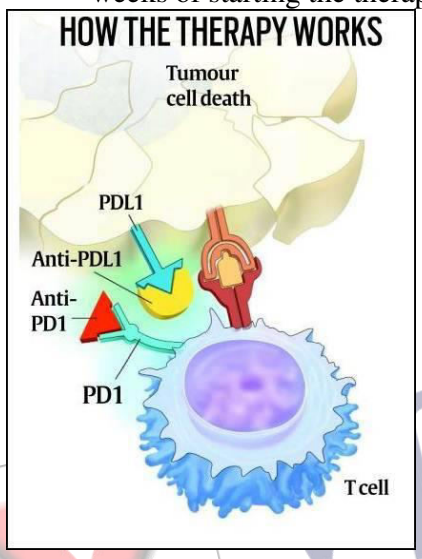
MEDICINE AND HEALTH

The science behind the cancer cure, and the therapy's future in India

CONTEXT: In a medical trial, 12 patients in the United States were completely cured of rectal cancer without requiring any surgery or chemotherapy.

What are the findings?

- The trial showed that immunotherapy alone – without any chemotherapy, radiotherapy, or surgery that have been staples of cancer treatment – could completely cure the patients with a particular kind of rectal cancer called 'mismatch repair deficient' cancer".
- All 12 patients had completed the treatment and were followed for six to 25 months after.
- No cases of progression or recurrence had been reported during the follow-up.
- The response too was rapid, with symptoms resolving in 81% of the patients within nine weeks of starting the therapy.



PD1 is a protein that regulates immune function and can sometimes keep T cells from killing cancer cells. The therapy in the trial used PD1 blockades, allowing T cells to kill cancer cells.

What is this deficiency, and how was it cured?

- Mismatch repair deficient' cancer is most common among colorectal, gastrointestinal, and endometrial cancers. Patients suffering from this condition lack the genes to correct typos in the DNA that occur naturally while cells make copies.
- The immunotherapy belongs to a category called PD1 blockades that are now recommended for the treatment of such cancers rather than chemotherapy or radiotherapy.
- PD1 is a type of protein that regulates certain functions of the immune system, including by suppressing T cell activity, and PD1 blockade therapy looks to release the T cells from this suppression.
- The anomalies in the DNA result in cancerous growths in patients with mismatch repair deficient cancers. (If it imagined the immune system to be a car, PD1 acts as the brakes for the T cells of the immune system. By giving the PD1 blockades, we release the brakes and allow the T cells to destroy the cancerous growth)
- India has a couple of PD1 blockades available, although not the one used for this study.

If PD1 therapy was already in use, what's new in the trial?

- Earlier, this therapy was used post-surgery, but the study has shown that a surgery may not be required.
- Although the therapy is usually used for cancers that have metastasised (spread to locations other than where the cancer formed), it is now recommended for all mismatch repair deficient cancers as they result in quicker improvement and lesser toxicity as compared to traditional chemo and radiotherapy.

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- So far, the therapy have been using after a patient undergoes surgery; it is used for 10 to 15 indications. This study shows that even the surgery was not needed in these patients.
- Eliminating other treatments can improve a patient's quality of life by preserving fertility, sexual health, and bladder and bowel functions.

When can such a treatment be accessible in India?

- Cost is believed to be a major hurdle.
- Patients can be well managed with chemotherapy and radiotherapy as well. Around 10 to 15% of cancer patients actually do not need surgeries.
- The problem with immunotherapies is that they are expensive and unaffordable for most people in India, and certainly for those coming to AIIMS.
- A genetic test can also cost up to Rs 30,000, the patients here cannot afford all this.
- Precision medicine, such as using particular immunotherapy drugs for particular types of cancers, is still at a nascent stage in India. Precision medicine for cancer treatment is happening in India, but it is still in nascent stages. It would take at least ten years for it to become commonplace.

So, how much does immunotherapy cost?

An immunotherapy treatment can cost around Rs 4 lakh per month, with patients needing the treatment for six months to a year.

PRELIMS

1. Carbon Bombs

A group of environmentalists, lawyers, and activists have come together to identify and 'defuse carbon bombs'– coal, oil and gas projects that have the potential to contribute significantly to global warming.

- It is "an oil or gas project that will result in at least a billion tonnes of CO2 emissions over its lifetime."
- Whenever coal, oil, or gas is extracted it results in pollution and environmental degradation.
- Further, carbon emissions take place in particularly large amounts when fuel is burned.
- In total, around 195 such projects have been identified world over, including in the US, Russia, West Asia, Australia and India.
- They will collectively overshoot the limit of emissions that had been agreed to in the Paris Agreement of 2015.
- The agreement was to contain the global rise in average temperature to 2 °C and strive for the target of 1.5 °C as compared to pre-industrial levels .

What is the plan for 'defusing' carbon bombs?

