NAMAN SHARMA
IAS ACADEMY

Daily
CURRENT AFFAIRS

May 26th, 2025

Offline Centre Location:
SCO 173-174, Sector 17C, Chandigarh

Index

Does Neurodegeneration Begin with Blood Vessel Damage?

Introduction: A New Clue in the Neurodegeneration Mystery

Neurodegenerative diseases, such as Alzheimer's, Parkinson's, and amyotrophic lateral sclerosis (ALS), have puzzled scientists for decades. These disorders gradually destroy neurons in the brain and spinal cord, leading to cognitive decline, memory loss, and loss of bodily control. Despite exhaustive research, their root causes remain frustratingly obscure. Traditional theories have focused on neuron-centric mechanisms, misfolded proteins, synaptic dysfunctions, or genetic mutations affecting brain cells.

Why is this news?

- The news of these findings is at the site where the problem begins: not inside the neurons, but in vascular cells that support and defend them. Until a while back, blood vessels in the brain were mainly seen as a passive track - a network to supply oxygen and nutrients.
- But new research suggests that they can play an active and initial role in triggering brain disorders.
- In particular, the study checks that the mutin-affecting protein affects ALS and frontotemporal dementia impact of the ALS-endothelial cells (which produce blood vessels) can disrupt the BBB's integrity.
- This resolution appears to be prejudiced - and possibly set - a series of molecular events that eventually kill neurons.
- Alzheimer's disease affects more than 55 million people globally and imposes increasing economic and emotional tolls on families and the health care system.
- The implications are very high. Cognitive symptoms can allow for preventive strategies to detect vascular damage before it appears and can fundamentally move the path for these catastrophic conditions.

Background: The role of the blood-brain barrier

- To understand the importance of this discovery, we must understand the obstacle to the blood-brain barrier.
- The BBB is a selective, semi -poverty barrier composed of endothelial cells, which closely connect to the support of permitted astrocytes. This allows essential nutrients to pass into the brain that holds harmful toxins, pathogens and even active immune cells.
- Under normal conditions, the BBB maintains brain healing cheese. However, if the barrier is "dripped", inflammatory molecules, proteins and even pathogens can be inserted into the brain and trigger a waterfall of immune reactions.

- Over time, this inflammation damages neurons and can perform ground functions for neurodegenerative disease.
- Interestingly, the signs of the BBB patch have been seen in many neurodegenerative diseases, but they were seen on a large scale as a result of the progression of the disease.
- These new studies tilt that story: Maybe not vascular lethargy is an underproduct, but a trigger.

Function: How two studies changed the landscape

- The first study led by Ashok Chemala and colleagues use genetic engineering mice to investigate which TDP-43 protein defects in endothelial cells.
- TDP-43 is usually limited to the core, where it helps regulate RNA joints. In many neurodegenerative diseases, however, it misinterprets cytoplasm and creates toxic sets.
- By starting a single point mutation in the gene coding for TDP-43 in mice, scientists observed a shocking result: Endothelial cells lost their structural proteins-such as Claudin-5 and VE-Cadherin, and the BBB became permeable.
- The molecules must have leaked out of the brain, which can lead to swelling and cognitive changes in mice. These mice eventually demonstrated practical symptoms, reminiscent of early dementia.
- More severe, these changes were clear in life before the symptoms of a fully developed neurological disease appeared in the rats.
- This strongly suggests that the dysfunction of blood can be an infrastructure, not a downstream effect.
- To improve these findings, the team performed an after-mortem analysis of 92 people on human brain tests, diagnosed with both healthy and neurodegenerative diseases at the age of 20 to 98 years.
- In patients, the endothelial cell nucleus had reduced the level of atomic TDP-43 and showed elevated inflammatory signs. A specific population of capillary cells caused an infection in a damaged, ssupportiveinflammatory state.

Challenge: Change attention to decades of research

- The proposal that blood vessels, not neurons, may be the first injury for neurodegenerative disease represents an important conceptual change. For decades, researchers have corrected faulty fault proteins such as Alzheimer's in Parkinson's or Beta amyloid plaques in tax parts and rope herds.
- The "amyloid hypothesis" dominates Alzheimer's research, which receives billions in financing and conducts dozens of unsuccessful clinical trials.
- This neuron-centric model, although valuable, can be ignored if upstream trigger-like vascular damage occurs.
- The transfer of the research lenses to include vascular can lead to the healing of previous perceptions and remains, experiments and drug-wiper pipes.
- But the challenges are excellent. For one, blood injuries are notorious for early discovery in humans.
- Advanced imaging technologies that can capture micro BBB leaks or endothelial dysfunction in real time just show up.

