

Rabies

- Rabies is a disease that is caused by a family of viruses called the lyssaviruses and found in a range of mammals.
- The virus targets the central nervous system and is nearly 100% fatal to the host animal if it succeeds in infecting it.
- Though many animals from cats to crocodiles can be transmitters of the virus, it is most likely to spread to people from the bite of an infected dog or a cat as they are the most common pets.
- Despite being potentially lethal, the virus is slow-moving.
- who have been exposed via a bite to an animal suspected to be infected.
- The vaccines are administered either into the muscles, or into the skin.
- It can also be given ahead of time to persons who have a high risk of being infected, such as veterinarians, animal handlers, areas with a high number of rabies infection, by what is called Pre Exposure Prophylaxis (PrEP).
- The advantage of a PrEP is that if bitten, one doesn't need a immunoglobulin injection, and two subsequent shots of the vaccine will suffice for full protection.

How is the vaccine made?

- The vaccine is made up of an inactivated virus that is expected to induce the body into producing antibodies that can neutralise the live virus in case of infection.
- There are also test vaccines that involve genetically modified viruses.
- There is no single-shot rabies vaccine or one that offers permanent immunity.
- There are mainly two ways of administering the rabies vaccine.
- One, called post-exposure prophylaxis (PEP), is given to persons
- **THE HINDU**
- **Nasal vaccine**
- Bharat Biotech's nasal vaccine for primary immunisation against COVID-19 in the 18-plus age group for restricted use in an emergency situation.
- It is hoped that Bharat Biotech's ChAd36-SARS-CoV-S recombinant vaccine, to be administered nasally and developed in association with the University of Washington, will prove a powerful tool in the battle against the virus by preventing infections, something the other vaccines have not been able to do.

What does the vaccine do?

- A nasal vaccine is delivered through the nose or mouth and it is expected to work on the mucosal lining, prompting an immune response at the entry points of the virus in the human body.
- The reason for that is that they are injected into the muscle.
- “Intramuscular shots prompt an immune response that includes T cells, which destroy infected cells, and B cells, which produce antibodies that ‘neutralise’ pathogens binding to them to stop them entering healthy cells. These cells and antibodies circulate through the bloodstream.
- But they aren’t present at high enough levels in the nose and lungs to provide rapid protection.
- Bharat [Biotech] and CanSino [Chinese vaccine maker that has secured a licence to use another nasal vaccine] won’t know whether their vaccines can achieve this until they have conducted further efficacy studies,”.

THE HINDU

Kushiyara agreement

The story so far:

- During Bangladesh Prime Minister Sheikh Hasina’s visit to India from September 5 to 8, the two sides signed a slew of agreements, including the first water sharing agreement since the landmark Ganga Waters Treaty, 1996.
- A memorandum of understanding (MoU) was signed on sharing of the waters of the Kushiyara river, a distributary of the Barak river which flows through Assam, and then on to Bangladesh.

What is the Kushiyara agreement?

- Over the last century, the flow of the Barak river has changed in such a way that the bulk of the river’s water flows into Kushiyara while the rest goes into Surma.
- According to water expert, Dr. Ainun Nishat, the agreement is aimed at addressing part of the problem that the changing nature of the river has posed before Bangladesh as it unleashes floods during the monsoon and goes dry during the winter when demand of water goes up because of a crop cycle in Sylhet.
- Under this MoU, Bangladesh will be able to withdraw 153 cusecs (cubic feet per second) of water from the Kushiyara out of the approximately

2,500 cusecs of water that is there in the river during the winter season

- Boro rice cultivation in the region had been suffering as India did not allow it to withdraw the required water from the Kushiya.

How will Bangladesh use the water?

- The water of Kushiya will be channelled through the Rahimpur Canal project in Sylhet.
- The Rahimpur Canal project in Zakiganj upazila or subdivision of Sylhet was built to help the farmers access Kushiya's water but the facility used to remain dry during the lean season without serving the purpose for which it was built.
- The eight km long canal is the only supplier of water from the Kushiya to the region and Bangladesh has built a pump house and other facilities for withdrawal of water that can now be utilised.

Why is the water from the Kushiya so important for Rahimpur Canal?

- The water of the Kushiya has been used for centuries in Sylhet's subdivisions like the Zakiganj, Kanaighat and Beanibazar areas. But Bangladesh has witnessed that the flow and volume of water in the

canal has reduced during the lean season.

- The utility of the river and the canal of rice as well as a wide variety of vegetables for which Sylhet is famous.
- The additional water of Kushiya through the Rahimpur Canal therefore is the only way to ensure steady supply of water for irrigation of agriculture fields and orchards of the subdivisions of Sylhet.

