patients in Korea, by cell culture. Currently, the diagnosis of COVID-19 is based on gene detection via real-time RT-PCR only. With the isolation of the causative agent, development of serological tests and rapid diagnostic tests in addition to virus detection will be required (Kim et al., 2020). Now the time is to focus more on identification and release of inhibitors and drugs effective in COVID 19 treatments.

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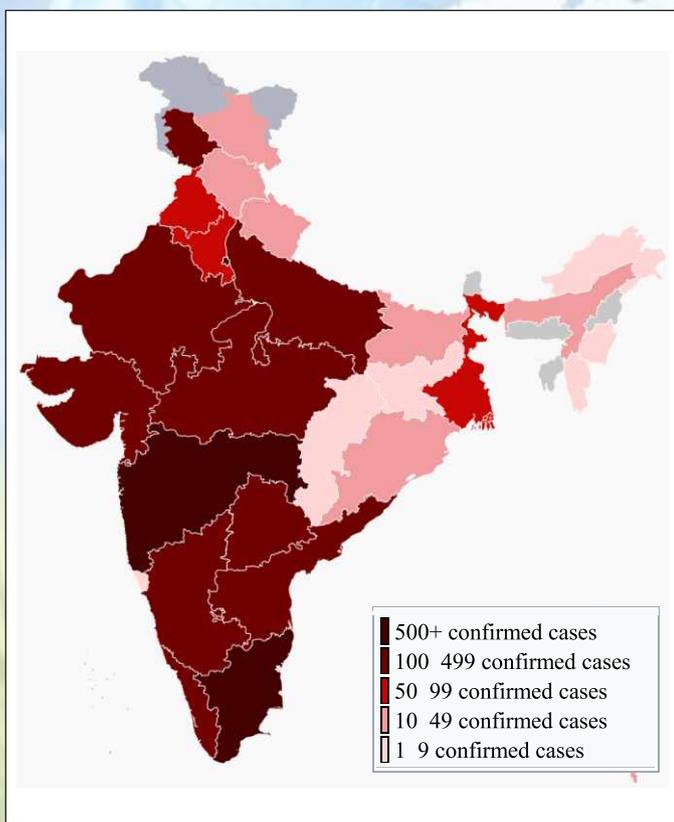
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Map of COVID 19 outbreaks in India as on 6th April 2020 (https://en.wikipedia.org/wiki/2020_coronavirus_pandemic_in_India#/media/File:COVID-19_Outbreak_Cases_in_India.svg)

UNEXPECTED CONSEQUENCES OF COVID 19

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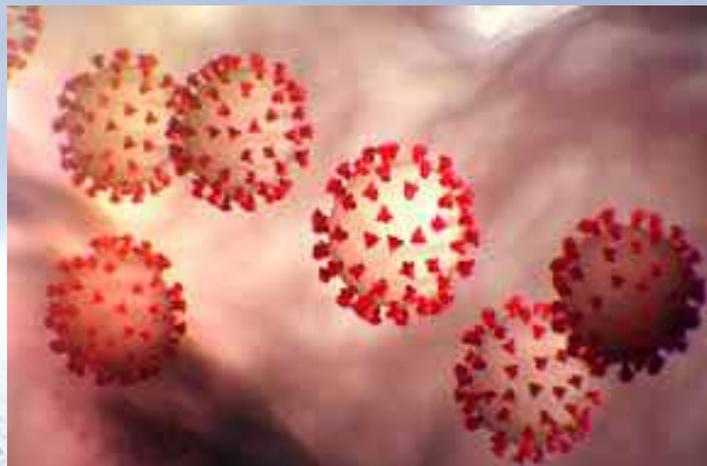
The coronavirus (COVID-19) pandemic offers profuse lessons on regional, national and international level. Environmentalists are overwhelmed with the positive impact of COVID 19 pandemic on environment. The spread of the pandemic brought cities and normal life at halt as the lockdowns are exercised the world over. The AQI has improved, waters in the rivers are ultra clean, wild animals are spotted on the roads in and around the cities, dolphins are appearing in lakes, sweet sound of birds is heard and nature is as its best. Messages are rolling out that Mother Earth is "healing" or "Earth is closed for repair". However, many believe that the environmental improvements during the Covid-19 crisis are shortsighted. Pollution may temporarily decline, but this is hardly a sustainable way of cleaning up our environment at the cost of tragic economic loss, social disruption and human distress. The virus crisis will bring peculiar environmental problems that are unexpected, might last for a longer time and are harder to deal with.

