



DAILY CURRENT AFFAIRS

20th JUNE, 2024



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POBITORA WILDLIFE SANCTUARY



A one-horned rhinoceros and its calf wading through floodwaters in Pobitora wildlife sanctuary in Assam's Morigaon district on Wednesday. The monsoon has brought relief from the extreme heat. RITU RAJ KONWAR

Aspect	Details
Location	<ol style="list-style-type: none"> 1. It is located on the southern bank of the Brahmaputra River in Morigaon district, Assam. 2. It covers 38.85 km² area providing grassland and wetland habitat for the Indian rhinoceros. 3. The Sanctuary consists of the Rajamayong Reserve Forest and Pobitora Reserve Forest.
Status	It attained the status of a wildlife Sanctuary in 1987 .
Special Feature	<ol style="list-style-type: none"> 1. It is known for holding the highest density of Greater One Horned Rhinoceros in the country. 2. Pobitora Wildlife Sanctuary also known as "Mini Kaziranga" due to its comparable landscape and notable population of the one-horned rhinoceros.
Vegetation	It has grassland vegetation consists of at least 15 grass species .
Flora	Pobitora Wildlife sanctuary comprised of wet savannah, featuring a variety of vegetation such as Arundo donax, Erianthus ravennae, Phragmites karka, Imperata cylindrica, and Saccharum spp.
Fauna	<ol style="list-style-type: none"> 1. The wildlife sanctuary is home to endangered one-horned rhinoceros and the other mammals such as Leopard, Leopard cat, Fishing cat, Jungle cat, Feral Buffalo, Wild pigs, Chinese pangolins, etc.



About One Horned Rhinoceros:

- ❖ The Greater One-Horned Rhino is the largest among the rhino species, characterized by a single black horn and a grey-brown hide with skin folds.
- ❖ They primarily graze, consuming grasses, leaves, branches of shrubs and trees, fruits, and aquatic plants.
- ❖ Assam hosts an estimated 2,640 rhinos across four protected areas: Pabitora Wildlife Reserve, Rajiv Gandhi Orang National Park, Kaziranga National Park, and Manas National Park. Approximately 2,400 of them reside in the Kaziranga National Park and Tiger Reserve (KNPTR).
- ❖ Conservation Status: Its conservation status is as follow:
 - ☛ IUCN Red List: Vulnerable.
 - ☛ CITES: Appendix I (prohibiting international trade in specimens except for scientific research).
 - ☛ Wildlife Protection Act, 1972: Schedule I.

Question:

Q.1 Consider the following statements regarding Pobitora Wildlife Sanctuary (PWS):

- 1 It is situated on the northern bank of Brahmaputra River.
- 2 It has the highest density of Greater One Horned Rhinoceros in the world.

Which of the above statements are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Answer: (b)



WORLD REFUGEE DAY (JUNE 20)

Blueprints beyond borders, for solace and shelter

Today, the world has over 43.4 million refugees, and with conflicts raging in different parts of the world, this number is only increasing. But as it rises, we also run the risk of treating these people as figures in a statistical compilation, and not human beings with needs, fears, hopes and wants. Yet this, precisely, is what they are. And World Refugee Day (June 20) is a sombre occasion to think of all those human beings – a ceaseless succession of families with dreams and desires, laughter and joy – whose lives have been uprooted, all those homes that have been destroyed, and all those futures that have been jeopardised. But this is also an occasion to think of safe havens granted, asylum ensured, refugees protected, and solutions found.

India is well-poised to commemorate this poignant day. History, after all, is on our side. Our record of granting asylum goes back millennia, from the Jews who fled to India centuries before Christ after the demolition of their Jerusalem Temple by the Babylonians and then the Romans, to the Zoroastrians fleeing Islamic persecution in Persia, to the East Bengalis – for the cause of whose nationhood we waged war with Pakistan in 1971, liberating what became Bangladesh – Tibetans and Sri Lankan Tamils in more recent years, alongside streams of Nepalis, Afghans and Rohingyas. As a nation that attained independence against the backdrop of one of the most horrific refugee crises in history, when 13 million to 15 million people crossed the freshly created borders between India and Pakistan, we are all too aware of the perils that befall refugees, and of the consequent need to help them rebuild their lives.

The pitch for suitable legislation

Despite our glorious history of affording solace and shelter to refugees from the world over, it is ironic that India is neither a signatory to the UN Refugee Convention (which outlines the rights of asylum seekers and refugees, alongside the obligations of host states) nor to its 1967 Protocol. Nor does our country have a domestic asylum framework. Whereas, with our history, we ought to lead the global march on the question of refugee rights, our present actions and lack of a legal framework does our heritage no credit, shames us in the eyes of the world, and fails to match up to our stellar past track record.

