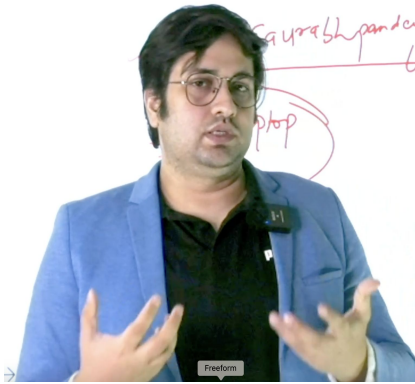
Topics - MINDS MAPS included (Daily current affairs 15th December 2024

- Metal Scrap Transformation into High-Performance Alloys.
- Giraffe Movement and Habitat Study
- Pancreatic Cancer Detection Advancements.
- **Neurotropism**
- The Political Landscape: A No-Confidence Motion Against Vice President Jagdeep Dhankhar
- Gene Therapy for severe Hemophilia A
- Mains



By saurabh Pandey

THE HINDU

Target Mains -2025/26 -

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BY SAURABH PANDEY SIR

Test -10 scheduled on Monday - 9:30 am

Solid phase alloying can turn metal scrap into high-value alloys

The Hindu Bureau

Metal scrap can be directly transformed and upgraded into high-performance, high-value alloys without the need for conventional melting processes, according to a new study published this week in the journal *Nature Communications*. The study demonstrates that scrap aluminum from industrial waste streams can produce high-performance metal alloys.

The upcycled aluminum performs on par with identical materials produced from primary aluminum, indicating that this approach can provide a low-cost pathway to bringing more high-quality recycled metal products to the marketplace. By converting waste into high-performance aluminum products, the new method, called solid phase alloying, not only enhances material properties but also contributes to environmental sustainability.

The innovative solid-phase alloying process converts aluminum scrap blended with copper, zinc, and magnesium into a precisely designed high-strength aluminum alloy product in a matter of minutes, compared to the days required to produce the same product utilizing conventional melting, casting, and extrusion. The research team used a PNNL-patented technique called Shear Assisted Processing and Extrusion, or ShAPE, to achieve their results. However, the researchers noted that the findings should be reproducible with other solid-phase manufacturing processes.

Longer lifespan

Within the ShAPE process, a high-speed rotating die creates friction and heat that disperses the chunky starting ingredients into a uniform alloy with the same characteristics as a newly manufactured aluminum wrought product.

The solid phase approach eliminates the need for energy-intensive bulk melting, which combined with the low-cost feedstocks originating from scrap, has the potential to sharply reduce the cost of manufacturing these materials. For consumers, this means recycled aluminum products will have a longer lifespan and better performance at a lower cost, whether they are part of a vehicle, a construction material, or a household appliance.

According to the researchers, the solid phase alloying process could be used to create custom metal wire alloys for various 3D printing technologies. “Solid phase alloying is theoretically applicable to any metal combination that you can imagine, and the fact that manufacturing occurs wholly in the solid state means you can begin to consider totally new alloys that we’ve not been able to make before,” Cindy Powell, a researcher at the Pacific Northwest National Laboratory, U.S. and a coauthor of the study said in a release.

Topic → Metal Scrap Transformation into High-Performance Alloys

Key Insights

🔄 **Direct Transformation:** Metal scrap can be upgraded into high-performance alloys without conventional melting processes.

🏭 **Aluminum Source:** Scrap aluminum from industrial waste can produce high-performance metal alloys comparable to primary aluminum.

💰 **Cost-Effective:** The new method offers a low-cost pathway for high-quality recycled metal products in the marketplace.

🌱 **Environmental Impact:** The solid phase alloying process enhances material properties while contributing to environmental sustainability.

⚙️ **Rapid Production:** The ShAPE technique allows for the creation of high-strength aluminum alloys in minutes, significantly faster than traditional methods.

🔧 **Versatile Applications:** The solid phase alloying process can be used for custom metal wire alloys in 3D printing technologies.

🧪 **Innovative Potential:** The method is applicable to various metal combinations, enabling the creation of new alloys previously unachievable.

Summary: A new study reveals that metal scrap can be efficiently transformed into high-performance aluminum alloys using a rapid, environmentally friendly process

Question Corner

Limiting factor

Do giraffes really struggle with slopes?

A new study analysing the movements of 33 GPS-collared giraffes across five reserves in South Africa has found that giraffes avoid steep terrain and are unable to navigate slopes with a gradient of more than 20 degrees, most likely due to the energy required and the risk of falling. Researchers found that giraffes will tolerate terrain of up to 12 degrees, but only if it leads to favourable vegetation. The findings highlight a mismatch between the ideal, flat habitats of giraffes and the areas they're being conserved in. Using the newly discovered 20-degree gradient threshold, the researchers were able to calculate the proportion of habitats in key African countries where giraffes are currently found that are inaccessible to the animals. They found that of all the countries that were mapped, one in three had more unusable areas in protected areas than outside of protected areas. Giraffes are currently found in 21 African countries but despite their wide distribution, populations have been declining.

Readers may send their questions / answers to questioncorner@thehindu.co.in

Topic → Giraffe Movement and Habitat Study

🦒 A study analyzed the movements of 33 GPS-collared giraffes across five reserves in South Africa.

⛰️ Giraffes avoid steep terrain and cannot navigate slopes with a gradient greater than 20 degrees due to energy expenditure and fall risk.

🌱 They tolerate slopes up to 12 degrees if it leads to favorable vegetation.

📊 The findings reveal a mismatch between giraffes' ideal flat habitats and their conservation areas.

🌍 Researchers calculated the proportion of inaccessible habitats in key African countries, finding that one in three had more unusable areas in protected zones than outside.