The prevention is the only cure and important preventive measure is regularly washing hands. The hygiene required to prevent the spread of virus requires clean and safe water which is still beyond the reach of millions of people in the country. Reports indicate that the 20-second hand wash, advised to kill the virus, would mean roughly 1.5-2 liters per wash and washing hands frequently would mean we need between 15-20 liters of water per person. It means that a household of five would need 100 liters per day only for hand washing.

Medical waste is also on the rise due to the use of gloves and masks. Hospitals in Wuhan produced an average of over 200 tons of medical waste per day during the outbreak, up from its previous average of less than 50 tons. The use of single use products is also on the rise. Hong Kong's seven million-plus residents have used single-use surgical face masks, but there is no mechanism of their proper disposal. As a result, these items have started littering forests, mountains and beaches. The masks are showing up in large enough numbers and affecting marine ecosystems and amplifying the spread of disease causing agents from asymptomatic carriers. India is also experiencing huge demand for single-use Plastic (SUP) gear used in treating and preventing COVID-19. The World Health Organization (WHO) estimates that some 89 million medical masks, 76 million examination gloves and 1.6 million goggles will be needed for the COVID-19 response every month while the pandemic lasts.

To fight the deadly disease, the sewage treatment plants are strengthened to improve disinfection. It has been noted that in order to prevent coronavirus from spreading through sewage, the use of chlorine is common. The possibility of some amount of that toxic chemical finding its way into the drinking water much above the permissible limit cannot be ruled out.

The outbreak is having profound and lasting economic and social consequences in every corner of the globe. Projections are made that once the situation improves, economy will bounce back and there will be more spending and excess pressure on the resources.



The same happened after the financial crash of 2008-09 after which the economy recovered leading to an all-time high. At present, the demand for oil products, steel and other metals has fallen more than other outputs but there are high stocks available indicating that production will quickly pick up after the crisis is over.

With respect to the disease itself, part of the challenge ahead relates to the origin of the disease as the spread of zoonotic diseases, i.e. disease originating from pathogens that transfer from animals to humans depends to a great extent on the health of the planet. Human infectious disease outbreaks are rising and in recent years there have been Ebola, bird flu, Middle East respiratory syndrome (Mers), Rift Valley fever, severe acute respiratory syndrome (Sars), West Nile virus and Zika virus all cross from animals to humans. Changes in temperature, humidity & seasonality directly affect the survival of microbes in the environment; & evidence suggests that disease epidemics will become more frequent, as the climate continues to change. It must be understood that as our fragile ecosystems are encroached, humans are more in contact with the animals. A large percentage of new and infectious diseases are zoonotic and, in fact, about 1 billion cases of illness and millions of deaths occur every year from these diseases. The crisis has urged that the wild animals must remain in the wild habitats. It is time to restore our forests, protect wildlife, and invest in environmentally friendly products.

An important way ahead will be towards building better and improved economy. As the engines of growth revive, we have to manage the natural resources in a way that green economy flourishes, green jobs are on the rise and a different perspective of life is seen post COVID. The better we manage nature, the better we manage human health. An important pillar in our post-COVID recovery plan will be to arrive at an ambitious, measurable and inclusive framework. Keeping nature rich, diverse and thriving will be the priority. It becomes altogether more important in current scenario when our forests form a pool of genetic resources on which the pharmaceutical industry depends.

Crises like COVID-19 show the urgency to promote necessary transformations for our society to survive in the 21st century. It can set a very good example that after any breakdown, there is always a silver lining for breakthrough.

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RECENT VIRUS TURMOIL: A GLOBAL CRISIS

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No one can forecast the market fall but here is somewhat that can happen. Corona virus poses an immense danger to the global economy as it is now considered a pandemic. It has begun to affect business seriously. Many companies are shut down to avoid the spread that means less market activities contributing to other economies' economic downturn. China has the greatest effect so far and many countries are dependent on China will also suffer.

It'll be foolish to say there's no effect on India. Although the cases of the Corona virus are less in India, India will be as much affected at the economic level as other countries, as in today's world all global trades are interconnected. The recent correction may be the beginning of a prolonged correction where indexes will drop significantly. Last time when a significant sell-off occurred in 2008–09, Nifty went from 6400 to 2700 (yes you read that right – please check NSE data) which was about 60% correction. I don't think the situation right now is so bad that we're going to drop 60 percent, but if the spread of the virus isn't urgently regulated, it may mean that the global economy is stuffing a lot of time and recession may turn around.

