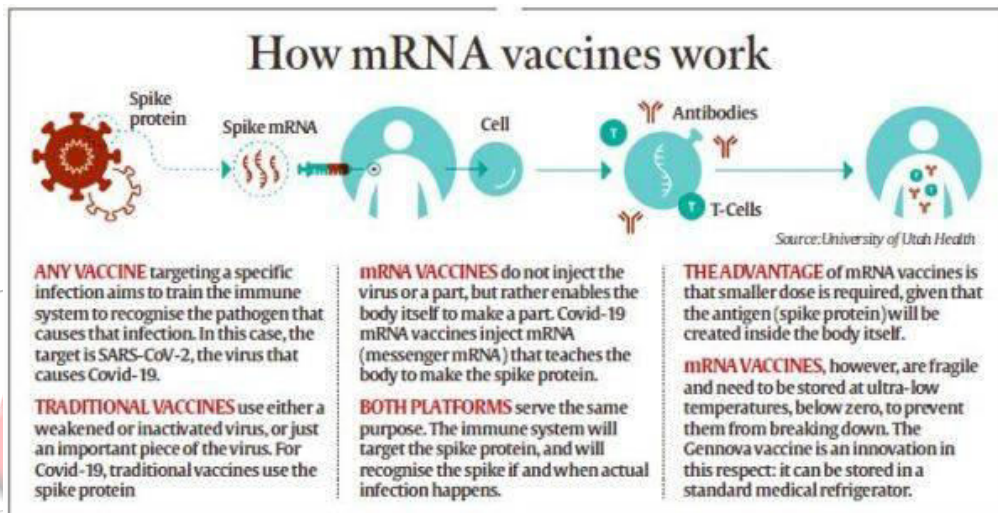


SCIENCE AND TECHNOLOGY

India's mRNA Covid vaccine

- ❖ **CONTEXT:** The country's first home-grown mRNA Covid-19 vaccine GEMCOVAC-19 developed at Pune's Gennova Biopharmaceuticals has got a 'restricted emergency use' nod for the 18-and-above age group.
- ❖ **The mRNA platform**
 - As the Covid-19 pandemic spread, an mRNA vaccine candidate was the first to enter human trials globally. The first two vaccines that were made available for use in the US were based on mRNA technology.
 - Unlike vaccines that put a weakened or inactivated virus in your body to activate an immune response, these two Covid-19 vaccines (Pfizer-BioNTech and Moderna) used messenger RNA or mRNA to deliver a message to immune system.
 - Basically, the technology uses genetically engineered mRNA to instruct cells to make the S-protein found on the surface of the Covid-19 virus.
 - According to reports from US-based Mayo Clinic, after vaccination, the muscle cells begin making S-protein pieces and displaying them on cell surfaces. This causes the body to create antibodies.



- These vaccines have to be stored at sub-zero temperatures as mRNA is fragile and breaks down easily.
- ❖ **Thermostable vaccine**
 - Unlike in the West, where the vaccine has to be stored at sub-zero temperatures, the challenge in India was to be able to store the vaccine between 2-8 degree Celsius. Gennova Biopharmaceuticals had innovate to suit India's local needs as to what is affordable and deployable. GEMCOVAC-19 can now be stored at the temperature of a standard medical refrigerator.
 - The conversion from liquid to powder form of the vaccine takes place via Lyophilisation — this is freeze-drying, a process where the water is removed from the product after it is frozen and placed under a vacuum allowing the ice to change directly from solid to vapor without passing through a liquid phase.
 - However, just removing water by Lyophilisation of the mRNA vaccine does not work. So, the surrounding pressure has to be tweaked and then kept stable to ensure the characteristics of the vaccine are the same as before Lyophilisation. For this to be achieved, the key was to add an external agent which at a certain critical concentration keeps it stable under lyophilized conditions. The Lyophilisation technology is not new, but a lyophilized mRNA vaccine is unique.
- ❖ **Trials and safety**
 - Freeze-drying the large and unstable mRNA molecule with the nanoparticle was a daunting challenge.

- This thermostable vaccine was thoroughly tested in various animal models to ensure its safety and immunogenicity before entering human clinical trials.
- Phase 1 and 2 trial data across 480 participants had been submitted earlier, and data from Phase 3 trial across 4,000 participants was then presented to the Central Drugs Standard Control Organisation (CDSCO). During the Phase 3 trials, 3,000 participants were administered the mRNA Covid-19 vaccine and 1,000 were given Covishield.
- According to Gennova, the trial data showed that the vaccine was safe and well-tolerated. Immunogenicity measured at 2 weeks post-dose showed that GEMCOVAC-19 is non-inferior to Covishield.
- The two-dose vaccine will have to be administered intramuscularly, 28 days apart.