It was to address these gaping lacunae that I introduced, in February 2022, a Private Member's Bill in the Lok Sabha, seeking the enactment of a Refugee and Asylum law. My Bill laid down comprehensive criteria for recognising asylum seekers and refugees, and prescribed specific rights and duties accruing from such status. This legislation was proposed because of our



Shashi Tharoor

Member of Parliament (Congress), who spent 11 years (1978-89) working for the UN High Commissioner for Refugees, including three and a half years as head of its Singapore office at the peak of the Vietnamese 'boat people' crisis. He is also an author and columnist who has long advocated the passage of a refugee/asylum law in India

The problems of refugees demand international cooperation and India needs to live up to its image of serving 'the still larger cause of humanity'

government's failure to honour the international legal principle of non-refoulement – the cornerstone of refugee law, which states that no country should send a person to a place where they may suffer persecution – and even more, its betrayal of India's impeccable tradition of granting asylum to strangers.

Titled the Asylum Bill, 2021, it followed close on the heels of our government expelling to Myanmar two batches of Rohingya refugees despite the grave risk of persecution in the country they had fled. In conducting this act of "refoulement" in violation of international law, our government revealed both religious bigotry (the refugees were Muslim) and intolerance. In fact, in 2017, the Ministry of Home Affairs issued a circular classifying Rohingyas as "illegal migrants", leading to their being callously flung into detention centres across India, where they languish in deplorable conditions – unable to communicate with their families and without any access to medical facilities, food, sanitation and water supply – until they are deported. As of August 2023, over 700 Rohingyas were in detention throughout India.

The government has also been inhospitable to the Chakmas in Arunachal Pradesh and Myanmaese in Mizoram. My Bill sought to put an end to such arbitrary conduct by the authorities. It afforded to all foreigners – regardless of their nationality, race, or religion – the right to seek asylum in India. It also called for the creation of a National Commission for Asylum to review and decide all such applications. Having staunchly affirmed, with no exceptions, the principle of non-refoulement, I specified reasons for exclusion, expulsion and revocation of refugee status, thus respecting the government's sovereign authority while limiting its discretion.

In a state of suspense

In the absence of a consistent and comprehensive law to deal with asylum seekers, we lack a clear perspective on refugee management. We have a flurry of such laws as the Foreigners Act, 1946, the Registration of Foreigners Act, 1939, the Passports Act (1967), the Extradition Act, 1962, the Citizenship Act, 1955 (including its ominous 2019 amendment) and the Foreigners Order, 1948, all of which club all foreign individuals together as "aliens". Because India has neither subscribed to international conventions on the topic nor set up a domestic legislative framework to deal with refugees, their problems are dealt with in an ad hoc manner, and like other foreigners, they always face the possibility of being deported. While speaking of refugee protection, we must not limit ourselves just to

providing asylum. We need a rigorous mechanism to ensure that refugees can access basic public services – chief among them medical facilities and educational institutions – and legally seek jobs to get back on their feet.

We can, and must, do better. India should enact a National Asylum Law, such as the one I have presented to Parliament. We currently host more than two lakh refugees, but the Bharatiya Janata Party government's churlish attitude to the Rohingya and other "inconvenient" refugees risks putting us in the global doghouse. Had it been enacted, my Bill would have placed India at the forefront of asylum management in the world. It would have vindicated our steadfast and immemorial commitment to humanitarian and democratic values while dealing with refugees.

Taking up the judiciary's baton

In 1996, the Supreme Court of India held that not just Indians but everybody living in India, irrespective of nationality, enjoys the inviolable rights guaranteed by Articles 14, 20 and 21 of the Constitution of India. On these grounds, the apex court, in the landmark case of *National Human*

Rights Commission vs State Of Arunachal Pradesh & Anr., stopped the forcible

eviction of Chakma refugees who had entered Arunachal Pradesh in 1995. The Court held that an application for asylum must be properly processed, and till a decision is made whether to grant or refuse asylum, the state cannot forcibly evict an asylum seeker. Our judiciary, therefore, has already pointed us towards the golden path: now we must scrupulously tread it. Yet, at times, different judges have taken radically different approaches, which we saw aplenty in the Rohingya case. The enactment and enumeration of refugee rights will reduce our reliance on judge-centric approaches – or, even worse, the whims of Home Ministry bureaucrats, police officers and politicians.

The problems of refugees worldwide are problems that demand international cooperation. India, as a pillar of the world community and as a significant pole in the emerging multipolar world, must play its own part – on its own soil as well as on the global stage – in this noble task, devising solutions for refugees that offer blueprints beyond borders. In so doing, we would uphold our own finest traditions and the highest standards of our democracy, alongside demonstrating that we truly are what we have forever claimed to be: a *vishwaguru*, striving inexorably to serve, in the words of Jawaharlal Nehru, "the still larger cause of humanity". This is a worthwhile aspiration for all of us who care about what India stands for, both at home and in the world.





Questions:

Q.2 Consider the following statements:

1. India is a signatory to UN Convention on Refugees.
2. Rohingyas are classified as Refugees by the Indian Government.
3. Government of India launched "Operation Insaniyat" to help Rohingya refugees in Bangladesh.