Here are some of the reasons

1. **Few customers** - There are international travel restrictions everywhere-this will impact the airline industry, the hotel industry, and their stocks will weigh down all other related businesses such as oil & catering. People are promised and they don't go shopping on Amazon, high street and so on.
2. **Lower demand for currency** - Global currencies are less in demand while people are not traveling.
3. **Interruption to business operations** - When a significant number of people are quarantined, not going to workplaces and other places of work, the entire economy is slowing down.
4. **Interruption to domestic & international trade** - Many trade routes for containing the virus are now blocked. This impacts China's export earnings, while simultaneously decreasing demand for their currency. International trading partners need to import products and supplies from other alternatives that might not be as cheap as what they got from China, thus their costs, increase, income fall, and stock prices fall.

Coronaviruses that affect animals can also evolve and cause people to become ill as a new human coronavirus. Three recent examples of this are the 2019-nCoV, SARS-CoV, and MERS-CoV. Researchers said about the new novel coronavirus at Ohio State University led by Shan-Lu Liu say there is "no reliable evidence" for genetic engineering (Emerging Microbes & Infections, doi.org/dpww). The genome of the virus has been sequenced, and if it had been changed we would hope to see signs of sequences of inserted genes. But we now know the points that vary from bat viruses are distributed relatively randomly, much as they would be if the new virus had naturally evolved. This virus does not constitute a bio-weapon. New diseases have arisen in human history and in the last two decades, we have seen two big outbreaks of coronavirus: SARS and MERS. So, the presence of the covid-19 virus shouldn't shock us. Many related viruses are found in wild bats, and it seems possible that this one has its origin, possibly through an intermediate host. Likewise, we know that both SARS and MERS originated from bats, so there is no need

to invoke an incident in the laboratory. SARS-CoV-2 is a new virus which is responsible for an outbreak of respiratory disease known as COVID-19 and has spread to many countries worldwide. It appears to have first appeared in late 2019, in Wuhan, China. Since that time the disease has spread across China to other countries around the world. By late January. Coronaviruses have exceptionally large single-stranded RNA genomes-lengthwise between 26,000 to 32,000 bases or letters of RNA. Particles of coronavirus are protected by a fat outer layer called an envelope and usually appear spherical, as seen under an electron microscope, with a crown or "corona" of club-shaped spikes on their surface. At least two other types of human coronavirus-Middle East respiratory coronavirus syndrome (MERS-CoV) and severe acute respiratory coronavirus syndrome (SARS-CoV)-are known to cause extreme coronavirus disease.

Severe acute respiratory syndrome (SARS) coronavirus (SARS-CoV) is a novel virus, which caused the new millennium's first global pandemic. SARS-CoV is one of 36 coronaviruses within the Nidovirales order in the Coronaviridae family. Coronaviridae members are known to cause human and other animals to develop respiratory or intestinal infections. The disease originated in late 2002, when the Guangdong Province first reported an outbreak of acute community-acquired atypical pneumonia syndrome. Retrospective monitoring in five cities around Guangzhou showed serious cases of the disease over a period of 2 months. The case for the index was recorded in Foshan, a city 24 km from Guangzhou. The second case involved a Heyuan chef who had served at a Shenzhen restaurant. The patient has had daily interaction with animals feeding on wild game. Also affected were his aunt, two sisters and seven members of hospital staff who had contact with him. A total of 305 cases were registered in m, from 16 November 2002 to 9 February 2003, a total of 305 cases have been registered in mainland China, of which 105 include health care workers. The devastating pandemic began in Hong Kong, Special Administrative Region (HKSAR), when, on 21 February 2003, a professor of nephrology from a teaching hospital in Guangzhou who had contracted the disease from his patients arrived at HKSAR. Within a day, he passed the infection on to 16 others in the hotel where he resided. One of the secondary events, his brother-in-law underwent an open lung biopsy from which the etiological agent was first detected and isolated. It was a coronavirus novel, called SARS-CoV. Unknowingly, the secondary cases took the disease to HKSAR clinics and other countries and continents including Malaysia, Canada, Singapore, the Philippines, the United Kingdom, and back to China. Carlo Urbani, a physician working at the World Health Organization (WHO) office in Hanoi, Vietnam, was the first to inform the WHO of cases outside Guangdong following an unprecedented nosocomial outbreak of SARS in a Hanoi hospital resulting from a person returning from the HKSAR hotel. Carlo Urbani's explanation of the disease he later succumbed to warned health authorities worldwide and speeded up joint efforts to classify the virus and fight the disease.

