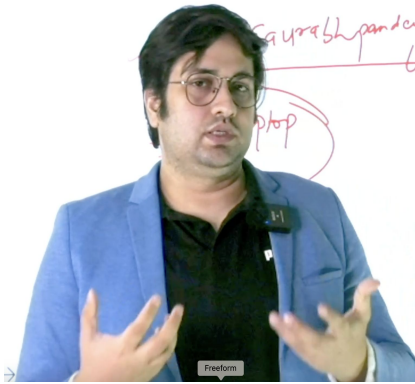
Topics - MINDS MAPS included (Daily current affairs)-- 28th & 27th October 2024

- Supreme Court Ruling on Intoxicating Liquors
- Aviation Security Overview
- Hematopoietic Stem Cell Transplant Study
- DNA Analysis
- Ocean Surface Temperature and Carbon Dioxide Absorption.
- Mini-Protein for Targeted Cancer Treatment
- Animal Evolution in Response to Human Impact
- Avian Influenza H5N1 Outbreak
- Mains



By saurabh Pandey

THE HINDU

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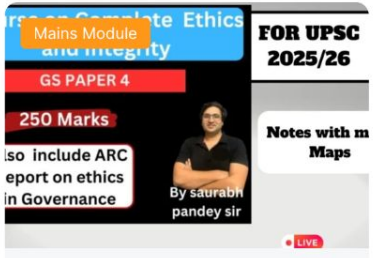

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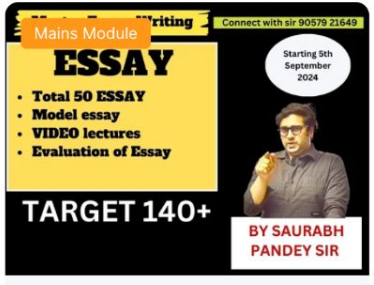

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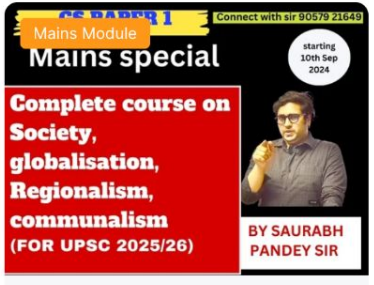

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Topic -- Supreme Court Ruling on Intoxicating Liquors

Key Highlights

🏛️ Supreme Court Ruling: Clarification that 'intoxicating liquors' in the State List includes both potable and industrial alcohol.

⚖️ Federal Principle: Reinforces the federal principle of power distribution, ensuring States retain control over alcohol regulation.

🍷 Scope of Entry 8: Encompasses all activities related to the production, sale, and distribution of various alcohol products.

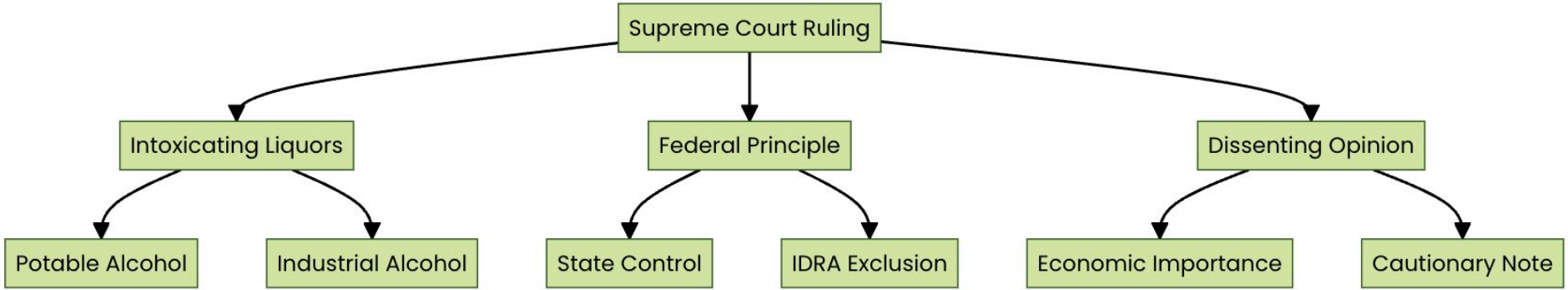
📜 IDRA Exclusion: Excludes 'intoxicating liquor' from the regulatory purview of the Industries (Development and Regulation) Act (IDRA), 1951.

- 🗳️ Dissenting Opinion: Justice B.V. Nagarathna argues 'intoxicating liquor' should only refer to potable alcohol, suggesting Parliament has control over fermentation industries.

💼 Economic Importance: Highlights the significance of industrial alcohol for the economy, particularly in the chemicals industry and as a fuel additive.

⚠️ Cautionary Note: Warns against misinterpreting the Constitution in a way that could disrupt the federal balance of power.

Conceptual Overview:



Summary: The Supreme Court of India ruled that 'intoxicating liquors' includes both potable and industrial alcohol, reinforcing state powers over alcohol regulation while a dissenting opinion cautioned against misinterpretation of constitutional terms.

What is the flight protocol for a bomb threat?

What has been the loss incurred by Indian aviation due to frequent security threats? What are the Standards and Recommended Practices to tackle this? Who sets up and monitors aviation guidelines? Can existing laws be tweaked to hand out more stringent punishment to offenders?

Murali N. Krishnaswamy

The story so far:

Over nearly two weeks, almost all Indian carriers including the Tata group airlines – Air India, Vistara, and Air India Express – as well as IndiGo, Alliance Air, and Star Air have faced a wave of threats, resulting in emergency responses and rerouting. There has been military fighter jet interception of some of the flights when they were in international airspace after the crew squawked an emergency transponder code. While all the threats have been determined to be a hoax, they have still led to significant flight delays and financial losses to the airlines, about ₹13 lakh-₹17 lakh an hour.

What do we know about the threats?

According to the Union Civil Aviation Minister, Kinjarapu Rammohan Naidu, most threats have been through social media. Intelligence agencies are looking into the issue and there is a strong possibility of cases being registered. As the threats are largely of an online nature, the tracking of IP addresses and virtual private network use are in focus. The Minister added that even if intuition was that it could be a hoax, nothing was being left unchecked. India has nearly 4,000 flight operations in a day, he said, and within the timeline since the threats began, this would mean over 275 threats for 48,000 flights. He said that efforts were on to make changes in the aviation laws in order to have a strong framework in place. There has been one detention so far – of a teenager who made hoax calls. Representatives of some of the social media platforms concerned have indicated that they are "committed to crack down on terror threats being made against Indian flights".