Fight against emerging variants

- For the first time, the mRNA platform has been used to develop a Covid-19 vaccine in India. This total process may have taken one-and-a-half years, but designing an mRNA vaccine against the Omicron variant barely took 60 days.
- This technology platform provides flexibility to quickly tweak the vaccine for any existing or emerging variants of the virus.
- A pandemic-ready platform technology has been created that can be used to quickly develop a vaccine should a variant-of-concern emerge due to the rapid mutation of the SARS-CoV-2 virus. Clinical trials need to be done to ascertain the effectiveness of the GEMCOVAC-19 against Omicron and sub-variants.
- A short clinical trial will also be conducted with the Omicron-specific vaccine, which has also been designed for use as a booster and a protocol submitted to the DCGI.
- The learning curve was steep not only in terms of production but also in conducting the clinical trials. The approval of the nation's first mRNA vaccine will pave the way for the development of new-variant specific mRNA vaccines that can be used as future booster doses. It was absolutely necessary to establish the safety and immunogenicity of the new vaccine platform technology in the Indian population.

PRILIMS

1. CAPSTONE

- ❖ **CONTEXT:** NASA launched CAPSTONE, a microwave oven-sized CubeSat weighing just 55 pounds (25 kg). CAPSTONE, short for Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment, is designed to test a unique, elliptical lunar orbit.
- The satellite, launched on Rocket Lab's Electron rocket from the Rocket Lab Launch Complex 1, is heading toward an orbit intended in the future for Gateway, a Moon-orbiting outpost that is part of NASA's Artemis program.
- As a pathfinder for Gateway, CAPSTONE aims to help reduce risk for future spacecraft by validating innovative navigation technologies, and by verifying the dynamics of the halo-shaped orbit.
- The orbit is known as a near-rectilinear halo orbit (NRHO). It is significantly elongated, and is located at a precise balance point in the gravities of Earth and the Moon. This offers stability for long-term missions like Gateway.
- At the Moon, CAPSTONE will enter NRHO, where it will fly within 1,600 km of the Moon's North Pole on its near pass and 70,000 km from the South Pole at its farthest. The spacecraft will repeat the cycle every six-and-a-half days and maintain this orbit for at least six months to study dynamics.
- CAPSTONE will gain experience with small dedicated launches of CubeSats beyond low-Earth orbit, to the Moon, and beyond.
- The spacecraft is currently in low-Earth orbit. It is attached to Rocket Lab's Lunar Photon.

2. Anthrax alert in Kerala

- It is a disease caused by a bacterium called Bacillus anthracis. Anthrax is caused by a spore-forming bacterium. It mainly affects animals. Humans can be infected through contact with an animal or by inhaling spores.

- It occurs naturally in both animals and humans in many parts of the world, including Asia, southern Europe, sub-Saharan Africa and parts of Australia.
- Anthrax bacteria survive in the environment by forming spores.
- People get infected with anthrax when spores get into the body. When spores get inside the body, they can get activated. When they become active, the bacteria can multiply, spread out in the body, produce toxins (poisons), and cause severe illness.
- Symptoms include black sore, headaches, fever, vomiting of blood, diarrhea. Symptoms depend on the route of infection. They can range from a skin ulcer to difficulty breathing.
- Anthrax responds well to antibiotic treatment but vaccines are necessary as the infection can cause death within two-three days leaving no scope for diagnosis and treatment. Inhaled anthrax is harder to treat and can be fatal.
- The anti-anthrax vaccines available in market generate immune response against a Bacillus protein-protective antigen — a protein that helps in transport of bacillus toxins inside the cells. This means that immune response is triggered only when spores germinate in body and start producing bacterial proteins. Anyone vaccinated with such a vaccine would show no immune response to bacillus spores and only perform once spores germinate and release toxins.

3. **Primary Agricultural Credit Societies(PACS)**

CONTEXT: Cabinet approved to computerise all credit societies to a common accounting system.

- The Primary Agricultural Cooperative credit societies (PACS) constitute the lowest tier of the three-tier Short-term cooperative credit (STCC) in the country comprising of approx.13 Cr. farmers as its members, which is crucial for the development of the rural economy.
- PACS is a basic unit and smallest cooperative credit institutions in India
- PACS is the link between the ultimate borrowers,i.e, rural people,on the other hand and the higher agencies like Central cooperative bank, state cooperative bank and RBI, on the other hand
- PACS have been providing credit and other services to their members
- PACS offers services like input facility in the form of a monetary or in kind component, agriculture implements for hire, storage space
- It can be formed by a group of ten or more people.
- The primary credit societies working capital is derived from their funds, deposits, borrowings and other sources
- Deposits can be made by both members and non members
- Borrowings are primarily made from central cooperative banks
- PACS account for 41 % (3.01 Cr. farmers) of the KCC(Kishan Credit Card) loans given by all entities in the Country and 95 % of these KCC loans (2.95 Cr. farmers) through PACS are to the Small and Marginal farmers.
- The other two tiers viz. State Cooperative Banks (StCBs) and District Central Cooperative Banks (DCCBs) have already been automated by the NABARD and brought on Common Banking Software (CBS).
- Computerization of PACS, besides serving the purpose of financial inclusion and strengthening service delivery to farmers especially Small & Marginal Farmers (SMFs) will also will become nodal service delivery point for various services and provision of inputs like fertilizers, seeds etc.
- The project will help in improving the outreach of the PACS as outlets for banking activities as well as non-Banking activities apart from improving digitalisation in rural areas.
- It will ensure speedy disposal of loans, lower transition cost, faster audit and reduction in imbalances in payments and accounting with State. Cooperative Banks and District Central Cooperative Banks.

