Prelim Bits 30-01-2022 & 31-01-2022 | UPSC Daily Current Affairs

Vellalore Lake

A miyawaki forest canopy with towering native trees and a dense belt of flowering plants has turned the Vellalore Lake into a butterfly hotspot.

- The 90- acre Vellalore Lake is located in the city of Coimbatore.
- This Lake was previously dry even during the rainy season.
- But it was filled as the channel connecting it with Noyyal River has been desilted and encroachments along the river were removed.
- This Lake is a breeding ground for spot-billed pelicans.

Reference

1. https://www.thehindu.com/sci-tech/energy-and-environment/coimbatores-vellalore-lake-is-now-a-butterfly-hotspot/article38335232.ece
2. https://timesofindia.indiatimes.com/city/coimbatore/vellalore-lake-comes-back-to-life-after-25-long-years/articleshow/64593599.cms

Intranasal Covid-19 Vaccines

The Drugs Controller General of India approved the trials of intranasal booster doses against Covid-19 that is being manufactured by Bharat Biotech, the maker of Covaxin.

- Vaccines are usually given through different routes.
- The most common being injectable shots delivered into the muscles (intramuscular) or the tissue just between the skin and the muscles (subcutaneous).
- Other routes of delivery, especially in some vaccines for infants, include administering the liquid solution orally instead of injecting.
- In the intranasal route, the vaccine is sprayed into the nostrils and inhaled.
- Many viruses, including the coronavirus, enter the body through mucosa triggering a unique immune response from cells and molecules there.
- [Mucosa is the wet, squishy tissue that lines the nose, mouth, lungs and digestive tract.]

  Intramuscular vaccines generally fail at eliciting this mucosal response, and instead rely on immune cells mobilised from elsewhere in the body flocking to the site of infection.

  An intranasal vaccine will act against the virus from the time it tries to break the body's barrier, thereby making it more effective than the intramuscular ones in many cases.

- **Working of vaccines** - Generally, both the aforementioned types of vaccines trigger a response in the blood.

- B cells would churn out antibodies - including IgG (particularly potent disease-fighter) - to roam the body in search of the virus.
- Other cells, called T cells, would either help B cells produce antibodies or seek out and destroy the infected cells.
- **Working of Intranasal vaccine** - However, vaccines that are injected through the nose or mouth would also tap into another set of immune cells that hang around mucosal tissues.
- The B cells that reside there can make another type of antibody called IgA that plays a large role in destroying the airway pathogens.
- In addition to this, the T cells that are residing nearby will be able to memorise the pathogens that it encountered and will lifelong scout the areas where these were first encountered.
- **Importance** - Intranasal vaccines are easy-to-deliver vaccines.
- As they go into a mucosal surface, it will likely be restricted (and there is a) likelihood of lower safety events.
- Intranasal vaccines aim to overcome potential difficulties with mass vaccination and reduce the cost by doing away with the need for needles and syringes.
- These vaccines are also expected to cut down on the dependence on various trained personnel to administer the vaccine.
- **Drawbacks** - Vaccines that arouse mucosal immunity come with their own drawbacks.
- After the rollout of the oral polio vaccines where in some cases, it still caused the disease after the weakened virus in the product mutated.
- Also, there is very little evidence to back the effectiveness of this route of delivery so far.

Reference

https://indianexpress.com/article/explained/what-are-intranasal-covid-19-vaccines-more-effective-7747160/

NeoCoV & Zoonotic Spillover

A new study explores how different coronaviruses that are similar to MERS-CoV interact with different receptors in different host cells.

> The study highlights that through further adaptation, coronaviruses like NeoCoV or other related viruses could potentially gain the ability to infect humans.

Receptor-binding Domain

- How a coronavirus latches onto special receptors on host cells depends on a key part of the virus known as its receptor-binding domain.
- The differences in the receptor-binding domain of coronaviruses are therefore what determine the type of host receptor the virus will use and thus the host that it will be able to infect.
- There are currently 4 well-characterised receptors for coronaviruses, including ACE2 (used by SARS-CoV and SARS-CoV-2), and DPP4 (used by MERS-CoV).

NeoCoV

- **NeoCoV** is a bat coronavirus that was first identified in 2011.
- It was identified in species of bats known as Neoromicia, which is where the name NeoCoV was derived from. Commonly known as aloe bats, this species is distributed in the Afro-Malagasy region.

- NeoCoV shares an 85% similarity to MERS-CoV in the genome sequence, making it the closest known relative of MERS-CoV.
- Inherently, NeoCoV cannot interact with human receptors, implying that in its current form the virus cannot infect humans.
- NeoCoV does not have the potential to use human ACE2 receptors and infect humans.
- So, specific mutations artificially created in the receptor-binding domain of NeoCoV can enhance its efficiency to interact with human ACE2 receptors.
- These mutations have not yet been seen in NeoCov isolates from natural settings.
- NeoCoV was found to use bat ACE2 receptors for efficiently entering cells and the interaction between NeoCoV and bat ACE2 receptors is different from what is seen in other coronaviruses that utilise ACE2.

Zoonotic Spillover

- Coronaviruses are a large family of viruses that are known to infect animals and humans.
- They are largely categorised into four genera - alpha, beta, gamma and delta.
- Alpha and beta coronaviruses commonly infect mammals such as bats and humans, while Gamma and Delta mainly infect birds.
- A number of human coronaviruses have been identified previously, including OC43, HKU1, 229E, NL63, SARS-CoV and MERS-CoV.
- While animals are generally considered as the reservoirs of corona viruses, rarely spillover events could occur.
- It is possible for viruses that infect animals to jump to humans, a process which is known as zoonotic spillover.
- Identified in 2012, the MERS-CoV was transferred to humans through infected dromedary camels through zoonosis.
- SARS-CoV-2, the coronavirus responsible for the COVID-19 pandemic, belongs to the genus of beta coronavirus.
- In fact, it is the 7th type of coronavirus known to infect and cause severe disease in humans. It is thought to be a result of spillover.
- **Significance** - The interactions between humans and animals continue to increase, given the expanding human population and encroachment of animal habitats.
- While the likelihood of spillover events is rare, an increased interaction can potentially accelerate such events.
- To prevent future outbreaks, it will thus be important to monitor this family of viruses for potential zoonosis.
- Genomic surveillance of human and animal viruses is therefore the key to understanding the spectrum of viruses, and possibly provide early warning to potential spillover events.

Reference

https://www.thehindu.com/sci-tech/health/explained-neocov-what-it-is-and-what-it-is-not/article38340753.ece