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UV-C Air Duct Disinfection System

- The UV-C air duct disinfection system developed by CSIR-CSIO (Central Scientific Instruments Organisation) will be installed in Parliament for the mitigation of airborne transmission of SARS-COV-2.
- This system is designed to fit into any existing air-ducts and the virucidal dosages using UV-C intensity and residence time can be optimised according to the existing space.
- **Uses** - This system deactivates the virus in any aerosol particles by the calibrated levels of UV-C light (wavelength 254 nm).
- It can be used to disinfect the air in auditoriums, malls, educational Institutions, AC buses, hospitals, laboratories, and in railways.
- But these conventional germicidal treatments are done in unoccupied rooms as they can cause health problems.
- Because viruses and bacteria are much smaller than human cells, far-UVC light can reach their DNA and kill them.
- **Finding** - When exposed to 222 nm UV-C irradiation at 0.1 mW/cm2 for 30-seconds, 99.7% of SARS-CoV-2 viral culture was killed.

Ultraviolet Radiation

- Ultraviolet (UV) is a type of light or radiation naturally emitted by the Sun. It covers a wavelength range of 100-400 nm.
- UV is divided into three bands - UV-A (315-400 nm), UV-B (280-315 nm) and UV-C (100-280 nm).
- UV-A and UV-B rays from the Sun are transmitted through our atmosphere and all UV-C is filtered by the ozone layer.
- UV-A rays can penetrate the middle layer of your skin or the dermis and can cause aging of skin cells and indirect damage to cells' DNA.
- UV-B rays can only reach the outer layer of our skin or epidermis and can cause sunburns and are also associated with skin cancer.
- UV-C radiation from man-made sources has been known to cause skin burns and eye injuries.

Re-wilding of Wild Animals

- Periyar Tiger Reserve (PTR) attempted to reintroduce into the wild an

abandoned tiger cub after rearing it in 'captivity' for two years.

- **Re-wilding** is systematic, scientifically planned re-introduction of viable populations of lost animals to natural environments.
- It is a form of environmental conservation and ecological restoration that has significant potential to increase biodiversity, create self-sustainable environments and mitigate climate change.
- **SOP** - National Tiger Conservation Authority (NTCA) laid down the Standard Operating Procedures (SOPs)/Guidelines under Section 38(O) of The Wildlife Protection Act, 1972.
- As per these SOPs, there are three ways to deal with orphaned or abandoned tiger cubs.
    1. First way is to make an effort to reunite the abandoned cubs with their mother.
    2. If a reunion of the cub with its mother is not possible, then shift the cub to a suitable zoo.
    3. Reintroduction of the cub into the wild after a certain time when it appears that the cub is capable of surviving in the wild independently. This is what is known as 're-wilding'.
- NTCA stresses that the tiger cub should be reared in an in situ enclosure for a minimum of two years, and during this time, each cub should have a successful record of at least 50 'kills'.
- Tiger cubs should be in prime health, and of dispersing age (three/four years). There should be no abnormality/incapacitation.
- **Challenges** - Failures of re-wilding led to deaths of many tigers due to illness, injuries and territorial fight. as well as serious livestock depredations, and even man-eating problems.
- Besides, the re-wilding process is very costly.
- **Choosing the location** - There is a need to protect more habitats strictly, so that the prey densities rise and more tigers can thrive.
- Reintroduction of captive animals in protected areas, which already have the presence of the same species, results is territorial fights.
- If these animals are released in a protected area, which requires a particular species, then there are chances of survival.

National Commission for Backward Classes

- The Union Cabinet has approved the Eleventh Extension of the term of the Commission constituted under Article 340 of the Constitution by 6 months beyond 31st July 2021 up to 31st January 2022.
- [Article 340 deals with the need to identify those socially and educationally backward classes (SEBCs), understand the conditions of their backwardness,

and make recommendations to remove the difficulties they face.]
- This Commission examines the issue of Sub-categorization within Other Backward Classes (OBCs) in the Central List.
- This Commission is called the National Commission for Backward Classes, which was established under the 102nd Amendment Act, 2018.
- Click here to know more about the National Commission for Backward Classes. Also, click here to know about the earlier Commissions on BC.