📉 Giraffes are found in 21 African countries, but their populations are declining despite their wide distribution.

🔍 The study emphasizes the need for habitat management that aligns with giraffes' movement patterns and habitat preferences.

Summary: A study reveals that giraffes avoid steep terrain, highlighting habitat mismatches in conservation areas and the decline of their populations across Africa.

Key Findings

Giraffe Movement: Analysis of 33 GPS-collared giraffes in South Africa.
Terrain Avoidance: Giraffes avoid slopes >20 degrees; tolerate up to 12 degrees for better vegetation.

Habitat Mismatch: Ideal flat habitats often not in conservation areas.

Inaccessible Habitats: One-third of key African countries have more unusable areas in protected zones.

Population Decline: Despite being in 21 countries, giraffe populations are decreasing.

Habitat Management: Need for alignment with giraffes' movement and habitat preferences.

Detecting premalignant pancreatic lesions with MRI

Precursor lesions of pancreatic cancer are very difficult to characterise with magnetic resonance imaging (MRI). But now, in a new study, researchers have shown, for the first time, that a particular form of MRI called Diffusion Tensor Imaging (DTI) is capable of robustly detecting premalignant lesions in the pancreas. Their study could open the way to early clinical diagnosis in people at risk, and to treatment assessment of pancreatic cancer.

Topic → Pancreatic Cancer Detection Advancements

🩻 Precursor lesions of pancreatic cancer are difficult to identify with traditional MRI.

🔍 New Study: Highlights the effectiveness of Diffusion Tensor Imaging (DTI) in detecting premalignant lesions.

📈 First-time Evidence: DTI robustly identifies these lesions.

🏥 Clinical Impact: Could lead to earlier diagnosis for at-risk individuals.

💊 Treatment Assessment: May improve evaluation for pancreatic cancer patients.

🔬 Research Optimism: Positive implications for future management of pancreatic cancer.

📅 Importance of Early Detection: Crucial for improving treatment outcomes.

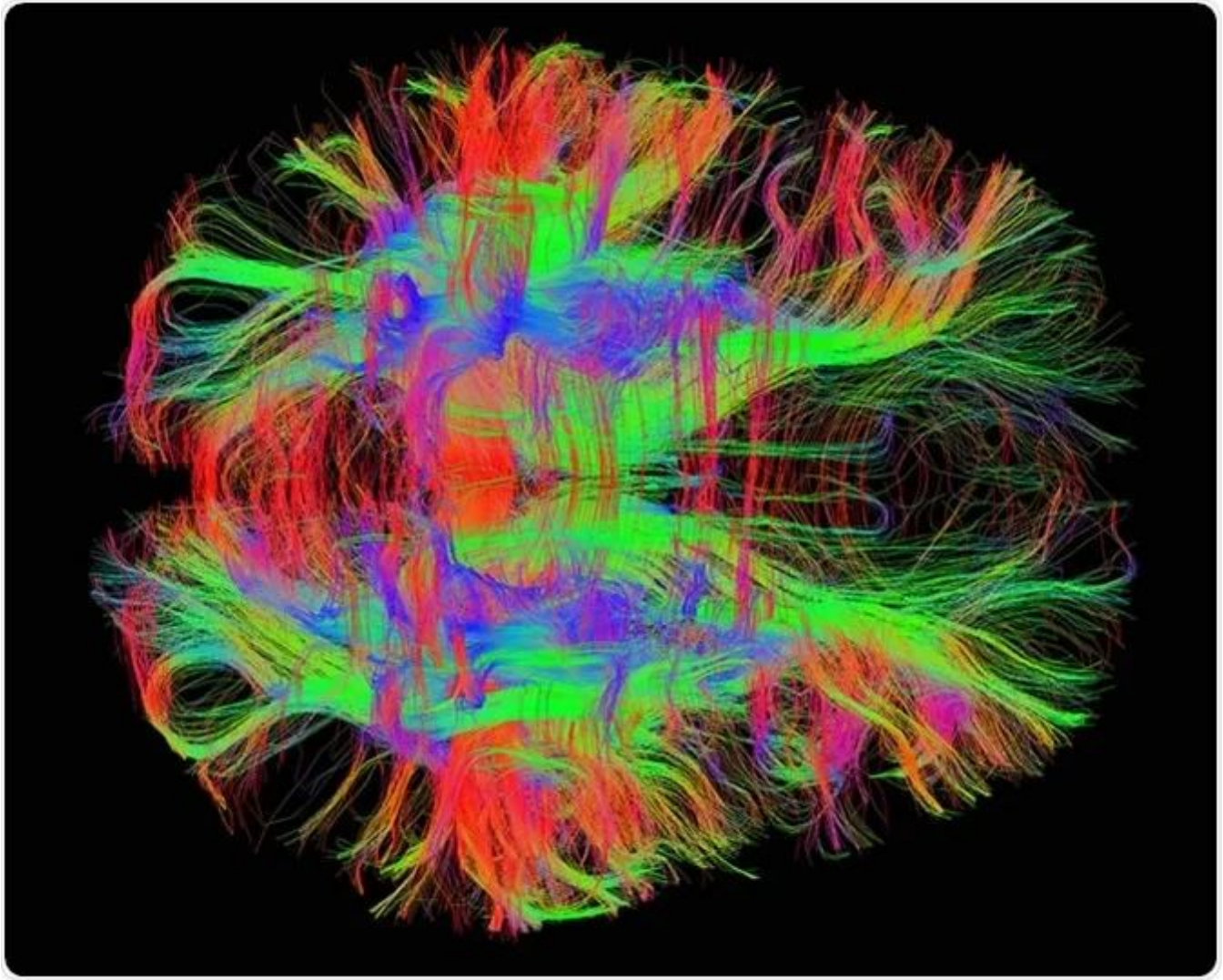
Summary: A groundbreaking study demonstrates that Diffusion Tensor Imaging (DTI) can effectively detect premalignant pancreatic lesions, potentially leading to earlier diagnosis and improved treatment strategies

What is DTI?