The outbreak of MERS-CoV emerged in Saudi Arabia in 2012, with people suffering similar symptoms but dying at a much higher rate of 34 per cent. Like SARS-CoV, which spread rapidly and extensively, MERS-CoV was largely restricted to the Near East. Coronaviruses are zoonotic which means they can be spread from animals to humans. Both SARS-CoV and MERS-CoV originally came from bats, but other animals – including camels in the case of MERS – may serve as intermediaries transmitting coronaviruses to humans. Many of the early cases of covid-19 were traced back to a wide market for seafood and animals in Wuhan. It is assumed that the virus had come from bats, probably from an intermediate source.

Among these, there are four primary coronavirus subgroupings, known as alpha, beta, gamma, and delta. We first described

human coronaviruses in the mid-1960s. The other four coronaviruses that are common human coronaviruses can infect people are: 229E (coronaviral alpha), NL63 (coronaviral alpha), OC43 (coronaviral beta), and HKU1 (coronaviral beta). People worldwide usually get infected with human coronavirus 229E, NL63, OC43, and HKU1. HCoV-229E has been associated with bronchitis, acute COPD exacerbations, and pneumonia in babies, adolescents, and elderly people with underlying diseases.

HCoV-NL63 has been shown to predominantly infect children and immunocompromised individuals with either moderate upper respiratory symptoms (cough, fever, and rhinorrhoea) or lower respiratory tract involvement, such as bronchiolitis and croup, observed predominantly in younger children. In addition, for up to 10 per cent of all respiratory diseases, HCoV-NL63 is the aetiological agent. HCoV-OC43 induces infections in the respiratory tract and the process of otitis. Despite discovering coronavirus-like particles in the stools of these patients there is no evidence of this virus causing enteric disease in humans. HKU1 (CoV-HKU1), related to pneumonia acquired in the population. However, the clinical disease continuum and the epidemiology of CoV-HKU1 infections with respect to other respiratory viruses which are unknown.

The precise mechanism of how the virus causes damage to severe standards in cells, tissues and organs remains elusive. Compared to other viruses, such as influenza A virus, Nipah virus or Ebola virus, SARS-CoV must have the ability to resist the cells' innate antiviral response to successfully replicate in the host. Below are the 12 worst killers, based on the probability that a person will die if one of them is infected, the sheer number of people they have killed, and if they pose an increasing threat.

Marburg virus

Scientists described the Marburg virus in 1967, when there were minor outbreaks among German laboratory staff exposed to infected monkeys imported from Uganda. According to the World Health Organization (WHO), the mortality rate in the first outbreak was 25 per cent, but it was more than 80 per cent in the outbreak in the Democratic Republic of Congo in 1998-2000 and in the outbreak in Angola in 2005.

Ebola virus

The first human cases recorded of Ebola occurred concurrently in the Republic of Sudan and the Democratic Republic of Congo in 1976. Ebola is transmitted from infected persons or animals by contact with blood or other body fluids, or tissue. The epidemic ongoing in West Africa started in early 2014, and is, according to WHO, the disease's biggest and most complex epidemic to date.

Rabies

While pet rabies vaccines, introduced in the 1920s, have contributed to making the disease relatively rare in the developed world, this disorder remains a serious problem in India and parts of Africa. It kills the brain, it's a very, really bad disease.

HIV

An estimated 32 million people died of HIV since the disease was first identified in the early 1980s. "It's still the greatest killer," said Dr. Amesh Adalja, an infectious disease physician and spokeswoman for the American Infectious Disease Society. In the WHO African region, approximately one in every 25 adults is HIV-positive, accounting for more than two-thirds of people living with HIV worldwide.

Smallpox

The World Health Assembly proclaimed the planet free from smallpox in 1980. Even before that, for thousands of years, humans fought smallpox and the disease killed about 1 in 3 of those it infected. The survivors were left with deep, lasting wounds and sometimes blindness. Smallpox killed 300 million people in the 20th century alone.