'Tackling hoax calls will require a lot of investment in technology such as advanced call tracking systems'

Disruption: An Air India flight that made an emergency landing in Thiruvananthapuram, on August 22, after a bomb threat. NIRMAL HARINDRAN

What is the aviation security architecture?

Almost all the main security guidelines and directives are rooted in the International Civil Aviation Organization's (ICAO) Annex 17-Aviation Security (Restricted). An ICAO spokesperson told *The Hindu* that the formulation and adoption of Standards and Recommended Practices (SARPs) for international civil aviation are important, which are detailed in technical annexes to the Convention on International Civil Aviation – also called the Chicago Convention. The ICAO has measures against acts of 'unlawful interference against civil aviation throughout the world'. The SARPs for international aviation security form Annex 17 to the Chicago Convention.

There is also the ICAO Aviation Security Manual (Doc 8973-Restricted) which assists ICAO member-states. The spokesperson said that Annex 17 and Doc 8973 are under constant review keeping in mind new threats and evolving technological developments. The spokesperson added that there are restrictions to the information on (member-) state discussions regarding the evolution of security matters, the resulting assessments, and the associated mitigation measures. Specific ICAO guidance on security matters is restricted.

In India, the nodal agency concerned is the Bureau of Civil Aviation Security. Its main responsibility is to have in place standards and measures for the security of civilian flights. The Directorate General of Civil Aviation (DGCA) is concerned with safety. Other agencies involved, directly and indirectly, include the Airports Authority of India; the Central Industrial Security Force; the National Security Guard; the Intelligence Bureau; the Research and Analysis Wing; the Ministry of Home Affairs, and the higher judiciary.

In the context of the threats, amendments could be planned to the Aircraft Act 1934, the Aircraft Rules 1937, and subordinate pieces of legislation to ensure stringent punishment and placing offenders on a 'no-fly list'. The Minister highlighted planned amendments to the Suppression of Unlawful Acts against Safety of Civil Aviation Act, 1982, which would allow legal action even when the aircraft is on the ground. Regulations now focus on in-flight incidents.

An official said that in every airport, the operator, airlines, and security agencies have procedures to handle security threats based on approved documents. He said, "Every airport is prepared to handle such situations as the procedures are regularly tested and updated." There are specific documents but they are restricted. Contingency procedures for unusual occurrences include bomb threats (and aircraft isolation), hijacks, radio communication failure, and other emergencies associated with aircraft.

A pilot who flies the Boeing 777 aircraft says a threat is taken very seriously and there are procedures for the crew. Air traffic control agencies also have procedures.

How are threats to be handled?

An aviation security expert who served in various geographical domains has told *The Hindu* that hoax calls are of a specific or non-specific nature. While specific details about the hoax calls in the Indian context might not be publicly available, the issue has highlighted systemic issues that concern standardised procedures, guidelines, training, technological limitations, communication gaps, and regulatory challenges.

Tackling hoax calls, for instance, according to the expert, would require investment in technology such as advanced call tracking systems, AI-powered call analysis, voice stress analysis, comprehensive threat assessment, and rewards and incentives for informers. The expert says the industry must look at emerging technologies such as quantum computing, having an aviation cybersecurity framework, pitching for a global hoax call database, having AI-powered chatbots for initial threat assessment, and putting in place enhanced psychological profiling of callers.

An aviation safety expert and a former member of the Civil Aviation Safety Advisory Council suggests placing the photographs of offenders on social media and on display at airports.

TOPIC→ Aviation Security Overview

🌍 International Guidelines

ICAO's Annex 17: Establishes Standards and Recommended Practices (SARPs) for international civil aviation security.

📜 ICAO's Role

Global Security Measures: Formulates and adopts measures to combat unlawful interference in civil aviation.

🔒 Constant Review

Regular Updates: Annex 17 and the ICAO Aviation Security Manual (Doc 8973) are updated to address new threats and technological advancements.

🇮🇳 India's Security Framework

Main Agency: Bureau of Civil Aviation Security oversees civilian flight security.
Collaborating Agencies: Includes the Directorate General of Civil Aviation (DGCA) and the Airports Authority of India.

⚖️ Legislative Amendments

Enhanced Security: Proposed amendments to aviation laws aim to improve security measures and impose stricter penalties, including a 'no-fly list'.

✈️ Preparedness at Airports

Established Procedures: Airports have protocols to manage security threats, regularly tested and updated for incidents like bomb threats and hijackings.

📡 Pilot and ATC Protocols

Coordinated Response: Specific procedures for pilots and air traffic control to respond to security threats during emergencies.

Summary: The aviation security framework is guided by ICAO's guidelines, emphasizing continuous updates, national agency roles, and preparedness for various threats.

Aviation Security and Hoax Calls

Key Issues in Hoax Calls

📞 Hoax Calls: Categorized as specific or non-specific, with limited public information in India.

🛠️ Systemic Issues: Highlight systemic problems in procedures, guidelines, training, and technology.

💻 Technological Investment: Requires investment in call tracking, AI analysis, and voice stress analysis.

🌐 Emerging Technologies: Explore quantum computing and AI chatbots for threat management.

📸 Public Awareness: Suggest displaying offenders' photos on social media and airports for safety.

🔄 Regulatory Challenges: Ongoing challenges need addressing for better hoax call handling.

🏆 Incentives for Informers: Rewards for informers could aid in threat information gathering

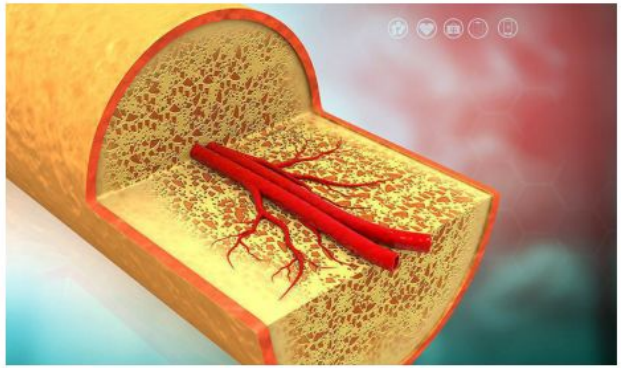
Transplant recipients demystify the fate of donated stem cells

The Hindu Bureau

A new human study involving some of the longest-living survivors of hematopoietic stem cell transplants sheds light on how transplanted stem cells from donors change after engraftment and mutate over time. The results were published in the journal *Science Translational Medicine*.