DTI technique was first introduced by Peter Basser in 1994.

It is an improved version of conventional MRI wherein signals are solely generated from the movement of water molecules.

The term ‘diffusion’ denotes random thermal motion of water molecules. In other words, DTI uses the diffusion of water as a probe to determine the anatomy of a brain network, which basically provides information on static anatomy that is not influenced by brain functions.



The diffusion of water molecules in a tissue is not the same in all direction (anisotropic diffusion) due to tissue heterogeneity. This anisotropy (directional dominance of water diffusion within a region) is used in DTI to determine the nerve cell organization in the brain.

The basic principle depends on the fact that water molecules should move faster along the axon fiber instead of moving upright to the fiber because obstructions present along the fiber are comparatively lesser to restrict its movement.

Based on the axonal orientation, anisotropic diffusion can produce completely new image contrast, which is very useful in visualizing important brain structures.

Bovine H5N1 displays pronounced neurotropism in many mammals

Pronounced neurotropism of the 2024 H5N1 virus belonging to the 2.3.4.4b clade is highlighted by high viral loads in the brain and minimal or no viral presence in the lungs of several species, suggesting a significant shift in virus behaviour

R. Prasad

A study investigated and compared the tissue tropism of a 2004 H5N1 strain isolated from a fatal human case and the 2024 bovine strain of H5N1 that is currently circulating in mice and found that the two strains displayed significantly different abilities to infect different tissues. While replication of the 2004 virus was largely in the respiratory tract with "limited" replication in the central nervous system, the 2024 bovine strain successfully replicated in the respiratory tract as well as various regions of the brain. Also, mice challenged with the 2024 bovine H5N1 isolates exhibited clinical signs consistent with central nervous system infection, and infectious viruses were detected in the brain tissue. The 2004 H5N1 virus was used for comparison as the virus strain has been extensively studied in animal models.

The study demonstrated that both the 2004 and the 2024 H5N1 isolates were uniformly fatal in mice when infected through aerosol exposure. But the tissue tropism was vastly different – the 2004 strain was largely restricted to the respiratory tract and predominantly caused respiratory disease, while the 2024 bovine strain showed preference to both the respiratory tract and the brain and caused inflammation in the brain and nasal cavity.

"Our findings reveal that the bovine isolate exhibits enhanced neurotropism, unlike the respiratory-restricted replication observed with the H5N1 isolate from 2004. This difference in tissue tropism, accompanied by distinct cytokine responses in the brain, underscores the potential for altered disease outcomes in other mammalian hosts," the authors of a study posted in a preprint server BioRxiv write. Preprints are yet to be peer-reviewed.

The H5N1 clade 2.3.4.4b has caused widespread infection in over 90 species of wild and domestic birds and more than 21 mammalian species, including several human infections. The virus has caused fatal infections in many different mammals. In March 2024, the 2.3.4.4b clade was first detected in dairy cattle in Texas. The virus has since spread rapidly; as of December 12, the virus has spread to 832 cattle herds across 16 States in the U.S., with 617 herds in California alone.

Mice were exposed to one of the two H5N1 isolates via aerosols to mimic a more natural route of infection. Upon exposure, mice in both groups displayed reduced activity, rapidly lost weight, and died. While the mice exposed to the 2024 bovine strain showed neurological signs of disease, neurological disease was absent in mice exposed to the 2004 isolate. Therefore, unsurprisingly, the virus titers were high in the brain tissue of mice exposed to the bovine strain compared with mice exposed to the 2004 strain.

'Heavily linked'

In April this year, 10 cats died in a rural South Dakota residence, showing respiratory and neurological symptoms. Lab testing of two cats confirmed H5N1 clade 2.3.4.4b infection. As per a paper accepted for publication in the journal *Emerging Microbes & Infections*, dead cats showed systemic infection with lesions and viral antigens in multiple organs. "Higher viral RNA and antigen in the brain indicated pronounced neurotropism," they write.

The authors note that while earlier H5N1 clades in cats caused subclinical infections or clinical disease characterised by pneumonia and encephalitis, the 2.3.4.4b H5N1 virus strain has also been "heavily linked to respiratory and neurological signs in cats in France, Poland, South Korea, and the U.S.".

The authors note that animals infected with clade 2.3.4.4b H5N1 viruses commonly exhibited pneumonia and meningoencephalitis, with neurological signs predominating in several animal species. Mammals such as dolphins, skunks, minks, red foxes, and sea lions have displayed significant neurological signs such as tremors, convulsions, and ataxia, with viral presence mainly in the brain. "Though neurotropism and neurological signs were observed during the outbreaks of previous clades of H5N1 viruses, the pronounced neurotropism of the current H5N1 clade 2.3.4.4b is highlighted by high viral loads in the brain and minimal or no viral presence in the lungs of several species, suggesting a significant shift in virus behaviour," they write.

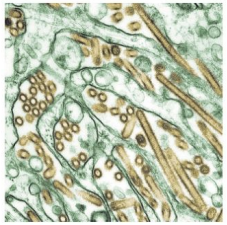
It must be noted that unlike in mice, central nervous system involvement has not yet been reported for dairy cows, either via natural or experimental infection by the bovine H5N1 strain (2.3.4.4b clade). The H5N1 transmission within and between cattle herds is hypothesised to be associated with milking practices. In cows, the H5N1 virus replication has been limited to the mammary glands when lactating cows were inoculated via the mammary gland.

