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MODERNISING MILITARY HEALTHCARE: FEMTO-LASIK SUITE AT THE FOREFRONT

WHY IN THE NEWS?

The Director General of Armed Forces Medical Services (AFMS), Surgeon Vice Admiral Arti Sarin, and the Director General of Medical Services (Army), Lt Gen Sadhna S Nair, inaugurated a state-of-the-art Femto-LASIK Suite at the Army Hospital (Research and Referral), Delhi Cantt. This advanced facility marks a major milestone in military healthcare, offering customised laser treatments for spectacle removal and addressing borderline refractive errors and corneal diseases. It highlights the Armed Forces' commitment to cutting-edge medical technology and enhanced patient welfare. Army Hospital (R&R) is the apex centre of AFMS.

WHAT IS FEMTO-LASIK?

Femto-LASIK (Femtosecond Laser-Assisted In Situ Keratomileusis) is an advanced form of laser eye surgery used to correct refractive errors such as myopia, hyperopia, and astigmatism. It uses a femtosecond laser to create a precise corneal flap, offering greater accuracy, safety, and faster recovery compared to traditional LASIK. This bladeless technique is especially beneficial for patients with thin corneas or complex prescriptions. The Army Hospital (Research and Referral), Delhi Cantt, recently inaugurated a state-of-the-art Femto-LASIK Suite, reflecting the Armed Forces Medical Services' commitment to cutting-edge healthcare. The new facility will help military personnel eliminate dependence on spectacles, enhancing their operational efficiency and quality of life.

MECHANISM OF FEMTO LASIK: WORKING, FEATURES AND APPLICATIONS

Working Mechanism	Key Features	Applications
Uses **femtosecond laser** to create a thin, precise corneal flap (bladeless method).	Bladeless and highly precise procedure	Correction of **myopia** (nearsightedness)
Excimer laser reshapes the cornea to correct refractive errors.	Customised treatment based on individual corneal topography	Correction of **hyperopia** (farsightedness)
The flap is lifted and then repositioned without stitches.	Faster healing and minimal discomfort	Treatment of **astigmatism**
Minimally invasive procedure with minimal tissue damage.	Suitable for borderline corneal thickness cases	Useful for patients unsuitable for traditional LASIK
High accuracy and reduced risk of complications.	Reduced risk of corneal complications	Management of certain **corneal disorders**
Enables enhanced visual recovery and stability.	Higher safety profile compared to conventional LASIK	Recently adopted in **military healthcare** to enhance combat-readiness

TECHNOLOGICAL AND CLINICAL BENEFITS

1. Bladeless Precision: Uses a femtosecond laser instead of a mechanical blade to create the corneal flap. This increases surgical accuracy and significantly reduces complication risks.

2. Customised Treatment: Based on individual corneal topography and vision profile. Enables personalised correction, improving surgical outcomes and patient satisfaction.

3. Faster Recovery: Minimal tissue disruption promotes quicker healing and less post-op discomfort. Patients can resume normal activities within a shorter time frame.

4. High Safety Profile: Reduces chances of flap-related complications, infections, and post-surgical issues. It's considered safer than conventional LASIK, especially in complex cases.

5. Suitable for Thin Corneas: Offers vision correction even to patients ineligible for traditional LASIK due to corneal thickness. Expands eligibility to a wider group of patients, including defence personnel.

6. Minimally Invasive: The laser performs the entire flap creation without cutting tools. This leads to a less painful and more comfortable surgical experience.

7. Long-Term Visual Stability: Delivers stable vision correction with minimal regression over time. Enhances quality of life without the need for repeat procedures in most cases.
8. Enhanced Operational Readiness: Especially useful for armed forces where wearing glasses or contacts is impractical. Improves combat readiness and field performance by ensuring clear unaided vision.

SIGNIFICANCE OF THE FEMTO-LASIK INITIATIVE

1. Enhanced Vision for Operational Efficiency: Improves visual acuity of military personnel, reducing dependence on spectacles in combat and field operations.
2. Cutting-Edge Medical Advancement: Demonstrates adoption of state-of-the-art technology in the Armed Forces Medical Services (AFMS), reflecting global standards.
3. Boosts Readiness and Safety: Ensures soldiers are visually prepared for high-risk environments, enhancing overall mission readiness and personal safety.
4. Support for Borderline Cases: Provides advanced treatment for personnel with thin or irregular corneas who were previously ineligible for LASIK.
5. Improved Quality of Life: Offers long-term vision correction, positively impacting daily functioning and psychological well-being of defence staff.
6. Symbol of Healthcare Modernisation: Highlights the military's commitment to modern, patient-centric care in line with national healthcare innovation.
7. Benchmark for Military Hospitals: Position Army Hospital (R&R) as a leading centre for advanced eye care within the AFMS network.
8. Potential for Wider Implementation: Sets a precedent for integrating Femto-LASIK across other military and government medical institutions in the future.