- Secondly, it is scientifically and morally difficult to establish that the work, not just correlations, is scientific and morally difficult for people between vascular injury and illness.
- In addition, TDP-43 is present in almost all cells in the body. To determine why and how its lethargy in endothelial cells leads to a cognitive decline, a deep examination is needed.
- Is the mechanism the same for all neurodegenerative diseases? Or are vascular problems more important in some disorders (eg ALS and frontotemporal dementia) than others? Finally, it is a difficult medical challenge to develop medicines that target endothelial cells or stabilise the BBB without consequences. Any treatment will require both extremely specific and safe for long -term use.

Feature: Initial identification and preventive strategies

- Despite these obstacles, conclusions provide a new direction for both diagnosis and treatment.
- If endothelial cell damage and BBB leakage occur quickly, they can serve as a biomarker - detection through brain imaging, blood tests or cerebrospinal fluid analysis. This opens the possibility of identifying risks at risk before cognitive decline begins. Preventive interventions, such as lifestyle changes, anti-inflammatory treatment or vascular-protective medications, then delays or even neurotization.
- In addition, research can inform the design. Most relevant treatments aim to remove toxic protein sets from the brain.
- However, if these sets are partly the result of a compromised BBB that allows inflammatory agents, stabilisation of the vascular can slow down the formation. This change can lead to the development of medicines that strengthen obstacle integrity or correct the TDP-43 patch at the endothelial level.

Conclusions: A new paradigm in neurodynamical research

- Recent studies have stated that neurodegeneration can begin with blood vessel damage, marking a possible turning point in neurology.
- They challenge long-term neuronized approaches and introduce the possibility that the vascular health-specifically is an important introductory determinant for brain-brain disease in the blood-brain barrier.
- This perspective does not deny the role of neuronal fault, genetic mutation or synaptic failure. Instead, it adds a new layer to our understanding of how these diseases can come out - and, significantly, how they can be prevented.

Main (Mains) Question UPSC GS Paper III (250 words):

Q. Recent studies suggest that neurodegeneration may begin with vascular dysfunction rather than neuronal damage. Critically examine this hypothesis in the context of neurodegenerative diseases like Alzheimer's and ALS.

How can this shift in perspective influence early diagnosis, treatment strategies, and public health policy?

Regarding TDP-43 protein and its role in neurodegeneration, consider the following statements:

1. Under normal conditions, TDP-43 is restricted to the cytoplasm and regulates DNA methylation.
2. Its mislocalization in endothelial cells can lead to breakdown of the blood-brain barrier.
3. Mutations in the Tardbp gene encoding TDP-43 have been linked to behavioural changes in animal models.

Which of the above statements is/are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

Correct Answer: B
(Explanation: TDP-43 is normally nuclear, not cytoplasmic. Statement 1 is incorrect.

Antimalarial Agents Sidestep Insecticide Resistance

A mosquito-borne contagious disease caused by plasmodium parasites has long been harassed in tropical and subtropical regions of malaria, claiming the lives of hundreds of thousands of humans annually. Despite the important progress of diagnosis, treatment and preventive equipment, Malaria continues to take a toll, especially in Africa and South Asia.

Central to the prevention strategies, Insecticide-treated nets (ITNs) (ITN) and indoor residual spray (IRS) have been used. However, widespread insecticides in mosquitoes, especially Anopheles gambiae, have quickly compromised these devices.

Why is it in the news?

- On May 22, 2025, the Hindus reported on the findings of an article from the Nature Journal, revealing a suite of 22 compounds that can block or reduce parasitic growth in malaria in mosquitoes, especially pesticide-resistant strains. Of these, the ELQ-456 and ELQ-331 appeared at the front.
- These compounds were integrated into polyethene films used in ITN and remained effective even after one year of open storage.
- In a recent success, researchers have identified antimicrobial compounds that target the parasites inside the mosquitoes, not like a mosquito.
- This new approach was published in Nature on May 22, 2025, and represents a change in strategy - attacking Plasmodium falciparum during the development stages of mosquitoes instead of relying only on vector mortality. This growth provides special promises to resource-poor areas, and provides a cheap, resistant help for existing interventions.
- The importance of research lies in its ability to circumvent pesticides, which are an increasing global threat to the malaria extinction effort. Reporting of 263 million malaria cases from the World Health Organisation (WHO) to a 4.3% increase in 2023, and India is still hosting 95% of the population of malaria-endemic sectors, This new approach marks a one-time and possible sports innovation.

Background

- Malaria is caused by Protozoan parasites of the genus Plasmodium, which are transmitted to humans through the bite of an infected female anopheles mosquito. Among the five plasmodium species that affect humans, Plasmodium falciparum is the deadliest.