Hantavirus

The infection is not transmitted from one human to another; rather, the disease is contracted by humans. Previously, according to a 2010 paper in the journal *Clinical Microbiology Reviews*, another hantavirus had caused an outbreak in the early 1950s, during the Korean War. Hantavirus pulmonary syndrome (HPS) first received widespread recognition in the United States in 1993. While the virus was new to Western medicine when discovered in the U.S., researchers later realized that the medical practices of Navajo identified a similar disease and related it to mice. In US health officials, hantavirus isolated from a deer mouse living in one of the infected people's house. According to the Centers for Disease Control and Prevention, over 600 people in the U.S. have now developed HPS, and 36 per cent have died from the disease.

Influenza

The most devastating flu pandemic, also called Spanish flu, started in 1918 and sickened as many as 40 percent of the world's population, killing an estimated 50 million.

Dengue

Dengue virus first appeared in the Philippines and Thailand in the 1950s, and has since spread all over the globe's tropical and subtropical regions. According to WHO, the dengue sickens 50 to 100 million people every year.

Rotavirus

Worldwide, the WHO reports that in 2008, 453,000 children under the age of 5 died of rotavirus infection. But countries which introduced the vaccine reported dramatic declines in hospitalizations and deaths from rotavirus.

Nipah virus

Nipah virus is a zoonotic virus (transmitted from animals to humans) and can also be transmitted through contaminated food or directly between humans. Also, the virus can cause severe disease in animals like pigs, leading to major economic losses for farmers.

Zika virus

The virus that emerges transmitted by *Aedes* spp. is Zika (ZIKV). Zika can in some cases cause paralysis (Guillain-Barré syndrome). There is no vaccine or medication related to this. Instead, the focus is on relieving symptoms, which involves fever which pain relief, rehydration and acetaminophen.

Lassa virus

In West Africa, Lassa is borne by a rat species called *Mastomys natalensis*. It is airborne, at least if you are floating around the fecal matter of the rodent. However, humans can only transmit this by direct interaction with body secretions. I already wrote regarding SARS-CoV, SARS-CoV-2 and MERS-CoV. The big pandemics which have taken place over time are:

| Name | Time Period |
|-----------------------------|----------------|
| Antonine Plague | 165-180 |
| Japanese smallpox epidemic | 735-737 |
| Plague of Justinian | 541-542 |
| Black Death | 1347-1351 |
| New World Smallpox Outbreak | 1520 – onwards |
| Great Plague of London | 1665 |
| Italian plague | 1629-1631 |
| Cholera Pandemics 1-6 | 1817-1923 |
| Third Plague | 1885 |
| Yellow Fever | Late 1800s |

| | |
|---------------|--------------|
| Russian Flu | 1889-1890 |
| Spanish Flu | 1918-1919 |
| Asian Flu | 1957-1958 |
| Hong Kong Flu | 1968-1970 |
| HIV/AIDS | 1981-present |
| Swine Flu | 2009-2010 |
| SARS | 2002-2003 |
| Ebola | 2014-2016 |
| MERS | 2015-Present |
| COVID-19 | 2019-Present |

Over the last 50 years, many different coronaviruses have emerged which cause a wide variety of human and veterinary

diseases. These viruses are likely to continue to arise and develop due to their ability to recombine, mutate, and infect multiple organisms and cell types and cause human and veterinary outbreaks as well. A lot of aspects of viral replication and pathogenesis will continue to be explored in future work on coronaviruses. First, knowing these viruses' tendency to switch between organisms, create infection in a new host, and identifying significant coronavirus reservoirs can significantly assist in our ability to predict when and where potential epidemics may occur. Finally, identifying the mechanism for how coronaviruses cause disease and recognizing the response of the host immunopathology would greatly enhance our ability to develop vaccines and the the burden of disease.

Revival of City Birds: Part 2

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The question is whether we have any alternative or any sustainable solution in our hand to protect the city birds from completely vanishing from the existing urban ecosystem. Well the simple answer to this conflict question is that yes it is still possible to save vanishing birds from our cities if we are ready to make some sacrifices to facilitate the accommodation of city birds in our concrete jungles. The use of artificial bird boxes at suitable places throughout the cities have resulted in significant conservation success for many species around the world in several developing, developed as well as underdeveloped countries. However in a highly populous country like India awareness regarding conservation of wildlife



and biodiversity, I seriously doubt whether such efforts could bear fruits in the long run.