CUTTING-EDGE TECHNOLOGY ADOPTION CHALLENGES IN INDIA

1. High Cost and Affordability: Advanced technologies often require huge investments, making them unaffordable for many healthcare institutions, especially in rural areas.
2. Infrastructure Limitations: Many regions lack the necessary infrastructure, such as reliable electricity, internet connectivity, and modern facilities to support cutting-edge tech.
3. Skilled Manpower Shortage: There is a scarcity of trained professionals and technicians who can operate and maintain sophisticated medical equipment.
4. Regulatory and Approval Delays: Complex regulatory frameworks and slow approval processes can delay the introduction and scaling of new technologies.
5. Unequal Access and Urban-Rural Divide: High-tech facilities are often concentrated in urban centres, limiting access for rural and remote populations.
6. Resistance to Change and Awareness Gaps: Lack of awareness among stakeholders and reluctance to adopt new methods impede technology uptake.
7. Data Privacy and Cybersecurity Concerns: Increasing digitalisation raises issues about data protection, privacy, and cybersecurity vulnerabilities.
8. Sustainability and Maintenance Issues: Maintaining advanced equipment requires continuous funding and support, which is often lacking in public healthcare.

WAY FORWARD

1. Increased Investment and Funding: Boost public and private sector investments to make advanced technologies affordable and widely available.

2. Strengthening Infrastructure: Develop robust physical and digital infrastructure, especially in rural and remote areas, to support technology deployment.
3. Skill Development and Training: Implement comprehensive training programs to build a skilled workforce capable of operating and maintaining advanced technologies.
4. Streamlining Regulatory Processes: Simplify and expedite regulatory approvals to facilitate faster introduction and scaling of new technologies.
5. Promoting Public-Private Partnerships (PPPs): Encourage collaborations between government, industry, and academia for innovation, research, and better resource utilisation.
6. Enhancing Awareness and Change Management: Conduct awareness campaigns and training to overcome resistance and educate stakeholders about technology benefits.
7. Focus on Data Security and Privacy: Establish strong data protection laws and cybersecurity frameworks to build trust in digital technologies.
8. Ensuring Sustainable Maintenance: Plan for long-term maintenance, upgrades, and support systems to ensure technology remains effective and reliable.

CONCLUSION

The inauguration of the state-of-the-art Femto-LASIK Suite at Army Hospital (R&R), Delhi Cantt, marks a significant advancement in military healthcare, demonstrating the Armed Forces Medical Services' commitment to adopting cutting-edge medical technology. Femto-LASIK offers safer, more precise, and faster vision correction, enhancing operational readiness and quality of life for defence personnel, especially those with complex eye conditions. While India faces challenges in adopting such advanced technologies nationwide, ranging from cost and infrastructure gaps to skill shortages, targeted investments, capacity building, and streamlined policies can pave the way for wider implementation. This initiative not only sets a benchmark for healthcare modernisation in the armed forces but also serves as a model for expanding access to advanced medical care across the country, contributing to improved health outcomes and operational efficiency.

PRELIMS QUESTIONS

Q. With reference to Femto-LASIK technology, consider the following statements:
1. Femto-LASIK uses a mechanical blade to create the corneal flap.
2. It is a bladeless laser procedure that offers greater precision than conventional LASIK.
3. Femto-LASIK is especially suitable for patients with thin or irregular corneas.
How many of the above statements are correct?
(a) Only one
(b) Only two
(c) All three
(d) None

Answer: A

MAINS QUESTIONS

Q. Discuss the significance of the recent inauguration of the Femto-LASIK Suite at Army Hospital (R&R), Delhi Cantt. What are the benefits and challenges of adopting such advanced medical technologies in India?

(250 words, 15 marks)

INDIA UNVEILS ITS FIRST GENOME-EDITED RICE VARIETIES: KAMALA AND PUSA DSR RICE 1

WHY IN THE NEWS?

Union Agriculture Minister Shivraj Singh Chouhan recently announced that India has become the first country in the world to develop rice varieties using genome editing technology. The new seeds will be available for farmers after the required clearances within six months and large-scale seed production will probably take place during the next three crop seasons.

WHAT ARE THE NEW VARIETIES?

A team of researchers from various institutions, guided by the Indian Council of Agricultural Research (ICAR), were behind the development of the two varieties — the DRR Dhan 100, also known as Kamala, which was developed from a popular high-yielding green rice Samba Mashuri, and Pusa DSR Rice 1, which was developed from the Maruteru 1010 (MTU1010) variety.