The findings, gathered from a unique group of 16 pairs of donors and recipients, suggest that the rate of mutations and clonal expansion stayed fairly similar and surprisingly low between donors and recipients for as long as 46 years after transplant. "Our data set the foundation for studying clinically relevant questions, such as the impact of donor age and preexisting donor CH [clonal hematopoiesis] on the long-term outcomes of [transplant] recipients," the authors write.

Hematopoietic stem cell transplants are life-saving procedures for people with blood cancers. After receiving a transplant, it is up to the donated stem cells to rebuild the recipient's entire blood cell-forming (or hematopoietic) machinery. This subjects the donor cells to a fair amount of replicative stress. Some scientists are concerned that this stress could lead to clonal hematopoiesis, a phenomenon where the donated stem cells acquire mutations that might one day lead to cancer or chronic diseases.



Clear image: The finding supports the immense regenerative capabilities of bone marrow. GETTY IMAGES

Rate of mutations

The researchers obtained and analysed blood samples from 16 pairs of stem cell donors and recipients, at a median time of 33.6 years after transplant. They performed whole genome sequencing with a technique called duplex sequencing, focusing on many genes that tend to be mutated in myeloid cancers and clonal hematopoiesis. This revealed that all the donors had some degree of clonal hematopoiesis variants, even in their earliest blood samples. However, the average rate of mutations in these genes was similar in donors compared to the recipients (2% vs. 2.6% per year).

This led the authors to conclude that there does not appear to be any widespread clonal expansion in stem cells even decades after transplant, a finding they say supports the immense regenerative capabilities of bone marrow.

Topic → Hematopoietic Stem Cell Transplant Study

Study Overview

🧬 A new study published in *Science Translational Medicine* explores long-term changes in transplanted stem cells from donors.
👥 The research involved 16 pairs of donors and recipients, focusing on their health up to 46 years post-transplant.

Key Findings

📉 Mutation Rates: The rate of mutations and clonal expansion remained low and similar between donors (2% per year) and recipients (2.6% per year).

🔬 Sequencing Method: Whole genome sequencing was performed using duplex sequencing, targeting genes commonly mutated in myeloid cancers and clonal hematopoiesis

⚠️ Clonal Hematopoiesis: All donors exhibited some clonal hematopoiesis variants, even in early blood samples, but no significant clonal expansion was observed.

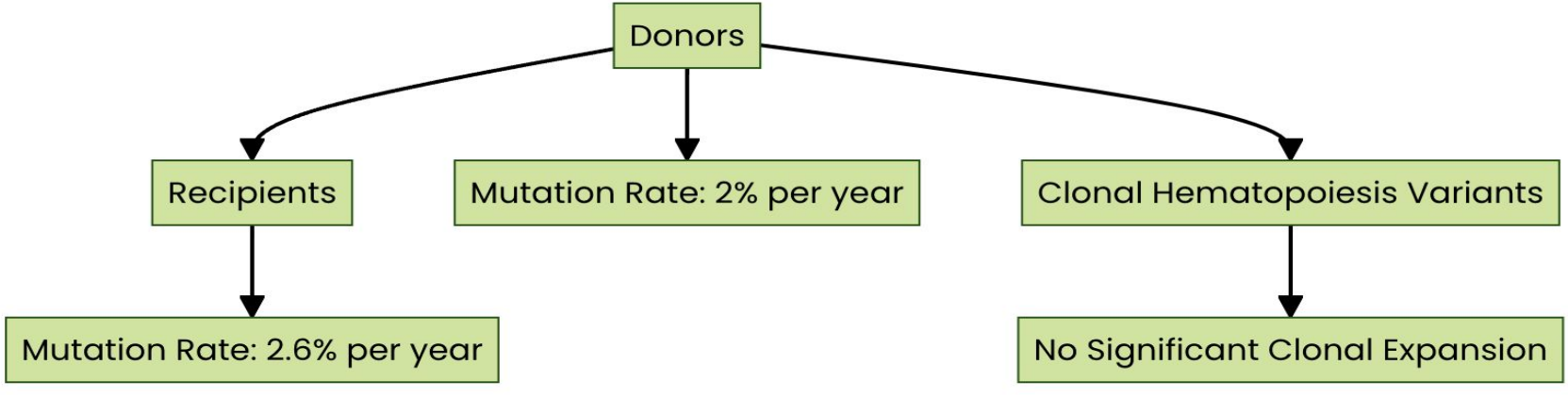
Importance of Hematopoietic Stem Cell Transplants

💉 These transplants are crucial for treating blood cancers, as they rebuild the recipient's blood cell-forming machinery.

Future Research Directions

📊 The study lays the groundwork for future research on the effects of donor age and preexisting clonal hematopoiesis on transplant outcomes.

Study Findings Overview:



Summary: A study reveals that mutations in stem cells from donors and recipients remain low even decades after hematopoietic stem cell transplants, supporting the regenerative capacity of bone marrow.

DNA analysis in newborns outperforms standard tests

Early results from a study called GUARDIAN of newborn screening methods show that DNA analysis picks up many more preventable or treatable serious health conditions than standard newborn screening. In genome sequencing, a newborn's DNA is analysed to look for hundreds of specific gene variants that are known to cause diseases. The technology has the potential to detect thousands of genetic diseases, far more than the approximately 60 disorders that standard newborn screening now detects.

Topic → DNA Analysis

Enhanced Detection: DNA analysis surpasses standard methods in identifyin genetic diseases.

Comprehensive Analysis: Genome sequencing covers a wide range of gene variants.

Potential Impact: Thousands of genetic diseases could be identified early.

Current Limitations: Standard screening is limited to about 60 disorders.

Health Benefits: Improved prevention and treatment of serious conditions.

Technological Advantage: Advanced genetic testing offers significant benefits.

GUARDIAN Study: Advancements in Newborn Screening

🧬 Early results from the GUARDIAN study indicate that DNA analysis is more effective than standard newborn screening.

👶 Genome sequencing analyzes a newborn's DNA for hundreds of specific gene variants linked to diseases.