Notable shift

"The growing list of susceptible mammalian hosts highlights the virus's ability to cross species barriers, raising concerns about its potential impact on wildlife and domestic animal populations," the authors of the accepted paper write. "There is a notable shift in the neurotropism of H5N1 viruses, particularly with the emergence of clade 2.3.4.4b in cats and wild carnivores like foxes... These cases have documented viral adaptations that facilitate central nervous system involvement, with some infections exhibiting viral mutations indicative of enhanced neurotropism."

Shift in tissue tropism

Replication of the 2004 H5N1 isolate was largely in the respiratory tract with "limited" replication in the central nervous system



The clade 2.3.4.4b of 2024 H5N1 virus has spread to 832 cattle herds across 16 States in the U.S. CYNTHIA GOLDSMITH

- The H5N1 clade 2.3.4.4b has caused widespread infection in over 90 species of wild and domestic birds and more than 21 mammalian species, including several human infections
- Unlike the 2004 H5N1 virus, the 2024 bovine strain successfully replicates in the respiratory tract as well as various regions of the brain in mice
- Mice exposed to the 2024 bovine isolate exhibited clinical signs consistent with central nervous system infection; infectious viruses detected in the brain tissue
- Aerosol exposure to 2004 and 2024 H5N1 strains was uniformly fatal in mice
- The difference in the tissue tropism of the 2024 bovine isolate underscores the potential for altered disease outcomes in other mammalian hosts
- The 2.3.4.4b clade of H5N1 virus is strongly linked to respiratory and neurological signs in cats
- Dolphins, skunks, minks, red foxes, and sea lions have displayed significant neurological signs and viral presence mainly in the brain

Topic → Neurotropism

🧠 Neurotropism refers to the affinity of certain viruses or pathogens for nerve cells.
🔬 It plays a significant role in the pathogenesis of various neurological diseases.

🦠 Viruses such as rabies and herpes simplex exhibit neurotropism, affecting the nervous system.

🧬 Understanding neurotropism can aid in developing targeted therapies for neurological conditions.

📊 Research in neurotropism contributes to the broader field of neurovirology.

🧪 Neurotropic factors are substances that influence the growth and survival of neurons.

🌍 Neurotropism is a critical area of study in both basic and clinical neuroscience.

Summary: Neurotropism is the tendency of certain pathogens to target nerve cells, impacting neurological disease understanding and treatment.

In session: Rajya Sabha Chairman Jagdeep Dhankhar conducts the House proceedings on November 25. PTI

Can the Vice President be impeached?

Why did the Opposition submit a notice to move a no-confidence motion against Vice President Jagdeep Dhankhar?

Aaratrika Bhaumik

The story so far:

On December 10, the Opposition submitted a notice to move a no-confidence or impeachment resolution against Vice President and Rajya Sabha Chairman Jagdeep Dhankhar. The notice accuses him of engaging in "partisan" conduct and being an "impassioned spokesperson" of the government's policies at public fora. A similar motion had been considered by the Opposition during the Budget session in August but was ultimately shelved as the session drew to a close.

What is the procedure for impeaching the Vice President?

As the second-highest constitutional authority (after the President), the Vice-President draws his or her powers from Article 63 of the Constitution. Article 64 further confers upon the post the power to serve as the "ex-officio Chairman of the Council of States (Rajya Sabha)." Thus, the Vice-President discharges the duties of both the Vice-President and Chairperson of the Rajya Sabha.

'The resolution can only be considered for discussion once the constitutionally mandated 14-day notice period has elapsed'

The process for the removal of both the Vice President and Rajya Sabha chairperson has been laid down under Article 67. The provision stipulates that the Vice-President will hold office for a term of five years from "the date on which he enters upon his office". However, he or she may leave mid-term by submitting a resignation letter to the President.

Additionally, Article 67(b) provides for the removal of the Vice-President if a majority of Rajya Sabha members pass a resolution to that effect, which must then be "agreed to" by the House of the People (Lok Sabha).

However, the provision specifies that no such resolution can be moved unless at least a 14-day notice has been given. "The resolution can only be considered for discussion once the constitutionally mandated 14-day notice period has elapsed. It must then be approved by a simple majority in both Houses for passage and implementation," P.D.T. Achary, former Secretary General of the Lok Sabha, told *The Hindu*.

Will the no-confidence motion be taken up?

It is unlikely that the no-confidence motion will be taken up for discussion in the House since the Winter Session of Parliament is scheduled to conclude on December 20, which is less than 14 days away.

For instance, in 2020 then Rajya Sabha Chairman M. Venkaiah Naidu dismissed a no-confidence motion against Deputy Chairman Harivansh on the ground that it required a 14-day notice. Even if the motion is taken up in the House, it is unlikely to yield any result since the Opposition lacks the requisite numbers for its passage. Ultimately, this move appears to be more of a symbolic protest against Mr. Dhankar's purported partisan conduct.

"Since it is a constitutional resolution, it does not lapse when the session is prorogued. It can be taken up in the next session of Parliament, or even in a special session convened specifically for that purpose," Mr. Achary clarified.

Can the Vice President preside over the motion in the Upper House?

Notably, even if the motion is taken up in the House and the Opposition's grievances are discussed, it would be difficult for Mr. Dhankhar to preside over those proceedings in the Rajya Sabha. Mr. Achary pointed out that Article 92 of the Constitution explicitly bars the Chairman or Deputy Chairman from presiding over proceedings while a resolution for their removal is under consideration. However, the provision permits the Chairperson to speak and participate in the proceedings although he or she is barred from voting "on such resolution or any other matter" during it.

These provisions however come into effect only if the motion is accepted by Deputy Chairperson Harivansh Narayan Singh.