BENEFITS OF THE NEW RICE VARIETIES KAMALA AND PUSA DST RICE 1

Feature	Kamala	Pusa DST Rice 1
Higher Yield	5.37 tonnes/ha (vs. 4.5 tonnes/ha in Samba Mahsuri)	3,508 kg/ha (9.66% more than MTU1010's 3,199 kg/ha)
Drought Tolerance	High drought resilience,	Not specifically designed for drought, but

Feature	Kamala	Pusa DST Rice 1
	performs well with less water	performs well in tough soils
Early Maturity	Matures ~20 days earlier than Samba Mahsuri	Not specifically early maturing
Salinity & Alkalinity Tolerance	Moderate tolerance	High tolerance — yields 30.4% more under coastal salinity, 14.66% more under alkalinity
Environmental Impact	Lower methane emissions due to shorter crop duration	Supports cultivation in marginal lands, improving land-use efficiency
Farming Advantage	Enables multiple cropping and input savings (water, fertiliser)	Expands cultivation to degraded or saline soils
Parent Variety	Derived from Samba Mahsuri	Derived from MTU1010

SALIENT FEATURES OF INDIA'S FIRST GENOME-EDITED RICE VARIETIES

1. High Yield Potential

DRR Dhan 100 (Kamala): Average yield 5.37 tonnes/ha (higher than 4.5 tonnes/ha of Samba Mashuri). **Pusa DSR Rice 1:** Shows 30.4% yield advantage under coastal saline and water-stressed conditions.

2. Early Maturity: These varieties mature 20 days earlier than their parent varieties. Early maturity helps in crop rotation and reduces the overall water requirement.

3. Climate Resilience: Drought Tolerance: Performs well under limited water availability. Salinity and Alkalinity Tolerance: Pusa DSR Rice 1 performs well under such stress conditions.

4. Nutrient Use Efficiency: High nitrogen-use efficiency, reducing dependency on fertilisers and lowering input costs.

5. Environmental Sustainability: Reduced methane emissions due to shorter crop duration and suitability for DSR. Lower water requirement → water conservation.

6. Non-GMO Status: Developed using genome editing (SDN1 & SDN2) without introducing any foreign genes. Considered non-GMO in regulatory terms, allowing for faster approvals in many countries.

7. Enhanced Agronomic Traits: Better grain quality, pest/disease resistance, and adaptability across multiple agro-climatic zones.

OBJECTIONS TO GENOME-EDITED RICE VARIETIES

1. Lack of Transparency: Field trial data was not made public before the announcement. Critics, including ex-ICAR member Venugopal Badaravada, raised concerns about accountability.

2. Regulatory Issues: Exempting SDN-1 and SDN-2 crops from GMO laws is seen as legally questionable. Activist groups argue it bypasses biosafety evaluations.

3. Seed Sovereignty and IPR Concerns: Use of patented gene-editing tools may undermine farmers' seed rights. Fear of corporate control over seeds.

4. Lack of Peer-Reviewed Evidence: Yield and resilience claims are not yet backed by independent scientific studies.

5. Public Mistrust: Conflicting views between government and civil society have led to confusion and concern.

WAY FORWARD

1. Ensure Transparent Evaluation: Conduct multi-location field trials and publish results openly to enhance scientific credibility and public trust.

2. Strengthen Regulatory Oversight: Establish an independent, science-based biosafety authority to evaluate genome-edited crops rigorously.

3. Develop a Clear IPR Policy: Frame policies that balance innovation with protection of farmers' seed rights and prevent monopolistic control.

4. Engage Stakeholders: Involve farmers, scientists, civil society, and consumer groups in policy decisions to ensure inclusive development.

5. Educate the Public: Launch awareness campaigns to clarify differences between genome editing and traditional GMOs.

6. Promote Indigenous Innovation: Encourage public sector R&D to reduce dependence on patented foreign technologies.

7. Ensure Farmer Access and Benefits: Make improved seeds affordable and accessible, especially to small and marginal farmers.

8. Monitor Long-Term Impact: Set up systems to track environmental, health, and socio-economic impacts post-release.

CONCLUSION

India's development of genome-edited rice marks a significant milestone in agricultural innovation, addressing critical challenges like climate change, water scarcity, and food security. The launch of DRR Dhan 100 (Kamala) and Pusa DSR Rice 1 showcases the potential of precision breeding to enhance yield, sustainability, and resilience without introducing foreign genes. However, the controversies surrounding transparency, regulation, and seed sovereignty highlight the need for cautious, inclusive, and science-driven policymaking. By ensuring robust field trials, safeguarding farmer rights, and fostering public trust through education and open data, India can harness the full benefits of genome editing while upholding food sovereignty and environmental safety.