What was India's objection to the Rahimpur Canal?

- Bangladesh had carried out the Upper Surma Kushiya Project which included clearing and dredging of the canal and other connected channels of water; but the channels could not be of much use to Bangladesh because India objected to the move and claimed that the dyke and other infrastructure interfered in border security as Kushiya itself forms part of the border between the two sides.

THE HINDU

Wildfire and ozone damage

- Ozone layer damage Smoke from Australia's extreme wildfires between December 2019 and

February 2020 increased atmospheric temperatures and probably made the hole in the ozone layer bigger.

- The plumes of smoke that rose into the atmosphere caused temperatures to spike by 3°C over Australia.

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Lysine butyrylation

- Our genetic material DNA is wrapped around protein balls called histones to form the highly organised genome.
- Different chemical modifications of both DNA and histones can dictate the fate of genes in terms of them being switched on or remaining switched off.
- This on/off balance of gene expression is critical for health and disease.
- Chemical modification of histone lysine butyrylation is critical for fat cell development that underlies obesity manifestation
- We could finally demonstrate that a semi-synthetic derivative of garcinol, a molecule naturally found in *Garcinia indica* (kokum) fruit rind, could selectively reduce the levels of this modification by inhibiting the

catalytic activity of the enzyme responsible for it the master epigenetic enzyme p300.

THE HINDU

Cloudburst- formation, Clausius Clapeyron relationship

- Cloudbursts violent and voluminous amounts of rain pouring down in a short duration over a small area
- Clouds blanket 70% of the Earth's surface at any given time. They are like a thin layer of the floating ocean, with enough water to cover the entire surface of Earth with about one inch of rain.
- Cloudburst events are often associated with cumulonimbus clouds that cause thunderstorms and occasionally due to monsoon wind surges and other weather phenomena.
- Cumulonimbus clouds can grow up to 12-15 km in height through the entire troposphere (occasionally up to 21 km) and can hold huge amounts of water.

Characteristics

- However, cloudbursts are not defined based on cloud characteristics and do not indicate clouds exploding.

- Cloudbursts are defined by the amount of rainfall. According to the India Meteorological Department (IMD), 100 mm of rain in an hour is called a cloudburst. Usually, cloudbursts occur over a small geographical region of 20 to 30 sq. km
- In India, cloudbursts often occur during the monsoon season, when the south-westerly monsoon winds bring in copious amounts of moisture inland.
- The moist air that converges over land gets lifted as they encounter the hills.
- The moist air reaches an altitude and gets saturated, and the water starts condensing out of the air forming clouds.
- This is how clouds usually form, but such an orographic lifting together with a strong moisture convergence can lead to intense cumulonimbus clouds taking in huge volumes of moisture that is dumped during cloudbursts.
- Tall cumulonimbus clouds can develop in about half an hour as the moisture updraft happens rapidly, at a pace of 60 to 120 km/hr.
- More prone areas Cloudbursts, hence, occur mostly over the rugged terrains over the Himalayas, the Western Ghats, and north-eastern hill States of India
- Detecting cloudbursts while satellites are extensively useful in detecting large-scale monsoon weather systems, the resolution of the precipitation radars of these satellites can be much smaller than the area of individual cloudburst events, and hence they go undetected.
- The skillful forecasting of rainfall in hilly regions remains challenging due to the uncertainties in the interaction between the moisture convergence and the hilly terrain, the cloud microphysics, and the heating cooling mechanisms at different atmospheric level.
- Multiple Doppler weather radars can be used to monitor moving cloud droplets and help to provide now casts (forecasts for the next three hours).
- This can be a quick measure for providing warnings, but radars are an expensive affair, and installing them across the country may not be practically feasible.
- A long-term measure would be mapping the cloudburst-prone regions using automatic rain gauges.
- If cloudburst-prone regions are co-located with landslide-prone

regions, these locations can be designated as hazardous.

- The risk at these locations would be huge, and people should be moved, and construction and mining in nearby regions should be restricted as that can aggravate the landslides and flash flood impacts.
- Climate change is projected to increase the frequency and intensity of cloudbursts worldwide. As the air gets warmer, it can hold more moisture and for a longer time.
- We call this the Clausius Clapeyron relationship.
- A 1-degree Celsius rise in temperature may correspond to a 7-10% increase in moisture and rainfall.
- This increase in rainfall amount does not get spread moderately throughout the season.
- As the moisture holding capacity of air increases, it results in prolonged dry periods intermittent with short spells of extreme rains.

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