Which of the above statement(s) is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 2 only
- (d) 3 only

Answer: (d)

Q.3 With reference to Refugees, consider the following statements:

1. India is not the signatory to 1951 Refugee convention under which UNHCR operates.
2. India has its own national law for protection of refugees.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Answer: (a)

Notes:

- ❖ **Statement 1 is correct:** India is not a signatory to the 1951 Refugee Status Convention. India is also not a signatory to the 1967 Refugee Status Protocol. 1951 Refugee Status Convention is also called as the Geneva Convention of 28 July 1951. It is a United Nations Multilateral Treaty that defines refugees and the rights of these refugees who are granted asylum and the responsibilities of the nations that grants asylum to them.
- ❖ **Statement 2 is incorrect:** India does not have a national refugee protection framework.

CASE OF ROHINGYAS, SRILANKAN TAMILS, TIBETAN AS REFUGEES

Diseases with higher burden in Asia and Africa lack research funding

These neglected tropical diseases typically affect populations in the poorest parts of the world

DATA POINT

The Hindu Data Team

Close to 677 million people in India required treatment against tropical diseases such as dengue, chikungunya, and snakebite envenoming in 2021, yet global research about these ailments continues to be heavily underfunded compared to illnesses such as HIV/AIDS. These diseases are termed as Neglected Tropical Diseases (NTDs) by the World Health Organization (WHO).

NTDs primarily affect populations in tropical and subtropical regions, and they have historically received less attention and fewer resources. The affected populations are typically among the poorest in the world. These diseases contribute to a cycle of poverty, as they cause long-term disability, social stigma, and economic burden, which in turn hinders economic development and attracts less commercial investment in treatments and research. They also lead to other health problems such as anemia, blindness, chronic pain, infertility and disfigurement.

Research and development for NTDs have been historically underfunded compared to diseases like HIV/AIDS, tuberculosis, and malaria as shown in **Chart 1**. It shows the annual research and development funding for NTDs in 2022 (\$, adjusted for inflation). The COVID-19 pandemic received a total research funding of \$4.22 billion in 2022. HIV/AIDS, tuberculosis and malaria received funding in the range of \$600 million to \$1.35 billion that year. Whereas, diseases such as dengue, chikungunya, leprosy and snakebite envenoming received funding in the range of \$10 million to \$80 million.

Map 2 shows the estimated number of people requiring treatment against NTDs in 2021. With 677 million people requiring treatments, India tops the charts followed by Nigeria with 139 million,

Indonesia with 79 million, Ethiopia with 71 million and Bangladesh with 56 million. Congo, Philippines, Tanzania, Uganda and Pakistan are the other nations in the top ten list. The geographic spread clearly shows that most of the disease burden in the case of NTDs is shouldered by countries in Asia and Africa. Mexico is the only non-Asian, non-African country with a higher share of burden featuring high (14th) on the list. Deaths due to NTDs in Europe, Oceania and North America (except Mexico) are few and far between.

India tops the charts in terms of dengue deaths with 17,500 such fatalities recorded in 2019. India also tops the charts in leprosy cases with over one lakh cases in 2022. With over 50,000 deaths due to venomous snakes in 2019, the mortality in India is much higher than the distant second - Pakistan (2,000 fatalities).

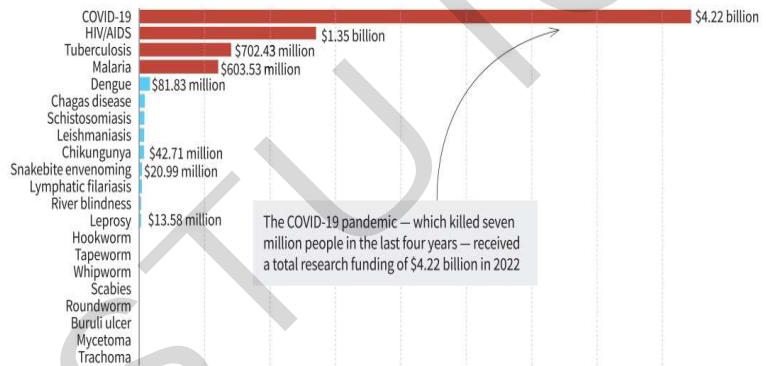
Chart 3 shows the technologies on which the global research and development funding for infectious diseases was spent. Most of the global research funding was focussed on finding vaccines to counter COVID-19. A sharp increase in vaccine funding to the tune of \$5.2 billion was recorded in 2020. In 2022, research funding dropped across all technologies including vaccines. Research money for new drugs, basic research, biologicals and diagnostic platforms declined in 2022.

A lot can be done to alleviate the health burden caused by NTDs. Many can be managed with inexpensive existing interventions or new technologies developed through research. However, these diseases still suffer from a lack of adequate funding, research and development, and global attention. The success of certain initiatives demonstrates what can be achieved with deliberate effort. Examples include the near-eradication of Guinea worm disease and the elimination of river blindness, lymphatic filariasis, and trachoma in many countries.