PRELIMS QUESTIONS

Q. With reference to genome-edited crops in India, consider the following statements:

1. Genome-edited crops developed using SDN-1 and SDN-2 techniques do not introduce foreign genes.
2. The DRR Dhan 100 and Pusa DSR Rice 1 were developed by private seed companies in collaboration with ICAR.
3. Genome-edited crops are currently exempted from India's GMO regulatory framework.

Which of the statements given above is/are correct?

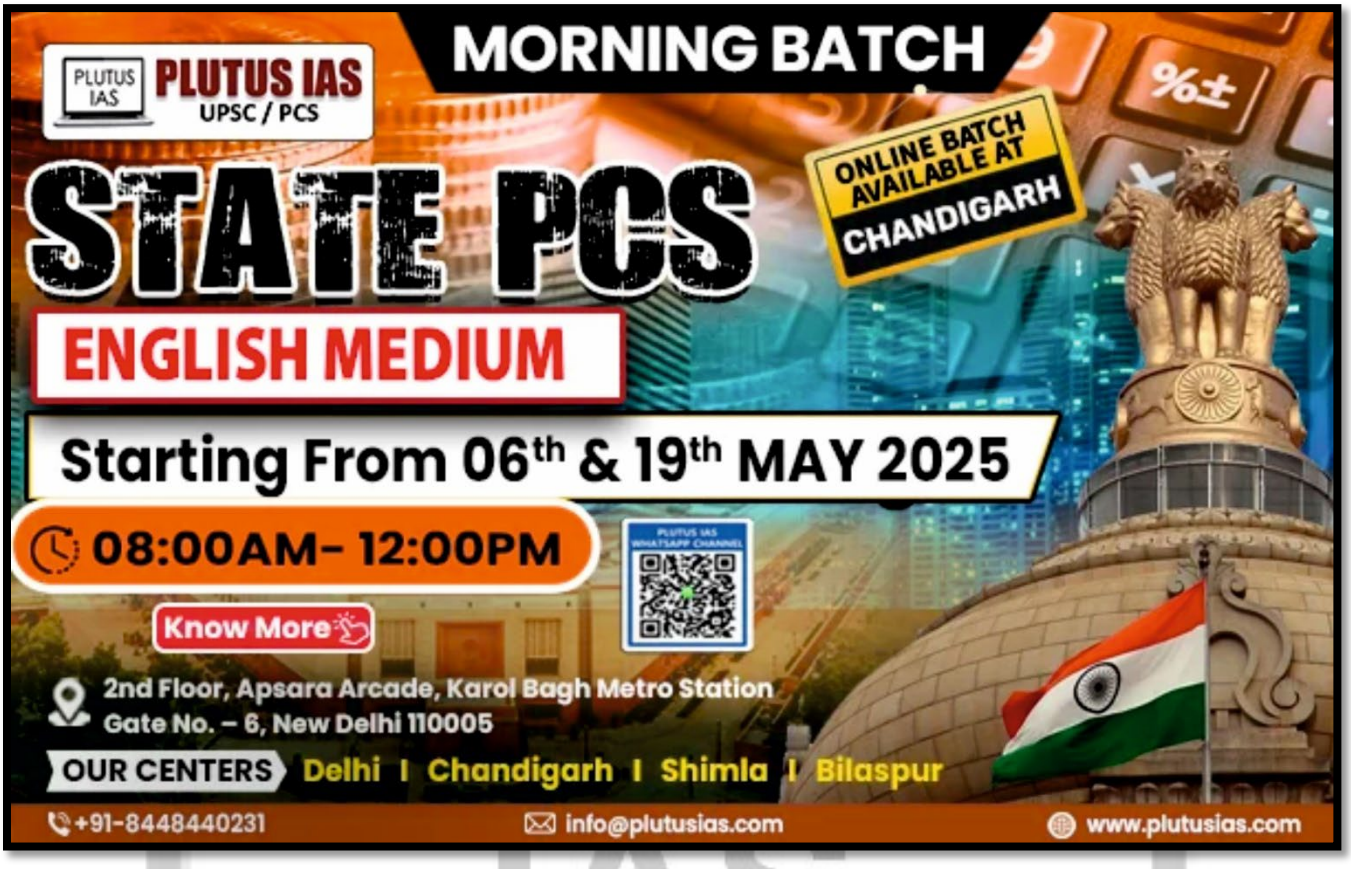
(a) 1 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: A

MAINS QUESTIONS

Q. Discuss the significance of genome-editing technology in Indian agriculture with reference to the recent development of rice varieties such as DRR Dhan 100 and Pusa DSR Rice 1. What are the concerns raised over such innovations and what should be the way forward?

(250 words, 15 marks)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