E-coli and Chemotaxis

- E.coli, bacterial resident of the human intestine, show chemotaxis in response to different chemicals present in human gastrointestinal tract.
- [Chemotaxis is the directed motion of an organism toward environmental conditions it deems attractive and/or away from surroundings it finds repellent.]
- Scientists have now found the condition that is most suitable for getting the best chemotactic performance. This finding will help track behavior of E-Coli bacteria in response to chemical signals.
- The response of E-Coli to chemicals in the intestine bacteria plays a crucial role in the functioning of the human intestine.
- E.coli uses its **run-and-tumble motion** to migrate towards the region with more nutrients. The nutrient molecules bind to the chemo-receptors present on the cell membrane.
- This input signal is processed by the sensing module of the signaling network, finally modulating the run-and-tumble motion of the cell.
- One important aspect of signaling network of chemotaxis is the **cooperativity or clustering tendency** of the chemo-receptors, which helps amplifying the input signal.
- As a result, E.coli can respond to very weak concentration gradient. Thus receptor clustering was known to increase the sensitivity of the cell.
- A recent study has shown that there is an optimum size of the receptor clusters at which the E.coli cell shows the best-directed motion guided by chemical signal received from its environment.
- As cluster size increases, sensing is enhanced, which improves chemotactic performance. But for large clusters, fluctuations also increase, and adaptation comes into play.
- The signaling network is now controlled by the adaptation module, and sensing plays a less significant role which brings down the performance.

Chemotaxis in other Organisms

- A sperm cell finds the ovum using chemotaxis.
- White blood cells that are needed for healing injuries find the site of injury or

inflammation by chemotaxis.
- Butterflies also track flowers, and male insects reach their targets by using chemotaxis.
- Understanding chemotaxis involves how it is affected by various conditions present inside the cell or in the environment.

Immunity Debt

- As countries start lifting curbs imposed on societies due to the pandemic, there are higher rates of respiratory infections, even unseasonal diseases such as influenza and the respiratory syncytial virus (RSV).
- This is known as the "immunity debt" and it was brought on by non-pharmaceutical interventions (NPIs) put in place during the pandemic like social distancing, use of masks, and hand hygiene.
- The NPIs have been employed to reduce the spread of the SARS-CoV-2 virus, and have succeeded at varying levels in countries.
- However, they have had unintended consequences for other directly transmitted, endemic respiratory diseases as well.
- The constant exposure to infectious agents boosts the immune response in the human body.
- In the absence of this, there is a possibility that there could be unseasonal outbreaks with greater severity than usual.
- Disruptions to the seasonal transmission patterns of these diseases may have consequences for the timing and severity of future outbreaks.

Post-2020 Global Biodiversity Framework

- The United Nations Convention on Biological Diversity (CBD) has demanded an additional $200 billion fund flow to developing countries from various sources to manage nature through 2030.
- It is one of many demands and targets that have been set through 2030 in the official draft of a new Global Biodiversity Framework.
- The post-2020 global biodiversity framework builds on the Strategic Plan for Biodiversity 2011-2020.
- This new framework will be the global guiding force to protect nature and to retain its essential services for humans from 2020 to 2030.
- **Goals** - The new frameworks have four goals to achieve by 2050.
    - To halt the extinction and decline of biodiversity,
        - The rate of extinctions has been reduced at least tenfold and
        - The risk of species extinctions across all taxonomic and functional groups is halved and
        - Genetic diversity of wild and domesticated species is safeguarded, with at least 90% of genetic diversity within all species maintained.

    - To enhance and retain nature's services to humans by conserving.
    - To ensure fair and equitable benefits to all from use of genetic resources.
    - To close the gap between available financial and other means of implementation and those necessary to achieve the 2050 Vision.

- The framework document says that the adequate financial resources to implement the framework are available and deployed, progressively closing the financing gap up to at least $700 billion per year by 2030.
- **Targets** - The new framework has the same 21 lofty targets agreed earlier to meet by 2030.
    - To bring at least 30% of land and sea under the world's protected areas,
    - To redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way, reducing them by at least $500 billion per year.
- This framework ensures the right capacity building of the communities /governments to take up conservation measures to meet the goals.
- These include the contentious technology transfer to countries that don't have it currently and also a wide scientific cooperation among countries.

Source: PIB, The Indian Express, Down To Earth

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