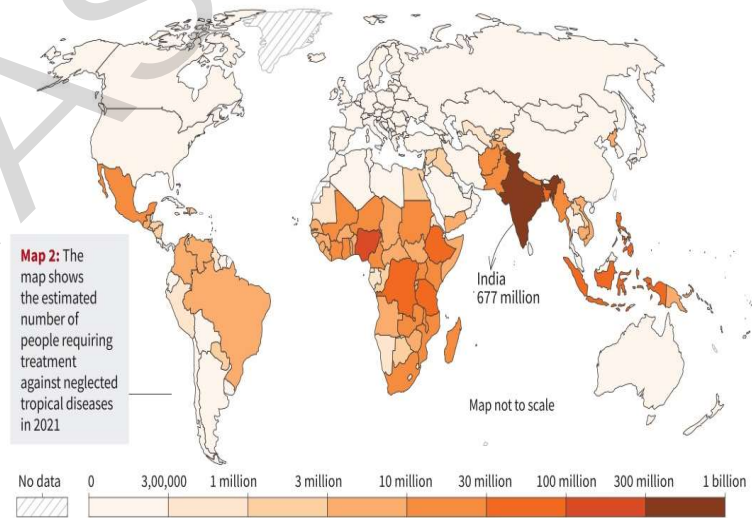
Paucity of funds

Saloni Dattani, Fiona Spooner and Max Roser (2024) - "Neglected Tropical Diseases", published in Our World in Data

Chart 1: The chart shows the annual research and development funding for NTDs in 2022 (\$, adjusted for inflation). Research and development for NTDs have been historically underfunded compared to diseases like HIV/AIDS, tuberculosis, and malaria

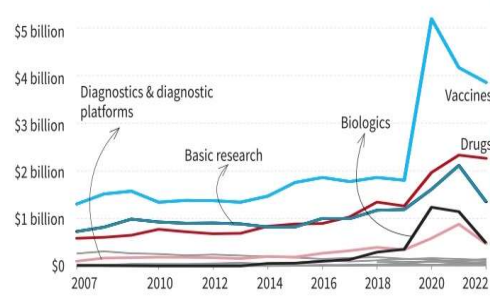


The COVID-19 pandemic – which killed seven million people in the last four years – received a total research funding of \$4.22 billion in 2022

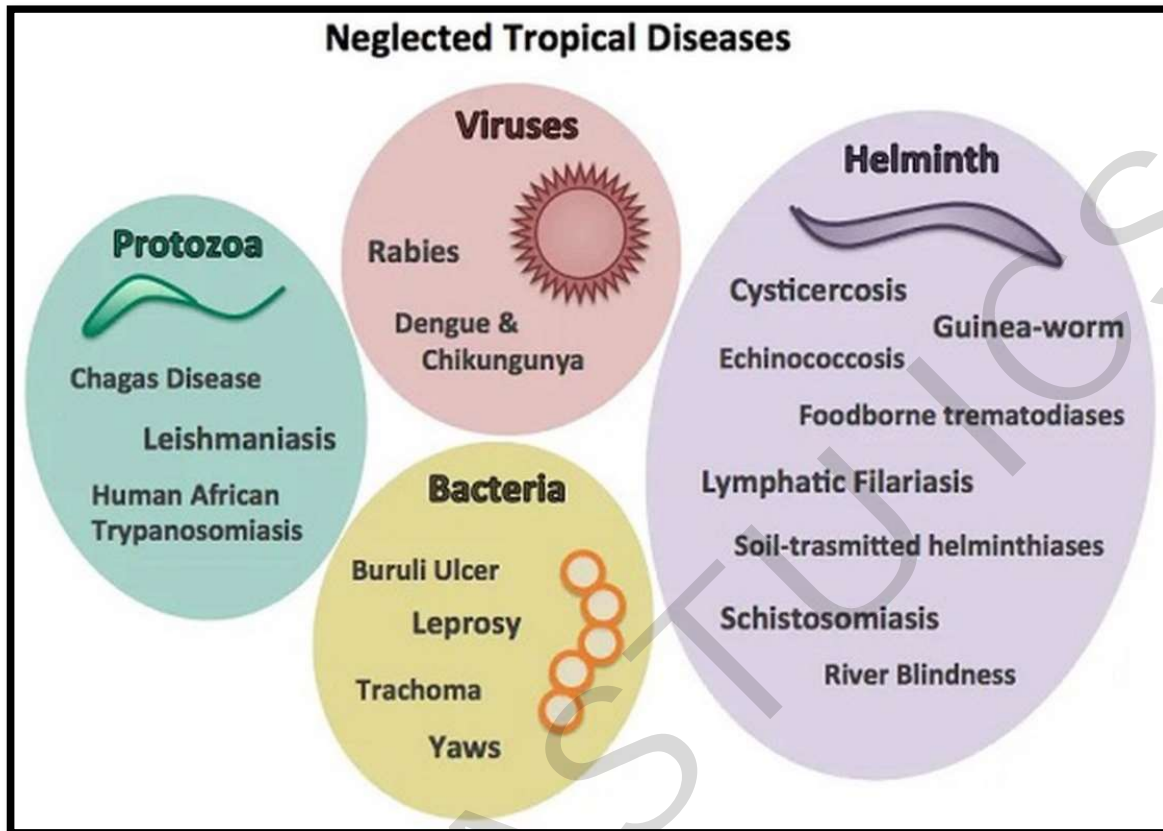


Map 2: The map shows the estimated number of people requiring treatment against neglected tropical diseases in 2021