Topic → The Political Landscape: A No-Confidence Motion Against Vice President Jagdeep Dhankhar

Introduction

Politics can often feel like a high-stakes game of chess, where every move is calculated and every piece has its role. Recently, the Opposition has made a bold move by submitting a notice for a no-confidence motion against Vice President and Rajya Sabha Chairman Jagdeep Dhankhar. This article dives into the details of this political maneuver, the accusations against Dhankhar, and the procedures involved in such a significant action.

The Opposition's Move

Background of the Notice

On December 10, the Opposition took a stand, accusing Dhankhar of being an “impassioned spokesperson” for the government’s policies. This isn’t the first time such a motion has been considered; a similar attempt was made during the Budget session in August but was ultimately shelved. So, what’s the driving force behind this renewed effort?

Accusations Against Dhankhar

Partisan Conduct

The crux of the Opposition's argument lies in the claim that Dhankhar has engaged in partisan conduct. They argue that as the Vice President, he should remain neutral, yet they perceive him as favoring the government’s stance in public forums. This raises questions about the integrity of his position and the expectations of impartiality that come with it.

The Impeachment Procedure

Constitutional Provisions

Understanding the impeachment process is crucial. The Vice President's powers are derived from Article 63 of the Constitution, while Article 64 designates him as the ex-officio Chairman of the Rajya Sabha.

Article 63 and 64 Explained

Article 63 establishes the Vice President as the second-highest constitutional authority, while Article 64 outlines his role in the Rajya Sabha. This dual responsibility adds complexity to the impeachment process.

Article 67: The Removal Process

According to Article 67, the Vice President serves a five-year term but can resign or be removed. The removal process requires a majority vote from the Rajya Sabha, which must also be approved by the Lok Sabha. However, a 14-day notice is mandatory before any resolution can be moved.

The Timeline of Events

Previous Attempts at Impeachment

The political landscape is not new to such attempts. The Opposition's previous motion during the Budget session serves as a reminder of the ongoing tensions between the government and its critics.

Will the Motion Be Discussed?

The 14-Day Notice Rule

With the Winter Session of Parliament concluding on December 20, time is of the essence. The 14-day notice rule poses a significant hurdle, making it unlikely that the motion will be discussed in this session.

Historical Context

Previous No-Confidence Motions

Historically, no-confidence motions have been a tool for the Opposition to express dissent. For instance, in 2020, a motion against Deputy Chairman Harivansh was dismissed due to the same notice requirement.

The Role of the Vice President

Duties and Responsibilities

The Vice President's role is multifaceted, serving not only as the second-highest constitutional authority but also as the Chairman of the Rajya Sabha. This dual role complicates the dynamics of the current situation.

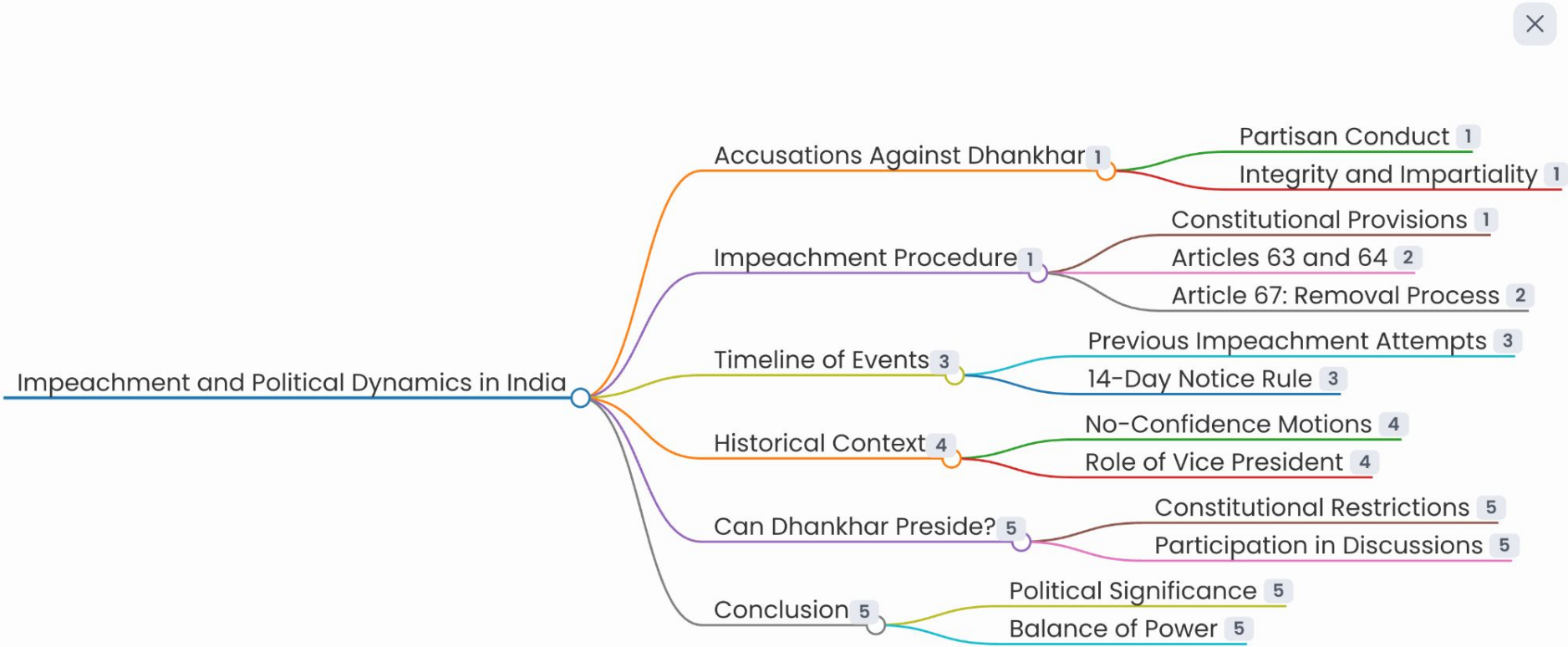
Can Dhankhar Preside Over the Motion?