Epidemiology

- Africa accounts for 94% of global malaria cases and 95% of deaths. In India, while in 2024, the high load has led to enough progress to leave the HBHI group, Malaria is still a widespread threat.

- The disease is spatial in 95% of India's population, especially in tribal, forest and flood-exposed areas.

Traditional approach

- The main strategies of malaria control and elimination are: Vector control via pesticides, walled bed nets (ITN) and indoor residual spray (IRS).
- Antimalarial medicines such as artemic -kin -based combination therapy (ACT). Vaccination, especially through RTS, S (mosquitoes) and R21/Matrix-M.

New threats

- While these strategies have performed significantly, they face new dangers: Pesticide resistance in anopheles mosquitoes, especially for pyrethroids.
- Drug resistance in plasmodium parasites, especially in Southeast Asia.

Function: Targeting of parasites inside the vector

The new study resumed the fight against malaria by focusing on killing a mosquitoes to disrupt the development of parasites in the mosquitoes.

Major conclusions of studies

- In its early stages in mosquitoes, 81 antimicrobial compounds were screened against Plasmodium falciparum. 22 compounds were found to be quite low or completely block parasitic growth.
- These compounds were applied to the top form on Anopheles Gambia before swallowing the infected blood. ELQ-456, a prominent connection, blocked the parasitic transfer completely.
- Even brief contact with treated surfaces was enough to prevent parasitic maturity. Used in polyethene films and netting.
- The most exciting aspect was to include these compounds in polyethene films, which were mirrors for the current ITN. The facilities include:
- Efficiency against pesticide-resistant mosquitoes. Stability maintains power even after one year of open storage. Ability for long-term safety without organic poisoning. Resistance and cross-resistance study.
- Researchers also discovered whether parasites could develop resistance to these compounds.
- However, his transition was weakened, which reduced the danger. No cross-resistance was found with other antimicrobial resistance, and a low risk of weapon resistance.

Empowerment and Access

A significant advantage lies in the simple and cost-effective synthesis of ELQ connections:

- They can be produced on a scale using direct chemical processes.
- Relevant beds ensure integration into the net production pipelines to ensure strength for resources.It makes a scalable global-special for Africa under the centre and South Asia.

Challenges and limitations

- While the conclusions are on the ground, there are many challenges before this strategy is implemented on a large scale.

- **Translation laboratory results in the field position:** The study was mainly performed in a controlled laboratory environment.
- The region's position, papamman, humidity, user behaviour and pure usage patterns can affect composite stability and effect.
- Field samples are necessary to confirm the results. New chemical agents require a complete regulatory review to assess environmental protection, human toxicity and ecological effects.

Production and supply chain logistics:

- Although it is easy to synthesise compounds, global use requires upscaling investment.
- Chemical construction.
- Polyet coating functions.
- Quality assurance system.
- Distribution to distant regions presents logistics barriers.
- **Possible development of resistance over time:** Although no instant cross-resistance is observed, the pressure of evolution may lead to resistance in the parasitic population. A long-term surveillance mechanism will be needed.
- **Integration with existing malaria control programs:** Public Health Systems is already invested in ITN and IRS strategies.

The way forward: Against the extinction of malaria

- This research adds a new dimension to malaria control, which promises long-term and resistance protection.
- However, the successful deployment will depend on multidimensional efforts in science, politics and public health infrastructure.
- Fast field trials and testing in the real world: Nigeria, Dr. Region-based efficiency studies begin to study in high-bound areas such as Congo and parts of India.
- Pilot programs in tribal and forest belts in India can be effective test cases. Multiplexed cooperation: Partnership between academics, the WHO, national malaria programs and pharmacy producers will be needed.
- Global funds, GAVI and the United Nations can support purchases and distribution.
- **Regulatory harmony:** These novels speed up the development of the WHO PREQUALIFICATION Route, specific for connections. Make a quick-track approval mechanism under national drug regulators (eg CDSCO in India).
- **Innovation in Bed Net Manufacturing:** Encourage public-private partnership to produce a web built with both pesticides and antimine agents. To raise local production units to reduce dependence on imports.
- **Community engagement and behavioural change:** Inspect and train the locals about the new way of action, while leading parasitic growth instead of killing mosquitoes. Promote sustained net use, even in areas where the vector density is low.
- **Monitoring, monitoring and resistance mapping:**
  - Enter real-time data platforms to monitor:
  - Efficiency of compounds.

- Signs of resistance in the parasitic population.
- Post -environmental effects.