Chart 3: The chart shows the technologies for which the global research and development funding for infectious diseases was spent



NEGLECTED TROPICAL DISEASES (NTDS)



About Neglected Tropical Diseases (NTDs):

- ❖ NTDs are a diverse group of 20 conditions/diseases that are mainly prevalent in tropical areas, where they thrive among people living in impoverished communities.
- ❖ They are caused by a variety of pathogens (including viruses, bacteria, parasites, fungi, and toxins) and are associated with devastating health, social, and economic consequences.
- ❖ These include Guinea worm, Chikungunya, Dengue, Kala Azar (Visceral Leishmaniasis), and Elephantiasis (Lymphatic Filariasis), among others, and India is home to about 12 NTDs.
- ❖ The World Health Organization (WHO) estimates that NTDs affect more than 1 billion people, while the number of people requiring NTD interventions (both preventive and curative) is 1.6 billion.
- ❖ The epidemiology of NTDs is complex and often related to environmental conditions. Many of them are vector-borne, have animal reservoirs, and are associated with complex life cycles. All these factors make their public-health control challenging.
- ❖ Global Initiative to end NTDs: The WHO's new road map for 2021–2030 calls for three strategic shifts to end NTDs:
 - ☛ From measuring process to measuring impact.
 - ☛ From disease-specific planning and programming to collaborative work across sectors.
 - ☛ From externally driven agendas reliant on programmes that are country-owned and country-financed.



Question: Home Work

Q.4 What do you understand about the Neglected Tropical Diseases? Suggest a few innovative ways for their treatment. (150 words)

Answer

Approach:

- ❖ Give a brief introduction about neglected tropical diseases.
- ❖ Mention the innovative ways for their treatments.
- ❖ Write an effective and appropriate conclusion.

Q.5 Consider the following statements about Neglected tropical diseases (NTDs):

1. They are a diverse group of 20 conditions mainly prevalent in tropical areas.
2. They are 'neglected' because they are almost absent from the global health agenda.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Answer: B

Notes:

Explanation:

- ❖ NTDs are a diverse group of 20 conditions mainly prevalent in tropical areas, where they affect more than 1 billion people who live in impoverished communities.
- ❖ They are 'neglected' because they are almost absent from the global health agenda.

CRISPR-CAS9, A GENE-EDITING TOOL, TO FIGHT THE GENETIC BLOOD DISORDER-SICKLE CELL ANAEMIA

India eyes breakthrough against sickle cell

Researchers working to develop gene therapy using CRISPR-Cas9, a gene-editing tool, to fight the genetic blood disorder that has a high prevalence rate among the Scheduled Tribes; Tribal Affairs Ministry wants ground-level healthcare workers such as ASHAs trained to screen for the disease

Abhinav Lakshman
NEW DELHI

India is getting closer to developing a gene therapy for sickle cell disease, a genetic blood disorder with a high prevalence rate among the Scheduled Tribes, officials of the Union Tribal Affairs Ministry said on Wednesday.

Vibhu Nayyar, Secretary, Tribal Affairs Ministry, said the government was expecting to hear "good news" by January 2025 on the laboratory tests that are being run.

M. Srinivas, Director of the All India Institute of Medical Sciences (AIIMS), said researchers were working to develop a gene therapy using CRISPR-Cas9, a gene-editing tool.

"We want that in the next six months to one year, we will be able to go forward with using this method for treating sickle

cell disease – making India one of the first countries to do so," Mr. Srinivas said.

He was speaking at the National Conclave on Generating Awareness on Sickle Cell Disease, organised by the Tribal Affairs Ministry in collaboration with the Birsu Munda Centre at the AIIMS.

Union Tribal Affairs Minister Jual Oram, addressing the opening of the conclave, lauded the efforts but said it was important to involve and coordinate with ground-level healthcare workers such as ASHAs and anganwadi workers for these plans to be implemented properly.

"They will be the ones doing the heavy lifting on the ground," Mr. Oram said.

Officials of the Tribal Affairs Ministry told *The Hindu* that the "good news" Mr. Nayyar was referring to was related to the tests that



Tribal Affairs Ministry official says the government was expecting to hear "good news" by January 2025 on laboratory tests being run. AP

are currently being run by the Council of Scientific and Industrial Research-Institute of Genomics and Integrative Biology (CSIR-IGIB).

"Following this, the tests will proceed to the next phase and eventually move on to being tested on patients," a senior official said.

This comes months after the U.S. Food and Drug Administration approved the CRISPR-Cas9 technology for a cell-based gene therapy to treat sickle cell disease in December 2023.

Making it cost-effective Ministry officials said one of the main challenges for India was to find a way to

make this therapy cost-effective. Developing a gene therapy using CRISPR has been part of India's mission to eradicate sickle cell disease by 2047.