🔍 The new technology can potentially identify thousands of genetic diseases.

⚕️ Standard newborn screening currently detects around 60 disorders.

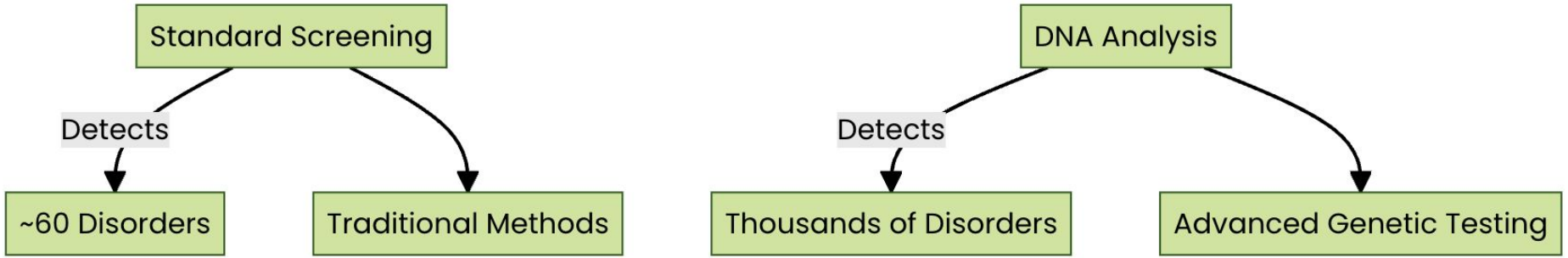
📈 The findings suggest a significant improvement in the ability to prevent or treat serious health conditions.

💡 The study highlights the advantages of advanced genetic testing over traditional methods.

🌍 This advancement could lead to better health outcomes for newborns.

Summary: The GUARDIAN study shows that DNA analysis can detect many more genetic diseases in newborns than standard screening methods.

Comparison of Screening Methods:



Cool water at ocean surface increase carbon absorption

Subtle temperature differences at the ocean surface allow more carbon dioxide to be absorbed, a study shows. Scientists studied the 'ocean skin' – a sliver less than 2 mm deep at the ocean surface – that is fractionally cooler than the rest. Theoretical and lab work suggested this difference should increase the amount of carbon dioxide absorbed by the ocean. But this had never been observed at sea before. Now researchers have confirmed that the temperature of the ocean skin aids carbon absorption.

Topic → Ocean Surface Temperature and Carbon Dioxide Absorption

Key Insights

🌊 Temperature Differences: Subtle temperature variations at the ocean surface enhance the absorption of carbon dioxide.

🔬 Focus on 'Ocean Skin': Scientists concentrated on the 'ocean skin,' a layer less than 2 mm deep at the surface.

❄️ Cooler Ocean Skin: This layer is slightly cooler than the water beneath, aiding in carbon absorption.

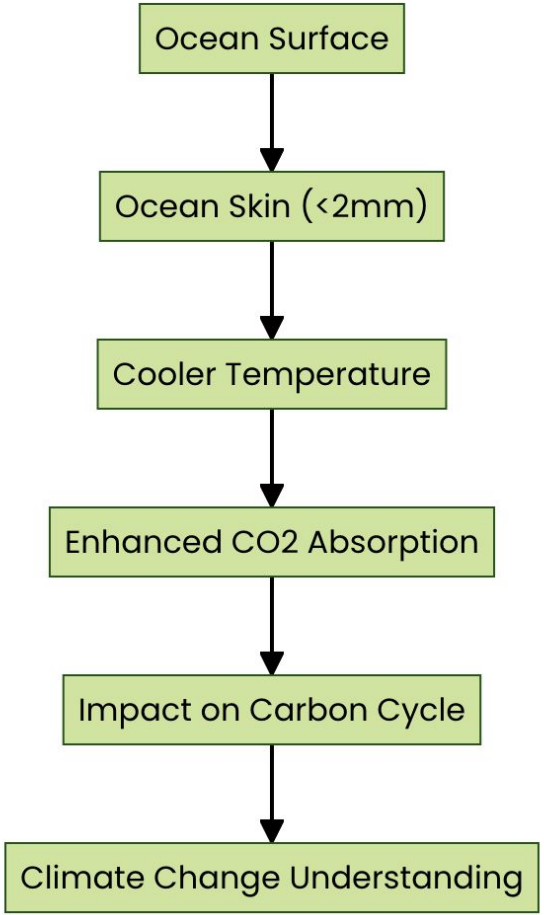
📊 Theoretical vs. Real-World: Previous studies suggested this phenomenon theoretically and in labs but lacked real-world evidence.

✅ Recent Confirmation: New research confirms that the cooler temperature of the ocean skin facilitates carbon absorption.

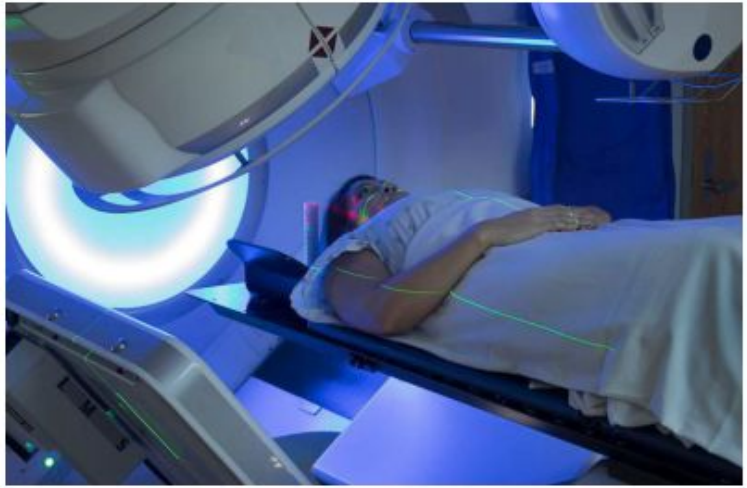
🌍 Implications: This discovery is crucial for understanding oceanic carbon cycles and climate change.

📅 Advancement in Marine Science: The study bridges the gap between theory and observation, marking a significant advancement.

Conceptual Diagram:



Summary: A study confirms that cooler temperatures in the ocean's surface layer enhance carbon dioxide absorption, supporting previous theoretical findings.