The lack of social and ethical consciousness in the country regarding nature and natural ecosystems is a bone of contention for any successful conservation effort to take shape in the country, nonetheless in the big cities and metropolis. To my mind the best approach to helping conservation of city resident birds is through education, awareness and participation of the public directly and indirectly in bird conservation programs. One of the simplest thing is to add bird boxes or nest boxes in your backyard kitchen garden or loans very small passerine birds can nest and breeding peace. Use of birdfeeders in the backyard gardens or lawns can attract as well as sustain several bird species to thrive since they are struggling for food and other resources. Unused urban spaces within and outside the city limits should be dedicated towards developing into urban forests to facilitate wild birds to forage, nest and breed without external anthropogenic disturbances.

Any available wetland areas within and outside city limits need to be strongly seriously protected to promote and facilitate breeding and feeding sites for local birds. It does not take huge investment to protect the city birds but we do need strong political will, empathy towards the birds and a determination to pus through their conservation. However, unless this is made into a people's





movement and initiative no conservation effort could ever be successful in any part of our planet forget conservation of the city birds in a densely populated country like India. We need to concentrate our efforts and work on a common platform to extend support to helpless birds. With only concrete effort we can expect to bring back environmentally sensitive species like domestic

sparrow back to our cities. Greening effort across the towns and cities could make significant positive impact in enriching city biodiversity.

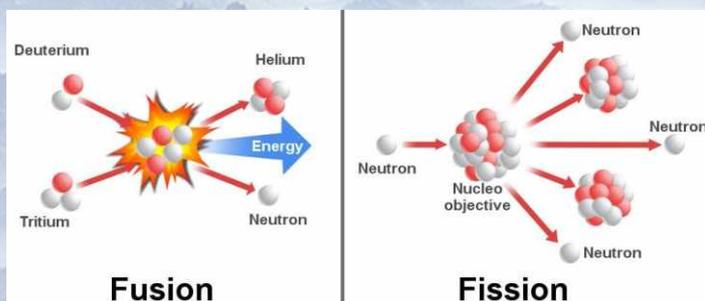
Acknowledgement: *Sikkim Express Photo credit: S. K. Basu*

NUCLEAR DISASTERS AND ITS IMPACT ON HUMAN HEALTH

S. Shenbagavalli

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For a large developing country like India with large population density, nuclear power will play an important role for sustainable supply of energy. There are now 439 nuclear reactors in operation around the world in over 30 countries, providing almost 16% of the world's electricity. Nuclear power is the fourth-largest source of electricity in India after thermal, hydro and renewable sources of electricity. As of 2010, India has 20 nuclear power plants in operation generating 4,780 MW while 5 other are under construction and are expected to generate an additional 3,900 MW. India's nuclear power industry is undergoing rapid expansion with plans to increase nuclear power output to 63,000 MW by 2032. Only Nuclear Energy offers Emission free energy on the massive and expanding scale the world so urgently requires. Nuclear fission and nuclear fusion are the major techniques of nuclear power generation. Nuclear reactors are fueled by naturally occurring uranium-235 whose nuclei split, when struck by neutrons. This process releases enormous amount of heat energy which is then used to power steam turbines and generate electricity.



In conventional reactors, uranium releases about 20,000 times as much heat energy as an equivalent weight of coal. However, the more efficient breeder reactors may release as much as 1,500,000 times the heat energy of coal per unit weight of fuel. Nuclear reactors produce very little air and water pollution. As uranium is a concentrated form of energy, less strip mining is required and, therefore, less land is disturbed. The cost of transporting nuclear fuels is considerably less than an equivalent amount of coal. The

use of nuclear fuels to generate electricity can save on coal, which can be used to generate synthetic liquid and gaseous fuels. This could result in stretching the supplies of petroleum and natural gas.

Nuclear Disasters

However, the risks associated with nuclear power are contamination of environment with radioactive wastes, thermal pollution, impact of radiation on health, limited supplies of uranium ore, high construction costs and dangers of accidents. Of all the environmental disaster events that humans are capable of causing, nuclear disasters have the greatest damage potential. The radiation release associated with a nuclear disaster poses significant acute and chronic risks in the immediate environs and chronic risk over a wide geographic area. Radioactive contamination, which typically becomes airborne, is long-lived, with half-lives guaranteeing contamination for hundreds of years. Concerns over potential nuclear disasters center on nuclear reactors, typically those used to generate electric power. Other concerns involve the transport of nuclear waste and the temporary storage of spent radioactive fuel at nuclear power plants. The fear that terrorists would target a radiation source or create a "dirty bomb" capable of dispersing radiation over a populated area was added to these concerns following the 2001 terrorist attacks on New York City and Washington, D.C.