Conclusion

- The discovery of parasitic target connections such as ELQ-456 and ELQ-331 represents a paradigm change in the prevention of malaria.
- This challenges the long-standing assumption that killing mosquitoes is the only viable path to transfer of control.
- These compounds can revive global malaria extermination efforts by ignoring pesticide resistance and offering long-term, cost-effective and scalable solutions. As the world aims to meet the WHO's global technical strategy for malaria 2016-2030, which increase malaria events and achieve a 90% reduction in mortality by 2030, such innovation is not just welcome - they are necessary.
- With timely investment, regulatory foresight and collaboration, this scientific milestone can be a tipping point in the centuries-old battle of humanity against malaria.

Main
Q.. “A paradigm shift in malaria control lies not in killing the mosquito but in disabling the parasite.” Discuss this statement in the context of recent scientific advancements in malaria prevention. Highlight the potential benefits and challenges of this new approach. (250 words)

Q. About the recent developments in malaria control, consider the following statements:

1. The newly discovered antimalarial compounds target Plasmodium falciparum inside mosquitoes rather than killing the mosquitoes themselves.
2. ELQ-456 and ELQ-331 are examples of endochin-like quinolones (ELQs) that have shown effectiveness in blocking parasite transmission.
3. These compounds are ineffective against insecticide-resistant strains of mosquitoes.
4. The compounds have been successfully tested when integrated into polyethene films similar to those used in insecticide-treated nets.

Which of the statements given above are correct?
A. 1, 2 and 4 only
B. 1 and 3 only
C. 2, 3 and 4 only
D. 1, 2, 3 and 4

Answer: A. 1, 2 and 4 only
Explanation: Statement 3 is incorrect because the compounds were found effective even against insecticide-resistant mosquito strains.

Schistura densiclava: Meghalaya's New Cave-Dwelling Fish

Why is Shistura Deniclava in the news?
A new species of cave-dwelling loach, named Schistura densiclava, has been discovered from the Krem Mawjymbuin cave in the East Khasi Hills district of Meghalaya.

Background

- **Species information:** The Shistura Dansiclava family belongs to Namecheyidae, a group of freshwater crayfish living at the bottom of the streams.
  - Housing: At 18 ° C with low oxygen, a cool, fast liquid subtrain current was found inside the cave, about 60 meters inside the cave.
- **Physical functions:** a thick deep bandage near the yellow -yellow body and back springs with vertical black colors (hence the name "Deniclava" which means "thick strip"). Sexual duality is observed, with different body and tag patterns in men and women.
- **Endemism:** This species is spatially for a single cave system, which makes it vulnerable to environmental changes.

Challenges

- **Housing specificity and vulnerability:** Being limited to a cave system means that species are exposed to housing disorders, pollution or climate change effects.
- **Low oxygen environment:** Adaptation for low oxygen water fish makes it unsafe for changes in water quality.Lack of consciousness: Cave ecosystems are often minor studies and are not known, which reduces neglect of care in the conservation efforts.Human effects: mines, tourism and pollution in Meghalaya threatened the delicate cave ecosystem.

The way forward

Protection and conservation: NEP cave and the surrounding area as a protected habitat to prevent the decline of the habitat. Further research: conduct organic and genetic studies to understand the size, reproduction and adaptability of the nature of species.
Environmental monitoring: Monitor water quality and cave status regularly to detect and prevent organic dangers. Awareness and community engagement: Education of local communities and stakeholders, which is about the importance of preserving subterranean biodiversity.
Sustainable tourism: Regulation of cave tourism to reduce disorders and environmental effects.

Conclusion on Schistura densiclava:

The discovery of Schistura densiclava in Meghalaya's Krem Mawjymbuin cave highlights the rich and unique biodiversity of underground ecosystems.

Why is Schistura densiclava in the news?
A) It is a newly discovered cave-dwelling fish species
B) It is used in medicines
C) It is found in the ocean
D) It is the largest freshwater fish in India

Answer: A

NITI Aayog

The 10th Governing Council Meeting of NITI Aayog was recently held in New Delhi, chaired by the Prime Minister, under the theme "Viksit Rajya for Viksit Bharat@2047". It helps coordinate efforts between the central government and states to boost India's growth and development.

Background

NITI Aayog often appears in the news because it is the key policy think-tank of the Government of India that guides and monitors important national development plans, including the Sustainable Development Goals (SDGs).
Establishment: NITI Aayog was created in January 2015, replacing the earlier Planning Commission.
Nature: It is not a constitutional or statutory body, but is formed by an executive decision.
Mandate: It has two main roles
Oversee and support the implementation of the SDGs across India.
Promote cooperative federalism by involving states and union territories closely in development planning.