‘Mini-protein’ carries radiation dose directly to tumours

Researchers have shown for the first time that it is possible for a specially-designed ‘mini-protein’ to deliver a radiation dose directly to tumour cells expressing a protein on their cell surfaces called Nectin-4. The researchers showed that the mini-protein, also known as a ‘radiopharmaceutical’, was able to target the cancer cells specifically, while avoiding healthy tissues, and that tumours in several different cancers absorbed the radiation dose.

Topic → Mini-Protein for Targeted Cancer Treatment

🧬 Researchers have developed a mini-protein that can deliver radiation directly to tumor cells.

🎯 The mini-protein targets cells expressing the Nectin-4 protein on their surfaces.

💉 This mini-protein is classified as a radiopharmaceutical.

🚫 Healthy tissues are spared from radiation exposure, enhancing treatment safety.

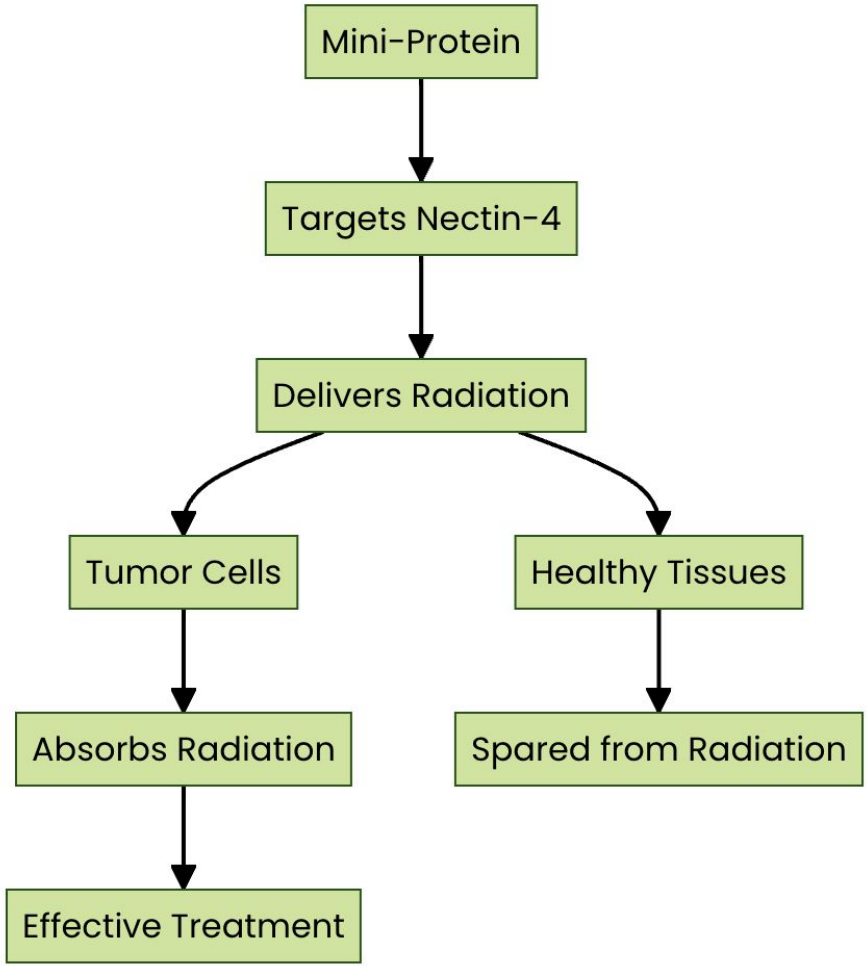
🔬 The study demonstrated effectiveness across various types of cancer.

📈 Tumors were shown to absorb the radiation dose effectively.

🌟 This marks the first successful demonstration of this targeted approach.

Summary: Researchers have created a mini-protein that effectively delivers radiation to tumor cells while protecting healthy tissues, targeting Nectin-4 expressing cancers.

Targeted Treatment Process:



Question Corner

Human factor

Is there any evidence of animal evolution in response to environmental changes caused by humans?

A new study has found that New Zealand's native stoneflies have changed colour in response to human-driven environmental changes. Researchers from the University of Otago provide arguably the world's most clear-cut case of animal evolution in response to change made by humans. They found the stonefly taking a different colour due to deforestation. Insects and small animals have evolved to achieve warning colours that mimic those of a poisonous forest species to escape from predators. The researchers found that stoneflies that mimic a related, toxic species repeatedly changed colour in response to forest loss and shifts in predation pressure. "The removal of forests since humans arrived has removed the poisonous species. As a result, in deforested regions the mimicking species has abandoned this strategy – as there is nothing to mimic – instead evolving into a different colour," Dr. Jon Waters, a co-author of the study said in a release.

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

Topic → Animal Evolution in Response to Human Impact

🦗 A study from the University of Otago highlights animal evolution in response to human-induced environmental changes in New Zealand.

🌳 Native stoneflies have changed color due to deforestation, showcasing a clear case of evolution linked to human activity.

🎨 The stoneflies evolved to mimic warning colors of a toxic species to evade predators, adapting to their changing environment.

🐍 The removal of forests has led to the disappearance of the poisonous species, prompting the stoneflies to abandon their mimicry strategy.

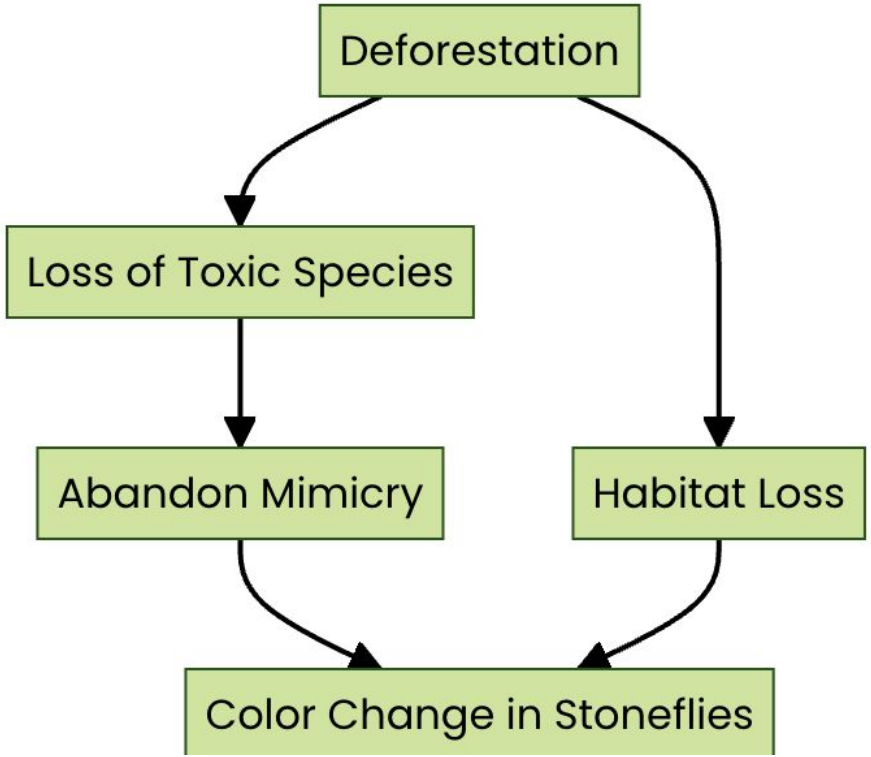
🔄 In deforested areas, stoneflies have evolved into a different color as there are no longer toxic species to mimic.