Constitutional Restrictions

Article 92 of the Constitution explicitly bars him from doing so while a resolution for his removal is under consideration. However, he can still participate in discussions, albeit without voting rights.

Conclusion

The no-confidence motion against Vice President Jagdeep Dhankhar is a significant political event that highlights the ongoing tensions in Indian politics. While the procedural hurdles may prevent immediate action, the implications of this move are far-reaching. It serves as a reminder of the delicate balance of power and the expectations of impartiality in high office.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How can gene therapy cure haemophilia A?

What is replacement theory and how effective is it as a form of treatment for haemophiliacs? What is Roctavian? How is using a lentivirus as the vector in gene therapy different from using an adenovirus? Are medicines for treating haemophilia affordable and accessible?

Jacob Koshy

The story so far:

Medical researchers at the Christian Medical College, Vellore have reported successfully applying gene-therapy to treat severe haemophilia A, a rare, hereditary condition that results from a faulty gene which triggers severe, spontaneous and fatal bleeding episodes.

What is the usual treatment?

The primary approach to treating haemophilia is called replacement therapy. As the disease is a condition resulting from low levels of clotting factor – necessary to prevent bleeding – replacement therapy involves slowly dripping, or injecting into a vein, concentrates of clotting factor VIII (for haemophilia A) or clotting factor IX (for haemophilia B). Clotting-factor concentrates can be derived and manufactured from human blood, which must be properly tested and screened to prevent the spread of diseases, such as hepatitis. It is also possible to use clotting-factor concentrates that aren't made from human blood reducing, the albeit very small risk, of contracting diseases from injecting blood. These are called recombinant clotting factors and can be easily stored, mixed, and used at home. Haemophiliacs can regularly inoculate themselves with replacement therapy to prevent bleeding, and is meant to protect against unexpected bleeding episodes. Among the challenges with clotting factors is that the body's own antibodies can destroy the clotting factor before it has a chance to work and defeats the whole idea of replacement therapy. Other forms of treatment include desmopressin (DDAVP), a man-made hormone used to treat people who have mild haemophilia A. DDAVP isn't used to treat haemophilia B or severe haemophilia A. This hormone increases the level of clotting factor in the blood.

A March 2024 study estimates the per-patient cost of treating a haemophiliac in India to be $3,00,000 over a 10-year period

GETTY IMAGES

What is gene therapy in haemophilia?

Among the emerging approaches to fix diseases such as haemophilia, which is due to a defective gene on the X chromosome, is gene therapy. Here copies of a 'corrected' gene are introduced into the cells of a patient, the idea being that this would result – in the case of haemophilia – normal expression of the necessary clotting factor. So far there is only one U.S. Food And Drug Administration-approved gene therapy for haemophilia. Called Roctavian, it is an adeno-associated virus vector-based gene therapy and approved only in 2023 for treating adults with severe haemophilia A, and that too only for those without pre-existing antibodies to adeno-associated virus. Roctavian consists of a viral vector carrying the necessary gene for clotting Factor VIII. The gene is expressed in the liver to increase blood levels of FVIII and reduce the risk of uncontrolled bleeding. The effectiveness of the treatment was established based on results from 112 patients followed up for at least three years after Roctavian treatment. Following the infusion, the mean, annualised bleeding rate decreased from 5.4 bleeds per year at baseline to 2.6 bleeds per year. The majority of patients who received Roctavian also got corticosteroids to suppress the immune system for the gene therapy to be effective and safe. Treatment response to Roctavian may decrease over time.

How was the Vellore trial different?

The main difference in this approach is the use of a lentivirus as the vector, instead of an adenovirus. Because adenovirus infections are fairly common in people, the chances of having antibodies are fairly high and this could actually be counter-productive to those using treatments such as Roctavian. Lentivirus infections being less common, it is expected that fewer people will have antibiodies to them, making them more effective in treatment. Further the Indian approach relies on gene transfer into adult stem cells with the lentiviral vector that integrates with the body's cells instead of in vivo transfer to a hepatocyte, or a liver cell, through a non-integrating AAV vector. The advantage of this approach is expected to be a reliable, life-long production of the clotting factor in necessary quantities without side-effects. Though tested in only five patients in Vellore, none of them reported bleeding episodes over an average follow-up period of 14 months.

Is haemophilia treatment affordable?

A March 2024 research study in the journal *Heliyon*, estimates the per-patient cost of treating a haemophiliac in India to be $3,00,000 over a 10-year period. Based on various estimates, there may be about 1,00,000 haemophiliacs with type A and type B conditions, with the former being more common. This is the reason why treatments can be expensive. Roctavian is also not cheap and costs nearly $2 million. Whether the gene-therapy product tested in the India will be affordable remains to be seen, though that is the hope. "It is too early to talk about costs but in principle it will need to be something that will make sense in the Indian healthcare system," Dr. Alok Srivastava, Head, Haematology Research Unit, St John's Research Institute, Bangalore, told *The Hindu*. He led the trial at Vellore.

Topic → Gene Therapy for severe Hemophilia A

Gene Therapy Breakthrough for Severe Hemophilia A at Christian Medical College, Vellore

In a groundbreaking development, medical researchers at the Christian Medical College in Vellore have successfully applied gene therapy to treat severe hemophilia A. This rare hereditary condition is caused by a faulty gene that leads to severe, spontaneous, and potentially fatal bleeding episodes. Let's dive into what this means for patients and the future of hemophilia treatment.