A government dossier on the mission, which was launched by Prime Minister Narendra Modi in July 2023, said the technology had "the potential to be a single dose cure for blood disorders like sickle cell anaemia".

Part of this mission is to also conduct over seven crore screenings among vulnerable tribal populations across 17 States and Union Territories, of which three crore screenings have been achieved so far, Ministry officials said.

The CRISPR-Cas9 system consists of an enzyme that behaves like molecular scissors, which can be directed to cut a piece of DNA at a precise location. This will then allow a guide

RNA to insert a changed genetic code at the sites of the incision.

While there are a few ways to effect such changes, the CRISPR system is believed to be fast and the most versatile of all.

Addressing the gathering of doctors, experts, and healthcare professionals, Mr. Oram said the Union government was committed to working on the sickle cell disease eradication mission and called for officials from across Ministries and departments to ensure that grassroots workers were roped in for the implementation process and that they should themselves engage with them.

Following the addresses by senior officials and the Minister, a series of technical panel discussions were also held on recognising and screening for sickle cell disease, managing the disease, and other issues.

Question:

Q.6 With reference to Sickle Cell Disease, consider the following:

1. It is an inherited blood disorder which affects the red blood cells.
2. It can cause damage to organs including the liver, kidney, lungs, heart and spleen.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Answer: (c)

Notes: Both statements are correct.

- ❖ **Statement 1 is correct:** It is an inherited blood disease which is most common among people of African, Arabian and Indian origin. It is a group of disorders that affects hemoglobin, the molecule in red blood cells that delivers oxygen to cells throughout the body.
- ❖ **Statement 2 is correct:** Over time, people with sickle cell disorders can experience damage to organs including the liver, kidney, lungs, heart and spleen. Death can also result from complications of the disorder.



What is Sickle Cell Disease (SCD)?

- ❖ About:
 - ☛ SCD is a group of inherited red blood cell (RBC) disorders. RBCs contain hemoglobin, a protein that carries oxygen and healthy RBCs are round. In SCD, the hemoglobin is abnormal, which causes the RBCs to become hard and sticky and look like a C-shaped farm tool called a “sickle.
- ❖ Symptoms:
 - ☛ Symptoms of sickle cell disease can vary, but some common symptoms include:
 - Chronic Anaemia: leading to fatigue, weakness, and paleness.
 - Painful episodes (also known as sickle cell crisis): these can cause sudden and intense pain in the bones, chest, back, arms, and legs.
 - Delayed growth and puberty
- ❖ Treatment:
 - ☛ Blood Transfusions: These can help relieve anemia and reduce the risk of pain crises.
 - ☛ Hydroxyurea: This is a medication that can help reduce the frequency of painful episodes and prevent some of the long-term complications of the disease.
 - ☛ It can also be treated by bone marrow or stem cell transplantation.



PM INAUGURATES NALANDA UNIVERSITY CAMPUS IN BIHAR

PM inaugurates Nalanda University campus in Bihar

The Hindu Bureau

PATNA

Prime Minister Narendra Modi on Wednesday inaugurated the new campus of Nalanda University, an international university, close to the site of the ancient ruins of Nalanda at Rajgir in Bihar.

Asserting that Nalanda is a symbol of India's academic heritage and vibrant cultural exchange, Mr. Modi said, "Nalanda is the proclamation of this truth that books may burn in the flames of fire, but the flames of fire cannot destroy knowledge. Nalanda is an identity, respect, and pride."

Wide representation

He expressed his happiness over the presence of representatives of many countries for the inauguration. He said the new campus proved that Bihar was on the path of development.

Parliament established Nalanda University through the Nalanda University Act, 2010.

The Act formed the basis for implementing the decisions arrived at the second East Asia Summit in the Philippines in 2007 for the establishment of the university as an "international institution for pur-



Glorious expanse: The campus of Nalanda University has an amphitheatre that can seat 2,000 people. @ICHIRAGPASWAN/X

suit of intellectual, philosophical, historical and spiritual studies" and at the fourth summit in Thailand in 2009.

It started functioning in 2014 from a makeshift location with 14 students and the construction work started in 2017.

External Affairs Minister S. Jaishankar and 17 Ambassadors from participating countries attended the event. Bihar Governor Rajendra Arlekar, Chief Minister Nitish Kumar, Deputy CMs Samrat Choudhary and Vijay Sinha were present.

Before inaugurating the campus, the PM visited the ancient ruins of Nalanda and planted a sapling of the Bodhi tree brought from Bodh Gaya.

Nalanda University

Chancellor Arvind Panagariya and Interim Vice-Chancellor Abhay Kumar Singh were present.

In his address, Mr. Modi said, "The renaissance of Nalanda University near its ancient ruins will introduce India's potential to the world. Nalanda is not just a renaissance of India's past, the heritage of many countries and Asia is linked to it. In days to come, Nalanda University will once again become a major centre for our cultural exchange."

The ancient Nalanda University was established in the 5th century and attracted students from all over the world. The ancient university flourished for 800 years before it was burnt down by invaders in the 12th century.