📉 The study provides evidence of how shifts in predation pressure and habitat loss can drive evolutionary changes in species.

🔬 Dr. Jon Waters, a co-author, emphasizes the significance of these findings in understanding human impact on animal evolution.

Summary: A study reveals that New Zealand's stoneflies have evolved color changes in response to deforestation caused by humans, abandoning mimicry of toxic species as their environment changes

Evolutionary Changes in Stoneflies:



What does H5N1 virus in cattle, humans portend?

Vinod Scaria
Bani Jolly

The emergence of a new clade of Avian Influenza H5N1 (2.3.4.4b) in late 2020 has led to a swift and widespread global outbreak, carried by migratory birds. Since then, the highly contagious clade has spread quickly across the world causing widespread mortality among birds. The outbreak is estimated to have killed millions of birds and the virus has infected over 200 mammalian species including humans.

A surprising twist occurred in March 2024, when avian influenza was detected in cattle in the U.S. Farmers had noticed a drop in milk production as early as January, but it was not until later that the U.S. Department of Agriculture (USDA) confirmed avian influenza H5N1 as the cause. The initial outbreak, caused by a sublineage that was identified in Texas, spread rapidly, impacting 100 herds by mid-June. It has since expanded to over 330 herds across 14 states. A preprint posted in May, which extensively analysed early genome sequences from the outbreak, suggested that the sublineage of the virus (B3.13) was likely introduced to cattle through poultry, possibly in late last year.

Remaining undetected

It remained undetected for nearly four months before being confirmed by the USDA. Recent studies in experimental settings suggest that the virus can infect cattle when administered through both aerosol and intramammary routes. With its continued spread among mammals, the outbreak shows no signs of slowing down, raising significant concerns. If the virus becomes endemic in mammals, it could create numerous opportunities for the virus to evolve and optimise its transmission.

Closed group: There has been no documented human-to-human transmission of the virus so far. AP

Human infections from the outbreak in cattle were first noted as early as April 2024 in Texas. Since then, 26 cases have been reported in California, Colorado, Michigan, Missouri, and Texas. Among them, 15 individuals had direct exposure to infected cattle, while 10 had contact with infected poultry. However, a case reported in Missouri in September had no known exposure to infected animals, and this remains a puzzle. The CDC confirmed that the Missouri patient had avian influenza A(H5N1) based on blood test results. Serology tests on close contacts did not indicate further human transmission. A household contact of the patient showed weak signs of potential exposure but did not meet the WHO criteria for confirmed infection.

There are concerns that the reported numbers may represent only a small portion of the actual cases, as human testing for the virus is not widespread, and access to tests remains limited. However, early serosurveillance studies on limited numbers of exposed individuals suggest that while the overall prevalence of H5N1 infections has been low, the risk increases with close and prolonged exposure to infected animals or contaminated environments.

According to the CDC, the risk of infection with avian influenza H5N1 for humans not directly working with cattle or poultry remains low. However, we are still navigating uncharted territory with this virus. So far, there has been no documented human-to-human transmission, and genome sequences do not show any signs of the virus adapting to spread between humans.

Despite the current calm, caution is necessary as spillover events in both cattle and humans continue to rise and the virus continues to evolve and adapt.

The wastewater surveillance programme in the US supplements conventional surveillance methods to provide early warnings. Genomic surveillance could enable timely interventions, enhance disease monitoring, and improve preparedness by identifying potential risks early, especially if the virus evolves to allow efficient human-to-human transmission.

(Vinod Scaria is a senior consultant and Bani Jolly is a senior scientist at Karkinos Healthcare)

Topic → Avian Influenza H5N1 Outbreak Overview

Emergence and Impact

🦠 Emergence of H5N1 Clade: A new clade of Avian Influenza H5N1 (2.3.4.4b) emerged in late 2020, leading to a global outbreak primarily spread by migratory birds.
🐦 Impact on Bird Populations: The outbreak has resulted in the death of millions of birds and has infected over 200 mammalian species, including humans.

Detection and Spread in Cattle

🐄 Detection in Cattle: In March 2024, avian influenza was confirmed in U.S. cattle, initially linked to a drop in milk production observed by farmers.
🌍 Spread Among Herds: The outbreak affected 100 herds by mid-June and has since expanded to over 330 herds across 14 states.

Virus Transmission and Human Cases

🔬 Virus Transmission: Studies suggest the virus likely spread to cattle from poultry and can infect cattle through aerosol and intramammary routes.

🧪 Human Cases: As of April 2024, 26 human cases have been reported, primarily linked to direct exposure to infected cattle or poultry, with one unexplained case in Missouri.

Ongoing Risks and Concerns

⚠️ Ongoing Risks: While the CDC states the risk of infection for the general public remains low, the potential for the virus to evolve and adapt raises significant concerns.

Summary: The emergence of a new H5N1 clade has led to a widespread outbreak affecting birds and mammals, including cattle and humans, with ongoing risks of evolution and transmission.