Understanding Hemophilia A

To appreciate the significance of this breakthrough, we first need to understand hemophilia A.

What is Hemophilia A?

Hemophilia A is a genetic disorder that affects the blood's ability to clot. It primarily affects males and is caused by a deficiency in clotting factor VIII. Without enough of this factor, even minor injuries can lead to excessive bleeding.

Symptoms and Risks

Symptoms include prolonged bleeding after injuries, spontaneous bleeding episodes, and joint pain due to internal bleeding. The risks associated with hemophilia A can be life-threatening, making effective treatment crucial.

Traditional Treatments for Hemophilia

Historically, the primary approach to treating hemophilia has been replacement therapy.

Replacement Therapy Explained

Replacement therapy involves infusing clotting factor concentrates into the bloodstream to help the blood clot properly. This is typically done through slow drips or injections.

Clotting Factor VIII and IX

For hemophilia A, patients receive clotting factor VIII, while those with hemophilia B receive factor IX. These concentrates can be derived from human blood or produced using recombinant technology.

Challenges with Replacement Therapy

One of the significant challenges with replacement therapy is that the body can develop antibodies that destroy the infused clotting factors, rendering the treatment ineffective.

Other Treatment Options

Other treatments include desmopressin (DDAVP), a synthetic hormone that can temporarily increase clotting factor levels in patients with mild hemophilia A. However, it is not suitable for severe cases or hemophilia B.

hemophilia.

The Role of Gene Therapy in Hemophilia

Gene therapy is an emerging approach that offers hope for a more permanent solution to

What is Gene Therapy?

Gene therapy involves introducing a corrected version of a faulty gene into a patient's cells, aiming to restore normal function. In the case of hemophilia, this means producing adequate levels of clotting factor VIII.

FDA-Approved Gene Therapy: Roctavian

The only FDA-approved gene therapy for hemophilia A is Roctavian, which uses an adeno-associated virus vector to deliver the necessary gene. While it has shown promise, it is only approved for adults without pre-existing antibodies to the virus.

The Vellore Trial: A New Approach

The recent trial at Vellore marks a significant shift in gene therapy methodology.

Differences in Methodology
Unlike Roctavian, the Vellore trial utilized a lentivirus as the vector. This is crucial because lentivirus infections are less common, meaning fewer patients will have pre-existing antibodies that could hinder treatment effectiveness.

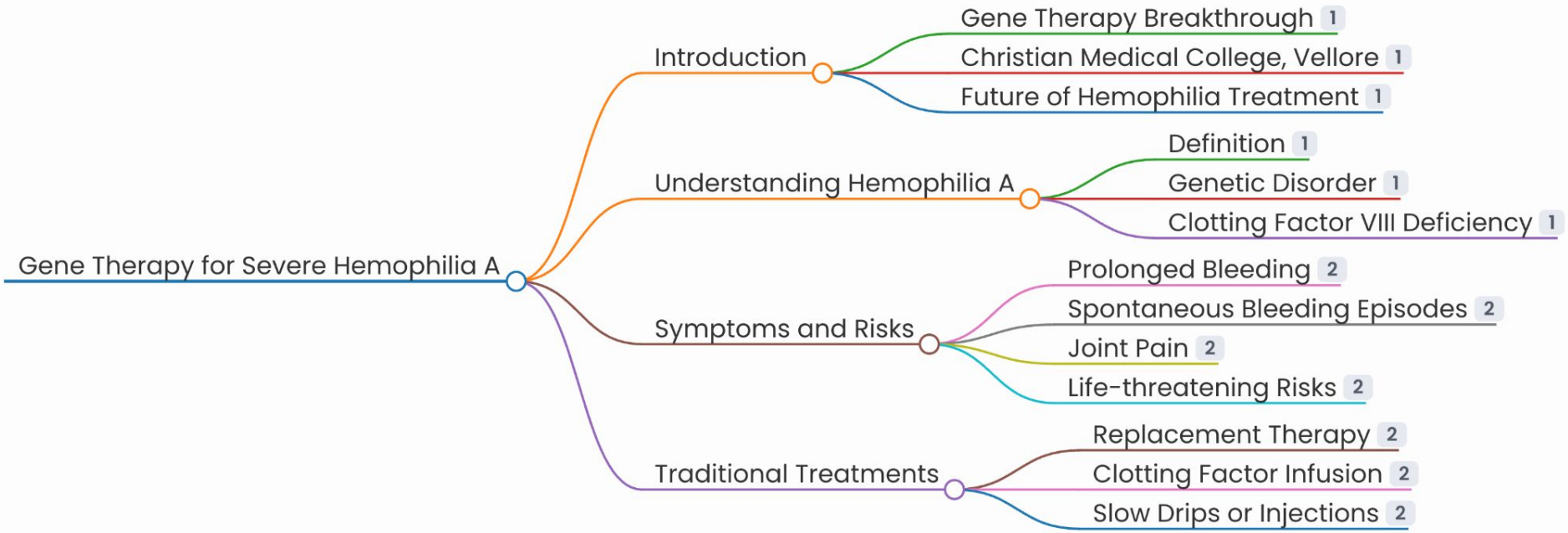
Results from the Vellore Trial
In the trial, five patients were treated, and none reported bleeding episodes over an average follow-up period of 14 months. This suggests a promising future for this approach.

The Cost of Hemophilia Treatment
While advancements in treatment are exciting, the financial implications cannot be ignored.

: Financial Implications in India
A recent study estimated that treating a hemophiliac in India could cost around $300,000 over ten years. With approximately 100,000 hemophiliacs in the country, the financial burden is significant. Roctavian itself costs nearly $2 million, raising concerns about accessibility.