About Nalanda University:

- ❖ Nalanda stands out as the most ancient university on the Indian Subcontinent.
- ❖ It was founded by Kumar gupta of the Gupta dynasty in Bihar in the early 5th century, and it flourished for 600 years until the 12th century.
- ❖ During the era of Harshavardhan and the Pala monarchs, it rose to popularity.
- ❖ It was a center of learning, culture, and intellectual exchange that had a profound impact on the development of Indian civilization and beyond.
- ❖ Nalanda was a monastic establishment in the sense that it was primarily a place where monks and nuns lived and studied. It used to teach all the major philosophies of Buddhism.
- ❖ It had students from far-flung regions such as China, Korea, Japan, Tibet, Mongolia, Sri Lanka, and Southeast Asia.



- ❖ The students at Nalanda were expected to follow a strict code of conduct and were required to participate in daily meditation and study sessions.
- ❖ Subjects such as medicine, the ancient Indian medical system Ayurveda, religion, Buddhism, mathematics, grammar, astronomy, and Indian philosophy were taught there.
- ❖ It continued to be a centre of intellectual activity up until it was destroyed in the 12th century AD, in 1193, by Turkish ruler Qutbuddin Aibak's general Bakhtiyar Khilji.
- ❖ After six centuries, the university was rediscovered in 1812 by Scottish surveyor Francis Buchanan-Hamilton and later identified as the ancient university by Sir Alexander Cunningham in 1861.
- ❖ The Chinese monk Xuan Zang has offered invaluable insights into the academic and architectural grandeur of ancient Nalanda.
- ❖ It is also a UNESCO World Heritage Site.

Questions:

Q.7 Which of the following is/are true about Nalanda university?

1. It was founded during the reign of Chandragupta II.
 2. It imparted knowledge of Both Mahayana and Hinayana sects of Buddhism along with Vedas and Sanskrit.
 3. Its fame declined with the advent of Tantric ideas in Buddhism in and around the 12th century A.D.
- (a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: (c)

Q.8 With reference to the ancient 'Nalanda University' consider the following statements:

1. The university was founded by the emperors of Haryanka Dynasty.
2. It is a UNESCO World Heritage Site.
3. It was destroyed by the Bakhtiyar Khilji.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
(b) 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: (c)

Notes:

Explanation:

- ❖ Statement 1 is incorrect. The Nalanda university was founded by the emperors of the Gupta Empire.
- ❖ Statement 2 and 3 are correct. It is a UNESCO World Heritage Site. It was destroyed by the Bakhtiyar Khilji.

AI THAT PREDICTS PROTEIN-ALFOLD3

How will AI that predicts protein structures change the life sciences?

'If the protein folding problem was set to us by God to teach us how to learn molecular interactions from first principles, we cheated,' pharmaceutical researcher Derek Lowe told *The Hindu*. 'We have figured out how they usually do it, even if we don't know why'

Rohini Subrahmanyam

Proteins are one of the most important molecules of life, with almost every biological function from birth to death being regulated by them in some way. Each protein is made up of a string of smaller building blocks called amino acids, which contain all the information to transform proteins – from a single sequence to a folded, functional 3D structure.

The steps a protein takes to go from its straight form to its final form are too many to count and too hard to follow, leaving the question of how every protein folds – the famous protein-folding problem – unanswered. "If you want to understand the molecular basis of how cells work, how organisms work, how life works, you need to understand how proteins get their shape," Frank Uhlmann, a biochemist at the Francis Crick Institute in London, said.

Answers ex machina

Things changed when Google DeepMind's protein-structure prediction software AlphaFold burst onto the scene in 2020. The highly improved AlphaFold 2 was introduced in 2021. AlphaFold uses machine learning and artificial intelligence (AI) to accurately predict protein structures from an amino acid sequence, seemingly solving the protein-folding problem without learning any of the deeper physical principles that drive this biological process.

"If the protein folding problem was set to us by God to teach us how to learn molecular interactions from first principles, we cheated," Derek Lowe, author of the *Science* column 'In the pipeline' and long-time pharmaceutical researcher, told *The Hindu*. "We haven't learned a tremendous amount more about that. We have figured out how they usually do it, even if we don't know why."

"It's startling how it works as well as it does."