- The network working towards this goal is called Leave It In the Ground Initiative (LINGO).
- Its mission is to "leave fossil fuels in the ground and learn to live without them.
- It believes the root of climate change is the burning of fossil fuels, and the 100% use of renewable energy sources is the solution.
- it has listed carbon bomb projects from all over the world.
- This includes the Carmichael Coal Project owned by the Adani Group, Gevra Coal Mines in Chhattisgarh owned by Coal India, and Rajmahal Coal Mines in eastern Jharkhand owned by Eastern Coalfields.

2. 4th State Food Safety Index (SFSI): FSSAI

- Recently, on the occasion of **World Food Safety Day,** the Union Health Minister of India announced the **State Food Safety Index awards.**
- **Developed By:** Food Safety and Standards Authority of India (FSSAI) in 2018-19.
- **Aim:** To measure the performance of states on various parameters of Food Safety. Creating a competitive and positive change in India's food safety ecosystem.
- **Five significant parameters for Ranking:**

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- Human Resources and Institutional Data,
- Compliance,
- Food Testing – Infrastructure and Surveillance,
- Training & Capacity Building and
- Consumer Empowerment.

Major Highlights

- **Large States:** Tamil Nadu topped the list among larger states, followed by Gujarat and Maharashtra.
- **Smaller States:** Goa was the winner, followed by Manipur and Sikkim,
- **Union territories:** Jammu and Kashmir emerged top, followed by Delhi and Chandigarh.
- States that showed significant improvement were also felicitated.
- To motivate smart cities to develop and execute a plan that supports a healthy, safe, and sustainable food environment through adoption of various Eat Right India initiatives. 11 winning smart cities of the EatSmart Cities Challenge were also fecilitated.
- AyurvedaAahar logo, which contains the initials of Ayurveda and Ahara, the first in Devanagari and the second in English, with five leaves symbolising five elements of nature was also launched. This logo will help in easy identification of ayurvedic foods.
- A guidance document on Food Borne Disease Outbreak Investigation and Microbiological Process Control, and Sampling and Testing of Fish and Fishery Products was released.

3. India Business & Biodiversity Initiative

- India's largest power generating firm NTPC Limited has issued renewed Biodiversity Policy 2022 to establish a comprehensive vision and guiding principle for conservation, restoration, and enhancement of biodiversity.
- India Business & Biodiversity Initiative was commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) in 2014.
- The lead Executing Agencies are the Indian Ministry of Environment, Forests & Climate Change (MoEFCC) and the Confederation of Indian Industry (CII).
- **Vision** - To sensitise, guide and mentor Indian business organisations in biodiversity conservation & sustainable use related to their operations, across their value chain and beyond towards conservation of India's biodiversity.
- The IBBI serves as a national platform of businesses and its stakeholders for dialogue sharing and learning, ultimately leading to mainstreaming sustainable management of biological diversity into businesses.
- **Membership** to IBBI is open for companies from any sector and size, as well as stakeholder organizations that can contribute to the platform in terms of technical assistance.
- The business members of IBBI are subject to become signatories to a 10-point IBBI Declaration, demonstrating the organization's commitment towards biodiversity.
- NTPC was the first PSU to issue Biodiversity Policy in 2018. In the same year, NTPC became a member of the India Business and Biodiversity Initiative (IBBI).

4. Operation Rakth Chandran

- The Directorate of Revenue Intelligence (DRI) seized 14.63 metric tonnes of red sanders in the international market from a consignment kept in an Inland Container Depot (ICD) in Gujarat.
- The DRI seized 840 logs of red sandalwood or red sandalwood under the Operation Rakth Chandran.
- It has been seized under the Customs Act, 1962.
- Its export is prohibited as per the country's foreign trade policy.

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- Rich hue and therapeutic properties of this tree are responsible for its high demand across Asia, particularly in China.
- They are used in cosmetics, medicinal products and high-end furniture and woodcraft.

5. Rogan Painting and Sanjhi Art

Indian Prime Minister gifted Sanjhi art and a wooden hand-carved box with Rogan painting to his fellow Quad leaders from Australia, the US and Japan.

Rogan Painting

- Rogan painting is an art of cloth printing practised in Kutch district of Gujarat.
- The word 'Rogan' comes from Persian, meaning varnish or oil.
- In the craft, paint made from boiled oil and vegetable dyes is laid down on fabric using either a metal block (printing) or a stylus (painting).
- Paint - A special paste made of castor is used in this craft.
- Castor seeds are hand-pounded to extract the oil and turned into a paste by boiling, Colored powder diluted in water is then mixed with this.
- The pastes of different colors yellow, red, blue, green, black and orange are stored in earthen-pots with water to prevent them from drying up.
- Process - Artists place a small amount of this paint paste into their palms.
- At room temperature, the paint is carefully twisted into motifs and images using a metal rod (kalam) that never comes in contact with the fabric.
- Next, the artisan folds his designs into a blank fabric, thereby, printing its mirror image. In effect, it is a very basic form of printing.
- Previously, the designs were simple and rustic in nature but with the passage of time, the craft has become more stylised and now is regarded as a high art form.