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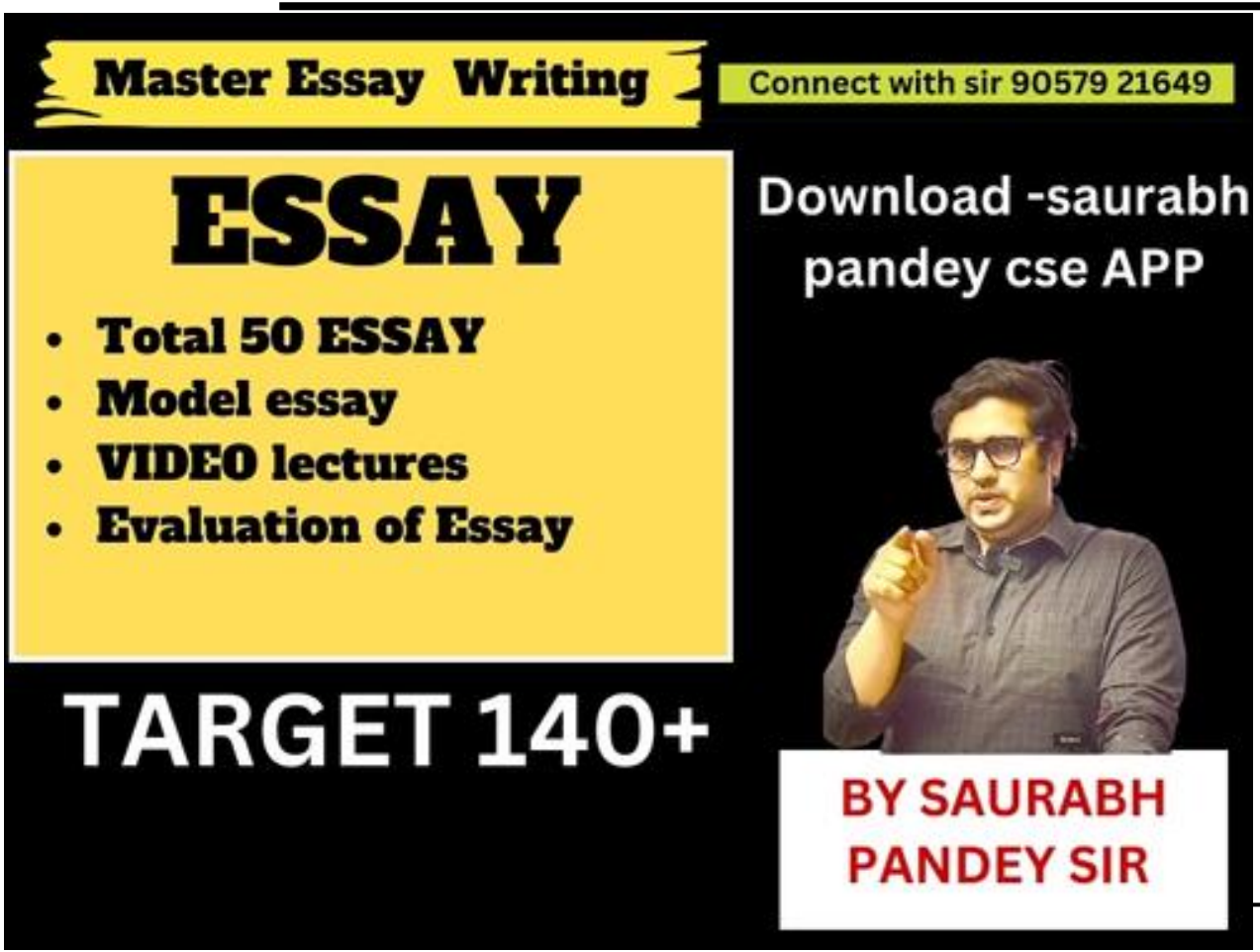
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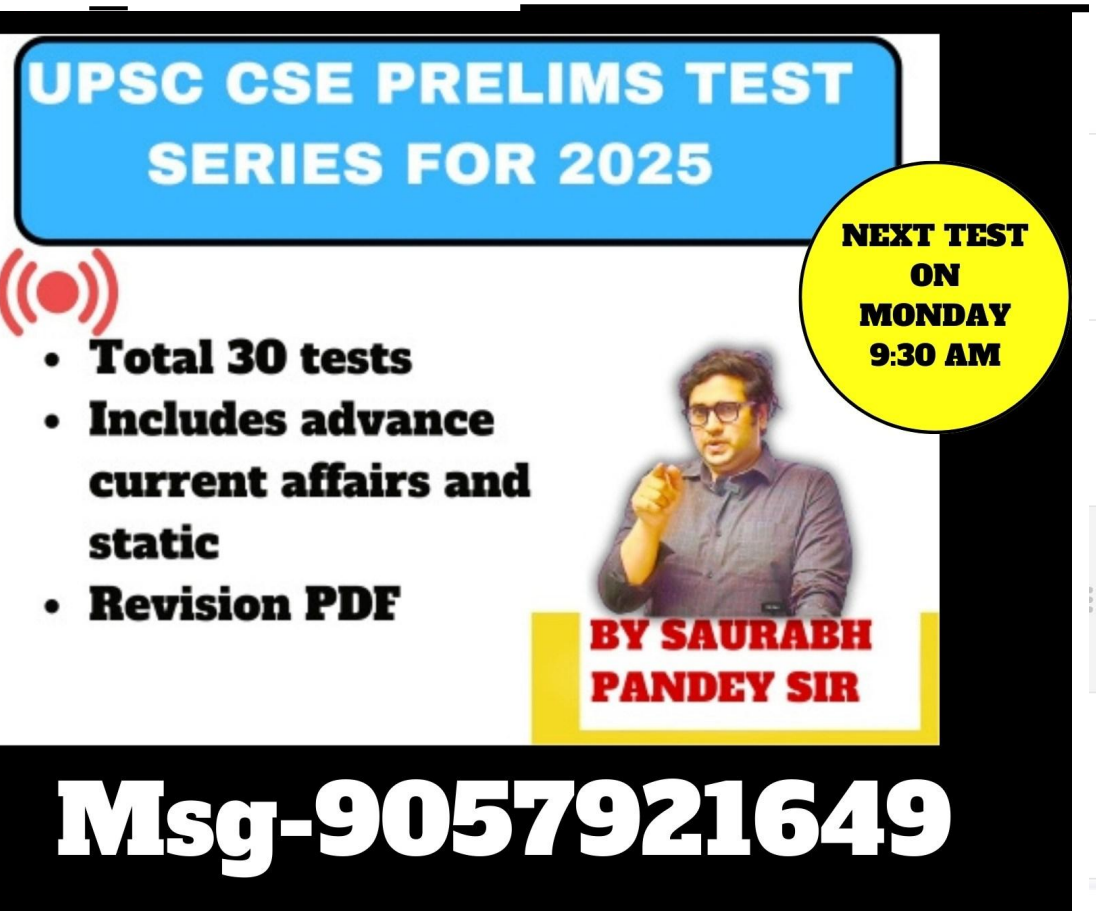