Composition:

The Prime Minister is the Chairperson.

- It includes the Chief Ministers of all states and UTs, some Union Ministers, a Vice-Chairperson, full-time members, and experts nominated by the PM.
- Regional Councils address issues specific to groups of states.

Challenges

- **Coordination Complexity:** Managing coordination between multiple states and central ministries can be difficult.
- **Balancing Federalism**: Ensuring equal participation and cooperation between states with different priorities and capacities.
- **Implementing SDGs:** Aligning diverse state development goals with national and international SDG targets is challenging.
- **Non-Statutory Nature:** Since it's not a constitutional body, its recommendations are advisory and depend on political will for implementation.
- **Monitoring Impact:** Measuring the real impact of policies and reforms remains a complex task.

Way Forward

- **Strengthen Federal Cooperation:** Enhance platforms for continuous dialogue between the Centre and states to ensure smoother policy implementation.
- **Capacity Building:** Support states with technical and financial resources to meet development targets.
- **Focus on Data & Technology:** Use data analytics and technology for better monitoring and evidence-based policymaking.

- **Promote Innovation:** Encourage an ecosystem that fosters innovation and entrepreneurship aligned with sustainable development.
- **Greater Public Engagement:** Increase transparency and include civil society and local communities in the development process.
- **Institutional Strengthening:** Though not a constitutional body, efforts can be made to give NITI Aayog a stronger role through legal and administrative reforms.

Conclusion

The 10th Governing Council Meeting of NITI Aayog, chaired by the Prime Minister, marked a significant step towards collaborative federalism with the theme "Viksit Rajya for Viksit Bharat@2047." It emphasised the role of states in India's journey towards becoming a developed nation by 2047.

Such meetings strengthen cooperation between the Centre and states, ensuring focused planning, implementation, and monitoring of development goals across the country.

NITI Aayog continues to be a crucial platform for shaping India's long-term sustainable and inclusive growth.

What is the main theme of the 10th Governing Council Meeting of NITI Aayog held in 2025?

A) Atmanirbhar Bharat
B) Viksit Rajya for Viksit Bharat@2047
C) Digital India
D) Swachh Bharat Mission

Answer: B

Nagshankar Temple

Why is Nagshankar Temple in the News?

Nagshankar Temple in Assam's Biswanath district has recently been recognised as a model temple for turtle conservation. The temple's pond is home to one of the largest populations of rare and endangered freshwater turtles, including the critically endangered black softshell turtle. This recognition highlights the temple's important role in preserving biodiversity and protecting rare species.

Background

- Nagshankar Temple is an ancient Hindu shrine dedicated to Lord Shiva, located on the north bank of the Brahmaputra River in Assam.
- It was originally built in the 4th century AD by King Narasankar of Nagakha and later restored by the Ahom king Su-sen-pha in 1480.
- The temple complex features a large pond that houses 250-300 turtles, including rare species like the black softshell, Indian softshell, and Malayan softshell turtles.
- Some of the turtles in the pond are believed to be hundreds of years old, indicating the temple's long-standing role in turtle conservation.
- The temple campus also supports other wildlife like peacocks, deer, and pythons, reflecting a rich ecosystem.

Challenges

- **Limited Habitat:** The pond can only support a limited number of turtles, restricting population growth.
- **Predators and Human Impact:** Hatchlings face threats from natural predators like mongooses and feral dogs. Human interference, such as feeding and pollution, can affect turtle health.
- **Conservation Awareness:** Lack of widespread awareness about the importance of turtle conservation in the area can hinder protection efforts.
- **Environmental Changes:** Changes in water quality and climate can impact the delicate ecosystem of the temple pond.

The way forward

Housing extension: To support population growth, identify and develop safer houses for turtles outside Tempammen.

- **Community Partnership:** Attach communities to conservation efforts through education and active participation to promote protection.
- **Scientific research and monitoring:** To ensure their existence, carry out regular monitoring of the turtle population and health by using modern techniques.
- **Politics help:** Strengthen conservation policy and integrate traditional cultural values with modern environmental practice.

Conclusion

- The Nagarkar temple in Assam is a unique example of how religious and cultural places can play an important role in the preservation of biodiversity.
- The temple makes a significant contribution to the preservation of wildlife by protecting the nature of the threatened turtle as the black softshell turtle, in the Holy Pond. However, challenges such as limited habitat, prediction and human impact should be solved through community participation, housing expansion and scientific monitoring.
- Strengthening protective efforts here can help protect these ancient species for future generations and promote permanent coexistence between nature and culture.