Sanjhi Art

- Sanjhi Art is the ancient art of hand-cutting designs on paper.
- This art of paper stencilling is practised across Mathura and Vrindavan in Uttar Pradesh.
- It is a tradition of art that originated out of the cult of Krishna.
- It was traditionally used to make ritualistic and ceremonial rangolis in temples dedicated to Lord Krishna.

ANSWER WRITTING

Q. What is Quantum supremacy ? And discuss the possible application of quantum computers in deferent field (150)

The phrase "quantum supremacy" was coined in 2012 by John Preskill. It refers to a quantum computer solving a problem that cannot be expected of a classical computer in a normal lifetime. A quantum computer can solve complex problems that are beyond the scope of a classical computer. The basic advantage of Quantum Computing is it's speed as it is able to simulate several classical computers working in parallel. Google recently announced that it achieved Quantum supremacy.

The difference between Quantum Computing and Traditional Computing:

Traditional Computing	Quantum Computing
Traditional computers work on the basis of the laws of classical physics, specifically by utilizing the flow of electricity.	A quantum computer, on the other hand, seeks to exploit the laws that govern the behavior of atoms and subatomic particles.
Conventional computers process information in 'bits' or 1s and 0s, following classical physics under which our computers can process a '1' or a '0' at a time.	Quantum computers compute in 'qubits' (or quantum bits). They exploit the properties of quantum mechanics, the science that governs how matter behaves on the atomic scale.
	In this scheme of things, processors can be a '1' and a '0' simultaneously, a state called quantum superposition.

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Possible applications of quantum computers in different fields:

- Data Mining and Artificial Intelligence (AI): Quantum computers would be useful for tasks which handle huge amounts of data. Data mining and artificial intelligence would be major beneficiaries, along with sciences which deal in volumes of data, from astronomy to linguistics.
- Drug Discovery: It could help with the development of new pharmaceuticals, new energy sources, new ways to collect solar power, and new materials.
- It can have a major impact through quantum chemistry, which could be important in agriculture and human health.
- GPS Navigation: Solving complicated optimization problems, such as calculating how to deliver packages in the shortest time while using the least energy could be achieved by quantum computing. Addressing these challenges could save both, money and help the environment.
- Encryption: Improving encryption technology by generating random numbers.
- Building Machine Learning Systems better at tasks like distinguishing between real and fake items like bogus political videos.

Thus, it can be fairly concluded that Quantum Computing has huge potential in different fields. India in 2018, unveiled a programme called Quantum-Enabled Science & Technology (QuEST) which aims at building a quantum computer in India within the next decade. However, to fully achieve the fruits of quantum computing extensive research and funding are required.

QUIZ

1. Consider the following statement with reference to Sanjhi Art recently seen in news

1. Sanjhi Art is the ancient art of hand-cutting designs on paper
2. It is a tradition of art that originated out of the cult of Siva

Choose correct statement/s using the codes given below

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

2. With reference to Quantum computing consider the following statements

1. Conventional computers process information in 'bits' or 1s and 0s while Quantum computers compute in 'qubits'
2. Drug Discovery can be a possible application of Quantum computing in India.

Which of the above statement/s is or are not correct

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

3. World food safety Day observed on which of the following date?

a) 7th June
b) 8th June
c) 9th June
d) 10th June

4. PD1 therapy recently seen in news is related to which of the following disease?

a) Diabetic
b) Cancer
c) Pneumonia
d) Hepatitis B

5. Which of the following institution topped the QS World University Rankings for 2023

a) IISc Bangalore

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b) IIT Bombay
c) IIT Madras
d) NIT Tiruchinapali

6. Consider the following statements with regards to Red sanders
   1. It is endemic to Eastern ghats
   2. It's IUCN status is Endangered and protected under schedule I of Wild life Protection Act 1972
   3. Recently for the first time a disease called Sandlewood spike disease has been reported form Mysore region.

   Select the correct statement/s using the codes given below
   a) 1 and 2 only
   b) 2 and 3 only
   c) 3 only
   d) 1 only

7. A term called "SAMATHUVAPURAM" recently seen in news is related to which of the following state?
   a) Karnataka
   b) Kerala
   c) Tamilnadu
   d) Andharapradesh

8. Consider the following statement with reference to Sports Authority of India
   1. It is a statutory body establish under Society Act 1860
   2. It is headed by Minister of Sports and youth affairs

Choose the incorrect statement using the codes given below
   a) 1 only
   b) 2only
   c) Both 1 and 2
   d) Neither 1 nor 2

9. The concern for arresting and reversing land degradation and desertification gets reflected in which of the following Acts and policies
   1. National Water Policy 2012
   2. National Forest Policy 1988
   3. National Policy for Farmers 2007
   4. National Rain fed Area Authority 2007
   5. National Environment Policy 2006

   Select the correct answer using the codes given below
   a) 1,2,,4, and 5 only
   b) 2,3 and 5 only
   c) 1,2,4, and 5 only
   d) All of the above

10. India's first climate change knowledge portal launched in the year
   a) 2020
   b) 2021
   c) 2022
   d) 2019

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