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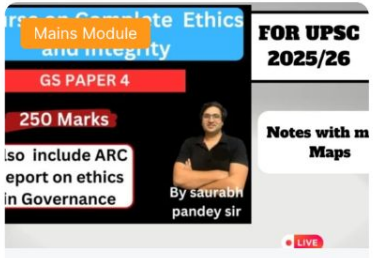

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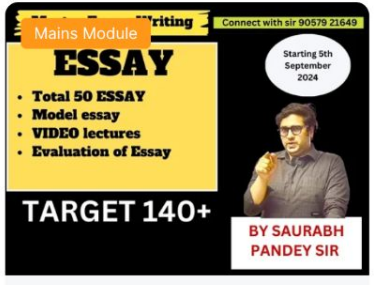

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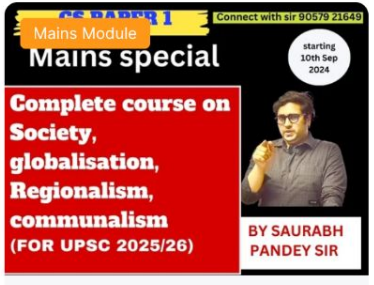

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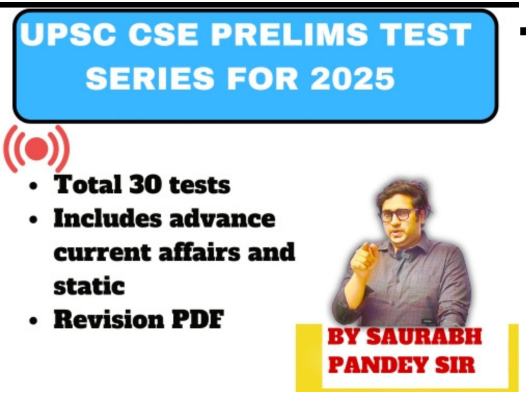

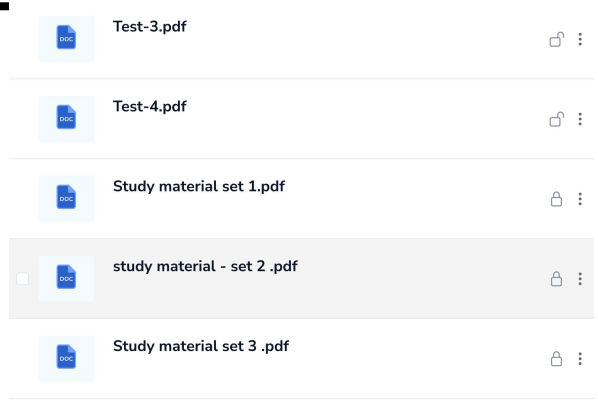

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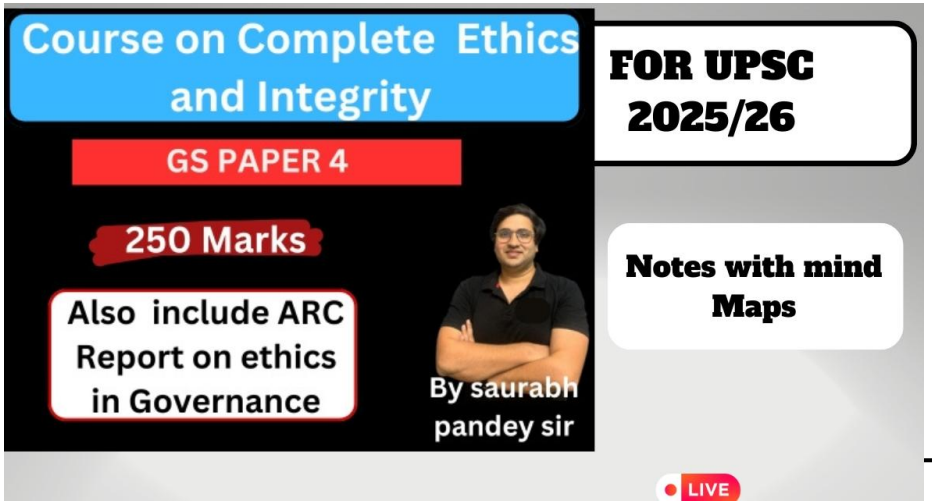

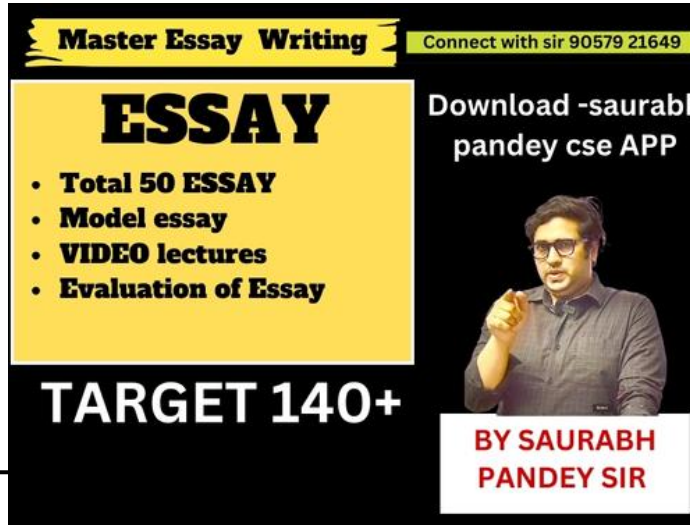

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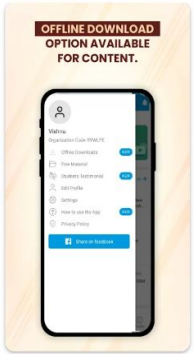

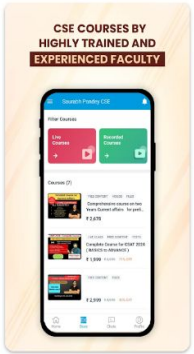

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