Nagshankar Temple, known for turtle conservation, is located in which Indian state?
A) Arunachal Pradesh
B) Assam
C) Meghalaya
D) Nagaland

Answer: B

Tianwen-2 Mission

Why in the news?

China is ready to launch its first asteroid testing assignment, **Tianwen-2**, which is aimed at near near-Earth asteroid 469219 Kamolava. If successful, this mission will place China among an aristocratic group of nations, including the United States and Japan, which have successfully returned asteroid materials to Earth. The mission aims to elaborate on our understanding of the formation of planets and possibly the origin of its moon of the Earth's moon.

Background

What is the Kamoʻoalewa Asteroid?

- Kamoʻoalewa was discovered in 2016 using the Pan-STARRS 1 telescope in Hawaii.
- It is a quasi-satellite of Earth, which means it orbits the Sun but stays close to Earth and is affected by Earth's gravity.
- It has a highly elliptical orbit and seems to move ahead of and behind Earth, giving the illusion of orbiting Earth.
- Kamoʻoalewa has been in this orbit for around 100 years and is expected to remain in it for the next 300 years.
- Scientific curiosity: The moon can be pieces of origin, possibly taken out because of the former cosmic conflict.

Tianwen-2 missions

- **Mission type:** China's first asteroid sample return mission from the asteroids.
- **Objective**: Asteroid 469219 Kamoolwa, an almost-earth-half-finalite.

Example of collection:

- Touch-and-go technology: Uses a projectile or gas to dislodge surface materials.
- **Anchor-and-signature technology:** The robot applies anchor arms and lives for sub-collect samples
- **Phase after test:** After the asteroid test on Earth returns, the spacecraft will continue its journey to the most important asteroid belt for extended exploration.

Technological Progress:

- High-resolution cameras for detailed imaging.
- Wise on board navigation system.
- Accurate dynamics in an environment with low samples.

Tianwen-1:

- Assignment purposes: China's first asteroid testing assignment was launched in July 2020.
- Structure: A judge, lands, and rover were included - all were launched together.
- Success Milestone: Utopia landed in planning, March.

Scientific contribution:

- Martian studied geology, atmosphere and the presence of potential water/ice.
- The first ground-based intrusive radar was deployed on the Martian surface.

Challenges

- Navigate and operate in ultra-cum gravity.
- Example collection coordination with the accuracy of a small, moving asteroid.
- Ensure safe return and reinstatement by collecting materials.

Orbital mobility:

- The semi-satellite classes are complex and unstable.
- The path requires correction and precise calculation for time.

Example Integrity:

- Avoid pollution during collection, storage and re-entry.
- Maintain chemical and structural integrity of the sample.

International competition:

- After successful asteroid missions such as NASA's Osiris-Rex and Japan's Hayabusa 2, China faces pressure to match or surpass advanced instruments.

The way forward

Scientific progress: Early solar system, asteroid composition and even the geological history of the Earth can provide a new insight.
The ability to confirm or refute the principles of the lunar material found on the Kamoolva.

Space cooperation and diplomacy:
Opportunities to share data with global space agencies and scientific cooperation. It helps China increase its role in the international space survey regime.

Capacity building: Will strengthen China's technical base, especially in deep-sea assignments, robotics and artificial intelligence.
Space Resource Use: A step toward asteroid mining, which has the opportunity to access rare minerals and resources.

Conclusion

The Tianwen-2 mission signifies not only China's growing prowess in space exploration but also its ambition to explore uncharted frontiers in planetary science. If successful, the mission could unravel cosmic secrets about our Earth-Moon system and add valuable insights to humanity's understanding of the solar system. As space becomes a new arena of strategic competition and cooperation, such missions have both scientific and geopolitical significance.

Question:
Regarding the Tianwen-2 mission and the asteroid 469219 Kamoʻoalewa, consider the following statements:

1. Kamoʻoalewa is a Trojan asteroid that shares its orbit with Earth around the Sun.
2. The Tianwen-2 mission plans to collect both surface and subsurface samples from Kamoʻoalewa using two distinct techniques.
3. After returning samples to Earth, the Tianwen-2 spacecraft is programmed to self-destruct in Earth's atmosphere.
4. Kamoʻoalewa is hypothesised to possibly contain material originating from the Moon.

Which of the statements given above is/are correct?