Conclusion

The successful application of gene therapy for severe hemophilia A at Christian Medical College, Vellore, represents a significant leap forward in treatment options. While challenges remain, particularly regarding cost and accessibility, the hope is that this innovative approach will lead to more effective and affordable treatments for patients in the future.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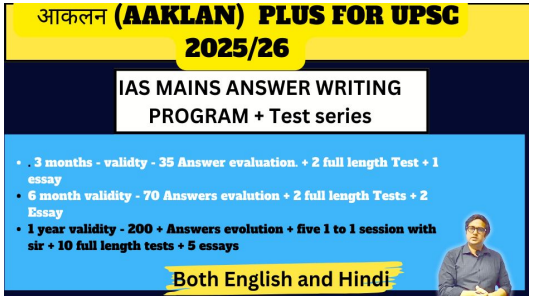
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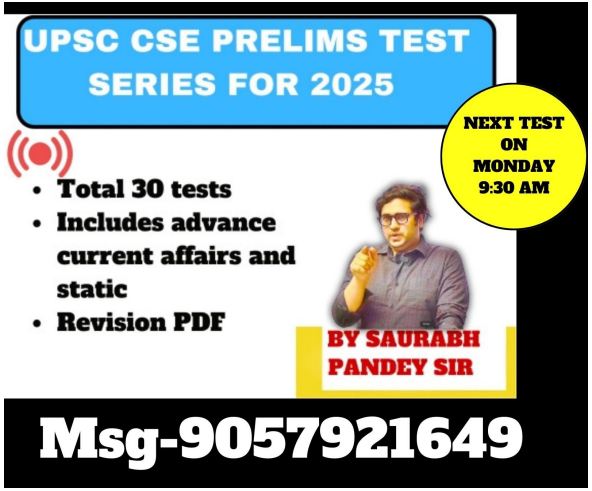
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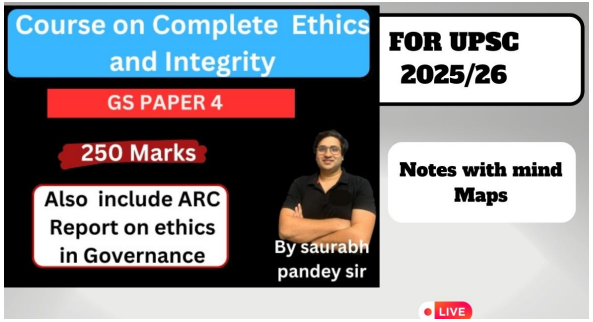
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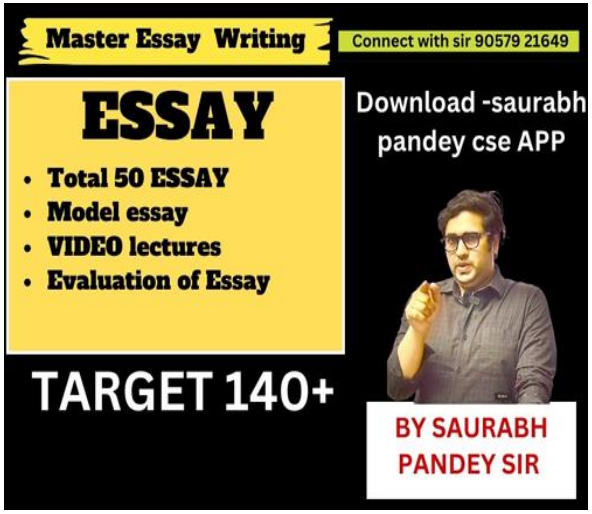
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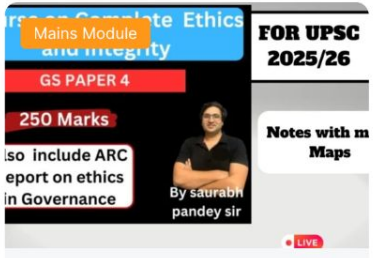

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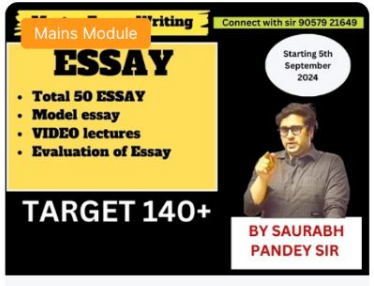

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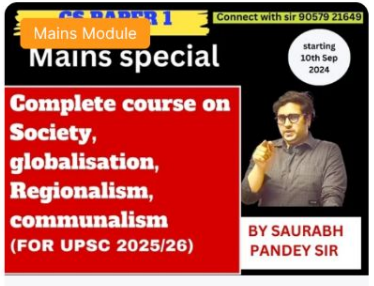

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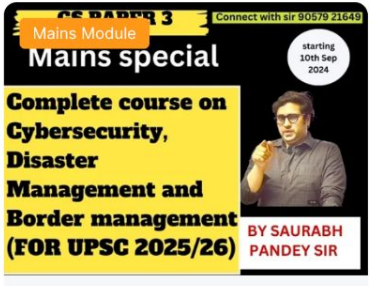

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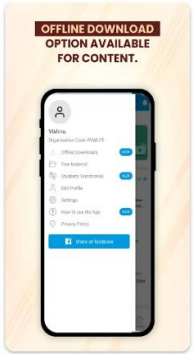

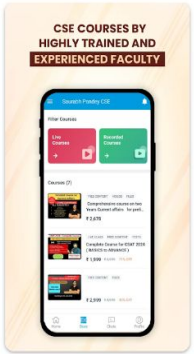

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