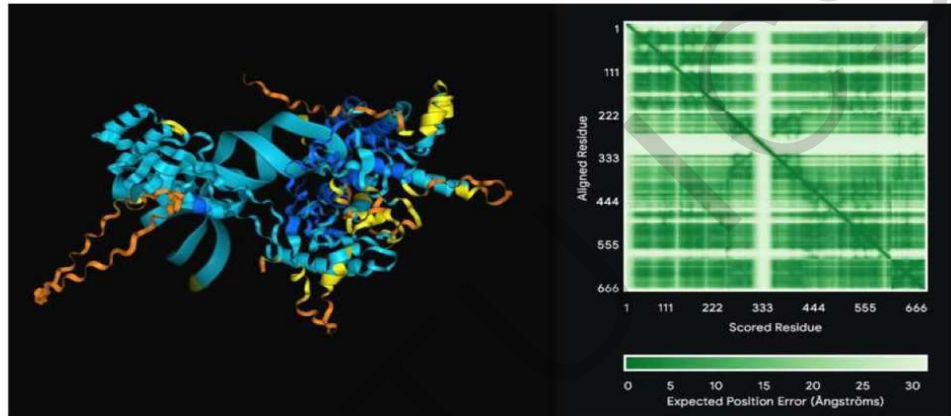
Now, in a *Nature* paper published in May 2024, scientists at DeepMind led by John Jumper introduced AlphaFold 3, building on its predecessors with even more transformative capabilities. AlphaFold 3 can predict protein-protein interactions as well as the structures of other molecules like DNA and RNA, along with the interactions of proteins with all these other compounds.

Democratising research

"AlphaFold 2 predicted the structure of proteins with revolutionary levels of accuracy," Josh Abramson, a research engineer at DeepMind and lead author of the new paper, told *The Hindu* in an email.

"AlphaFold 3 is even more accurate for proteins, but can also predict the structure of DNA, RNA, and all the other molecular components that make up biology. The interaction of all these biomolecules is what makes up the processes of life, so it is important to be able to predict the structure of these interactions."

Apart from being able to give us a lot more insight into biological processes, the new AlphaFold is also more usable by scientists who aren't experts in machine learning. Dr. Uhlmann, who has been using AlphaFold 3 to study how proteins



The three-dimensional structure of the protein-RNA ion PDB 8AW3, as predicted by AlphaFold 3. The plot on the right shows the expected position error in the prediction. ALPHAFOLD SERVER

and DNA interact in chromosomes, said, "You don't need to know anything about coding, now literally everybody can do it. All you need is a Google account, you can upload protein sequences in the DeepMind server, and 10 minutes later you get your results. That completely democratizes structure prediction research."

From noise to signal

The original AlphaFold was trained on the thousands of sequences and protein structures present in the protein data bank, a giant protein repository where scientists submit experimentally determined protein structures. "It completely ignores all the fundamental physics and thermodynamics, it's modelling based on learning what real structures *tend* to look like, taking advantage of tendencies of protein structures that are too subtle for humans to realise," Dr. Lowe said.

Unlike its predecessors, AlphaFold 3 uses a diffusion model, which is what image-generating software also uses. The model works by first training on protein structures, adding noise to the data, and then trying to de-noise it. This way, the model becomes able to work its way back from a noisy structure to a real protein structure. This architecture also helps AlphaFold 3 handle a much larger input dataset.



AlphaFold 3 can predict protein-protein interactions as well as the structures of other molecules like DNA and RNA. GETTY IMAGES



If you want to understand the molecular basis of how cells work, how organisms work, how life works, you need to understand how proteins get their shape

A reliability problem

Its accuracy at predicting protein-protein interactions is also incredibly high – but not its reliability when it comes to interactions between small molecules and proteins. Proteins use a language of 20 amino acids whereas small molecule ligands "have a much larger vocabulary", according to Dr. Lowe.

Greater variations in the dataset and the use of diffusion techniques can lead to the model coming up with answers that look plausible but aren't real. Adding more training data can help circumvent this problem, but not entirely get rid of it.

Nevertheless, AlphaFold 3 predicts protein structures and interactions better than other models right now. Academics and companies can potentially use it to find drug candidates that can bind to proteins and help cure diseases. In fact, DeepMind's spin-off company Isomorphic Labs is using AlphaFold 3 for this very purpose: drug discovery. However, this option isn't open to everyone yet.

A peek under the hood

Additionally, even though scientists are free to use the AlphaFold server to upload their protein sequences, many researchers are irked at not being able to access the model's full code. This means they can't play around with its nuts and bolts and modify it for specific use-cases.

An important implication of this lack of access is that it's currently impossible to use AlphaFold 3 to find structures of proteins bound to drug candidates. Researchers expressed their disappointment in an open letter signed by more than 600 to date. According to the text, the restriction "does not align with the principles of scientific progress, which rely on the ability of the community to evaluate, use, and build upon existing work." Different groups have also begun a race to crack the model's code and make open-source versions. Responding to the backlash, DeepMind scientists have also changed their initial stance of not releasing the whole code to saying they will do so in six months.

The journey begins

For now, we need to wait and watch how DeepMind decides to let scientists examine AlphaFold 3 more closely, to appreciate its full power. But until then, the model remains one of the best AI-based protein structure prediction models out there, now with the ability to predict interactions with other kinds of biological structures as well.

At the same time, both Dr. Lowe and Dr. Uhlmann wanted to be clear that even if AlphaFold 3 makes very good predictions, it shouldn't be treated as an "infallible oracle". Instead, it offers a good starting point where scientists can obtain some answers, which they can then build on with further experiments and expert analysis. "It's a prediction, you can't take it for granted," Dr. Uhlmann said. "It's not solving your question, but it's a new and exciting discovery tool that helps you build and test new hypotheses."

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