Major Nuclear Accidents:

Chernobyl

The explosion in the Chernobyl nuclear plant in the erstwhile USSR on April 26, 1986, rendered over 600,000 hectares of land unsafe for agriculture. About 40 million people were affected by the radioactive dust which was blown over much of Europe as far west as France and to the shores of the Mediterranean.

Three Mile Island

The thriller *China Syndrome*, which warned that a nuclear power plant meltdown would blow a hole through the earth all the way to China and "render an area the size of Pennsylvania permanently uninhabitable" had been playing for eleven days when, at 4:00 am on March 28, 1979, Reactor #2 at the Three Mile Island (TMI) nuclear power plant suffered a partial meltdown. The plant was just downriver from Harrisburg, Pennsylvania.

The accident occurred sequentially. A minor problem caused the temperature of the primary coolant to rise. In one second, the reactor shut down but a relief valve that was supposed to close after ten seconds remained open. Plant instrumentation showed operators that a "close valve" signal had been sent. There was no

instrumentation to tell them the valve itself was still open. The reactor's primary coolant drained away and the reactor core suffered serious damage. Fuel rods were damaged, leaking radioactive material into the cooling water and a high temperature chemical reaction created bubbles of hydrogen gas. One of these bubbles burned, creating fears that a larger hydrogen bubble would explode, possibly breaching the plant's containment structure. Some gases were purposefully vented into the atmosphere.

The many health studies following TMI showed no evidence of abnormal cancer rates, however, There was widespread panic including an unordered mass evacuation. The greatest problem at TMI was a total failure of communication.. For eighteen years, the Pennsylvania Department of Health maintained a registry of 30,000 people who lived within five miles of TMI.

Health hazards:

Radioactive wastes produced from the nuclear reactors cause health hazards in living things. the particulate and electromagnetic radiations emanating from radioactive materials inflict deleterious effects on the living cells. These effects are classified as "somatic" and "genetic effects". Somatic effects are caused on the exposed individuals and the cell damage caused may manifest in malignancies such as leukemia or cancer. Genetic effects are transmitted to the descendants of exposed individuals and thus can affect unexposed generation too.

| Radiation and the human body | |
|------------------------------|--|
| In microsieverts μSv | Effects |
| 800,000 - 16,000,000 | Radiation dose of first responders to Chernobyl |
| Above 7,000,000 | Instant radiation dose - vomiting, internal bleeding, death within 2 weeks |
| 3,000,000 | 50% chance of dying within 60 days if untreated |
| 680,000 | Highest dose received by a worker at 2011 Fukushima disaster |
| 350,000 | Approx dose rate if you lived in Chernobyl's "Red Forest" area for one year |
| 20,000 | Annual limit for nuclear workers in Europe |
| 10,000 | Instant radiation from a whole body CT scan |
| 3,100 | Annual natural background radiation in US |
| 1000 | Approx annual dose above natural background in the less contaminated parts of Chernobyl Exclusion Zone |
| 60 | Radiation dose from a London to Los Angeles flight |

* For illustrative purposes, not to scale

Source: OECD Nuclear Energy Agency, American Nuclear Society, Prof. J.T. Smith School of Earth & Environmental Sciences, University of Portsmouth

The radiation –induced changes in the genes may manifest themselves in a. Gene mutations, b. Chromosome aberrations and c. Changes in the number of chromosomes. Such changes can result in abnormalities in the offsprings which may be mild or



lethal. The extent of damage is maximum in the reproductive organs, block forming tissues, the digestive tract and developing embryos which are called radiosensitive organs. Biochemical wastes originate from hospitals, clinics result in spreading of diseases.

Radioactive emissions of particular concern include **strontium-90** and **cesium-137**, both having thirty-year-plus half-lives, and **iodine-131**, having a short half-life of eight days but known to cause thyroid cancer. In addition to being highly radioactive, **cesium-137** is mistaken for **potassium** by living organisms. This means that it is passed on up the food chain and **bioaccumulated** by that process. **Strontium-90** mimics the properties of **calcium** and is deposited in bones where it may either cause cancer or damage bone marrow cells.