A. 1 and 3 only
B. 2 and 4 only
C. 1, 2 and 4 only
D. 2, 3 and 4 only

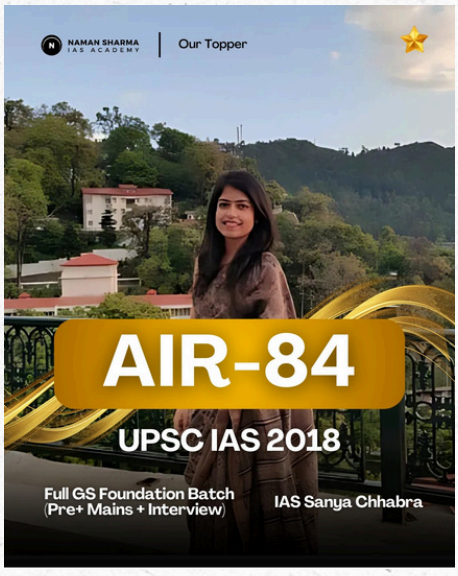
Answer: B. 2 and 4 only

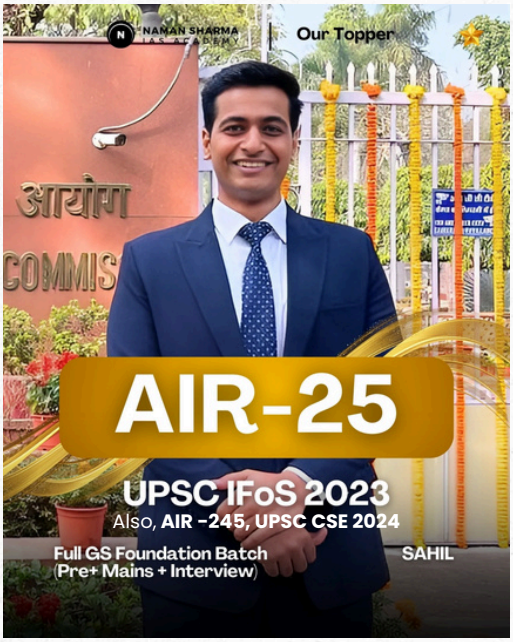
Explanation:

- **Statement 1 is incorrect:** Kamoʻoalewa is a quasi-satellite, not a Trojan asteroid. Trojan asteroids are asteroids that share an orbit with a planet, specifically residing in the planet's leading and trailing Lagrange points (L4 and L5)
- **Statement 2 is correct:** Tianwen-2 uses both Touch-and-Go and Anchor-and-Attach techniques for sample collection.
- **Statement 3 is incorrect:** After returning the sample, Tianwen-2 will continue to the main asteroid belt for further exploration, not self-destruct.
- **Statement 4 is correct:** Scientists speculate that Kamoʻoalewa may contain lunar fragments.

NAMAN SHARMA
IAS ACADEMY

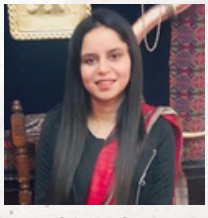
Our Recent Toppers:





IRS Rudraksh Ravi
AIR-617, CSE 2021

Anshul Shandil
AIR-7, HPPCS 2019



Arshiya Sharma
AIR-3, HPPCS 2019

Kirti Sharma
AIR-35, PCS 2021

IPS Vineet Ahlawat
AIR-231, CSE 2020

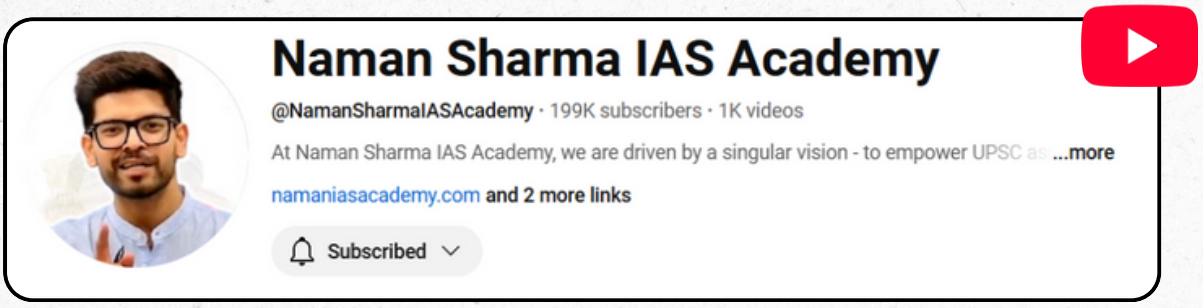
SDM Himani Sharma
AIR-2, HPAS 2024

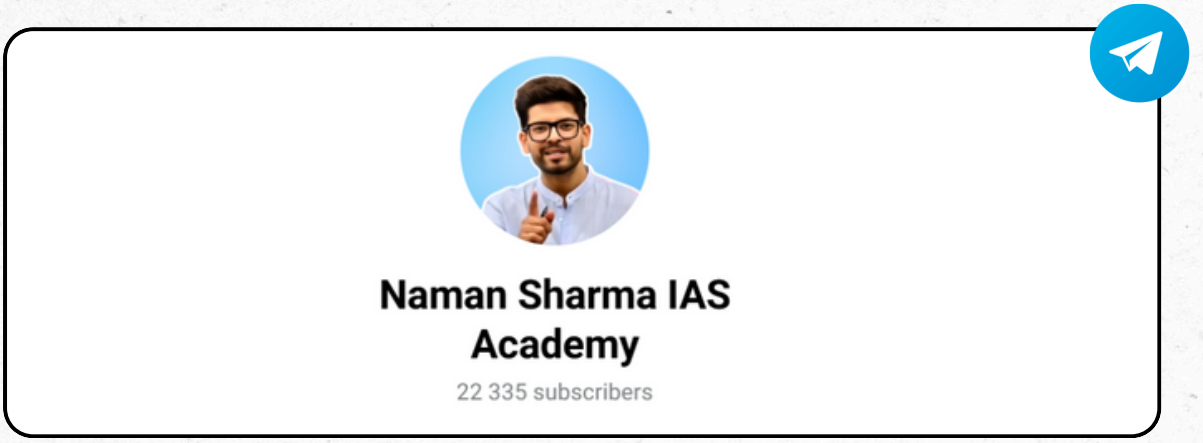
WhatsApp Now +91-843-768-6541

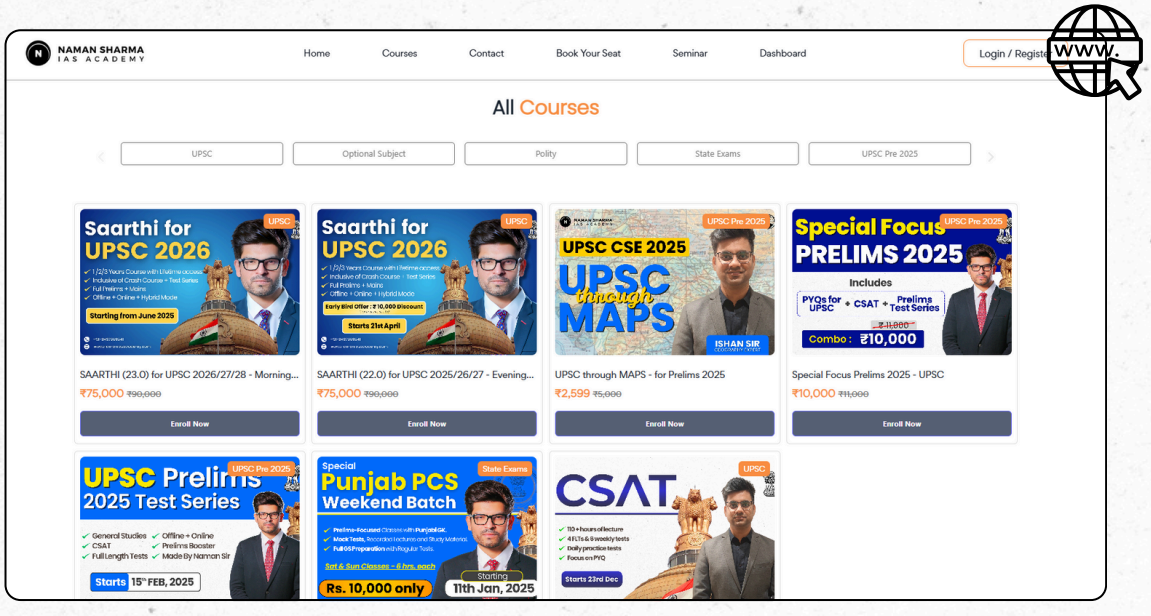
Offline Centre Location: SCO 173-174, Sector 17C, Chandigarh

NAMAN SHARMA
IAS ACADEMY

Join our Communities:







Offline Centre Location: SCO 173-174, Sector 17C, Chandigarh

NAMAN SHARMA
IAS ACADEMY

Admissions Now Open!

Enroll in just ₹2000

- Mode: Offline/Hybrid/Online
- Medium: Hinglish (Notes in English)
- Timings:
  Morning: 9 AM - 1 PM
  Evening: 4 PM - 8 PM

Enrollment Process:

- Visit Our Website: ***Naman IAS Academy***
- Call us at **+91-843-768-6541 for Free Seminar**

Free UPSC seminar
Saturday, 4PM

LIVE zoom

Offline Centre Location: SCO 173-174, Sector 17C, Chandigarh