APPEAL TO LIFE MEMBERS

In the month of May articles are invited on the following special and important days viz., **May 11, National Technology Day; May 15, National Endangered Species Day; May 18, World AIDS Vaccine Day; May 22, International Day for Biological Diversity** (The theme for 2020 is "Our Solutions are in Nature". The theme aims to show that biodiversity remains the answer to several sustainable development challenges that the world faces) and **May 31, Anti-Tobacco Day**. The articles for May edition can be submitted to nesapublications@gmail.com before **30th April, 2020**.

Dr. R.S. Tomar
Editor-in-Chief, NESA E-newsletter

A LESSON FOR HUMANS



Mohd Tasleem
Delhi, India

In the 21st Century, COVID-19 (Coronavirus Disease-2019) a virus borne disease has spread all over the world. The whole world is in trouble because of its uncontrolled spread. Humans felt that the world is under their control. If that would have been the case, humans were made up of different constituents but that didn't happen. All the living beings (Viruses, Bacteria, Fungi, Algae, Plants and Animals) are biologically same with its biochemical and molecular pathways.

They all require protein, carbohydrate, lipid, metabolites and above all nucleic acid (DNA/RNA) to perform their activities. With the evolution and time human has developed himself the most and set at the top of the ecological system. But, this does not mean that the human beings will control nature. All the living organisms including human in the world have equal rights to perform their activities for survival and existence. It is very important for them to be in equilibrium with each other. These synergies create a system which keeps all connected to each other.

"If anything in nature is disturbed, then there will be a problem" as rightly said by a great scientist for every action there is an equal and opposite reaction. It pertains highly relevant to present situation.

KEEP CALM AND STAY SAFE AT HOME

From the Editor's

Dear Readers,

I wish my warm wishes!!

We all are aware that the world is suffering from Corona virus (COVID-19) infection. The severity of infection is so strong and virulent that it is spreading at a rapid speed in almost all parts of the world. A pandemic situation has arrived in everywhere on the planet earth. The team of researchers, medical staff administration, policemen and security staff along with health workers are working day and night to save the lives. We appreciate their kind efforts and contribution in the hard times.

In April issue, we recount the articles published from authors from diverse field to recount the status and situation on Corona virus infection. This issue includes Annual awards by Academy for its members actively involved in their field or events and activities organised by the Academy. NESA is well known for its environmental awareness activities.

The month of April witnessed special days i.e. 7th April, World Health Day; 14th April, B.R. Ambedkar Remembrance Day, 22nd April, World Earth Day; 25th April, World Malaria Day; 28th April, World Veterinary Day and 30th April, Ayushman Bharat Diwas. These were the days which reminded us their importance for existence. The theme for Earth Day 2020 is climate action. The enormous challenge but also holds vast opportunities to take action on climate change. This way 50th anniversary of Earth Day will be celebrated in 2020.

I express my sincere and huge thank to all the persons who contributed writing the wonderful and inspiring articles, without which there wouldn't have been this newsletter issue. Please continue sharing such articles and share with your friends also.

I would like to thank President and General Secretary, NESA, New Delhi, and the Editorial team including Print, Designer and Publication committee for their nonstop support and efforts throughout this edition.

We hope this edition makes an interesting read. Please feel free to offer any suggestions for improvement.

Dr. Sushma Tiwari
Associate Editor

Dr. R. S. Tomar
Editor-in-Chief



To, _____

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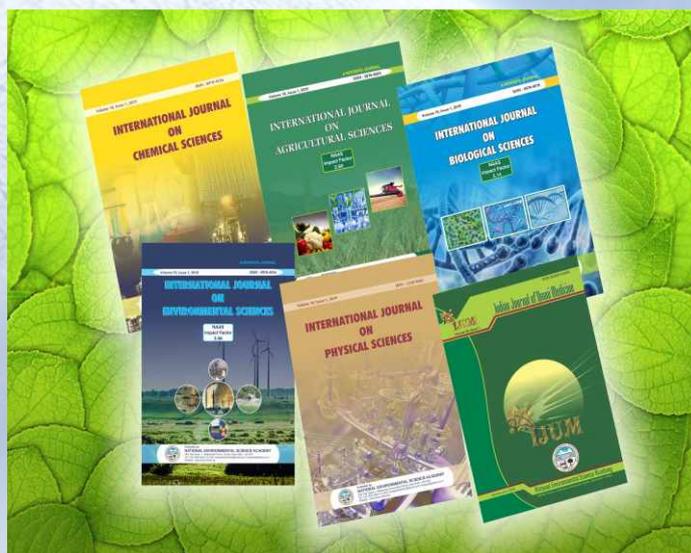
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From

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