4. **'Udyami Bharat' programme**

❖ **CONTEXT:Prime Minister Shri Narendra Modi will participate in the 'Udyami Bharat' programme at Vigyan Bhawan in New Delhi.**

- 'Udyami Bharat' is reflective of the continuous commitment of the government, to work towards empowerment of MSMEs.

- Under this Government has launched several initiatives from time to time like MUDRA Yojana, Emergency Credit Line Guarantee Scheme, Scheme of Fund for Regeneration of Traditional Industries (SFURTI) etc. to provide necessary and timely support to the MSME sector, which has helped benefit crores of people across the country.
- PM will launch the 'Raising and Accelerating MSME Performance' (RAMP) scheme, 'Capacity Building of First-Time MSME Exporters' (CBFTE) scheme and new features of the 'Prime Minister's Employment Generation Programme' (PMEGP).
- Prime Minister will also digitally transfer assistance to beneficiaries of PMEGP for 2022-23; announce results of MSME Idea Hackathon, 2022; distribute National MSME Awards, 2022; and issue Digital Equity Certificates to 75 MSMEs in the Self Reliant India (SRI) Fund.
- ❖ **'Raising and Accelerating MSME Performance' (RAMP) scheme**
 - This Scheme aims to scale up the implementation capacity and coverage of MSMEs in the States, with impact enhancement of existing MSME schemes.
 - It will complement the Aatmanirbhar Bharat Abhiyan by fostering innovation, encouraging ideation, incubating new business and entrepreneurship by developing quality standards, improving practices and processes, enhancing market access, deploying technological tools and Industry 4.0 to make MSMEs competitive and self-reliant.
- ❖ **'Capacity Building of First-Time MSME Exporters' (CBFTE) scheme**
 - This Scheme aims to encourage MSMEs to offer products and services of international standards for the global market. This will enhance the participation of Indian MSMEs in the global value chain and help them realise their export potential.
- ❖ **'Prime Minister's Employment Generation Programme' (PMEGP)**
 - Prime Minister's Employment Generation Programme (PMEGP) is a credit linked subsidy programme is credit linked Scheme that aims to generate continuous and sustainable employment opportunities in Rural and Urban areas of the country through setting up of new self-employment ventures / projects / micro enterprises.
- ❖ National MSME Awards 2022 is a recognition of the contributions of MSMEs, States/UTs, Aspirational Districts and Banks for their outstanding performance in the growth and development of India's dynamic MSME sector.

ANSWERITTING

Q.The appointment of first Lokpal, though delayed, is important step towards the cause of fighting graft in the government. Comment (150)

Introduction

Justice Pinaki Chandra Ghosh was appointed as India's first Lokpal after five years of the enactment of the Lokpal and Lokayuktas Act. The Act envisaged the appointment of a Lokpal at the Centre and Lokayuktas in the States to look into cases of corruption against certain categories of public servants.

The appointment of the Lokpal, though delayed, is an important step towards the cause of fighting corruption because:

- Lokpal has a wide jurisdiction; it has jurisdiction to inquire into allegations of corruption against anyone who is or has been Prime Minister, or a Minister in the Union government, or a Member of Parliament, as well as officials of the Union government under Groups A, B, C and D.
- It also covers chairpersons, members, officers and directors of any board, corporation, society, trust or autonomous body established by an Act of Parliament or wholly or partly funded by the Centre. It also covers any society or trust or body that receives foreign contribution above ₹10 lakhs.
- The Lokpal can initiate a preliminary investigation after it receives a complaint under the Prevention of Corruption Act, 1988. If the complaint is found to be true, the Lokpal can ask the government to take disciplinary action against the public servant and also file a case in a special court to be set up by the Centre.
- Lokpal has the power of superintendence and direction over any investigation agency like CBI, CVC while investigating and prosecuting cases under the direction of Lokpal.
- It also empowers citizens to complain to the Lokpal against corruption by public officials.

However, the institution of Lokpal faces certain limitations such as:

- The Lokpal cannot inquire into any corruption charge against the Prime Minister if the allegations are related to international relations, external and internal security, public order, atomic energy and space.
- The Act also provides that the Lokpal shall not inquire or investigate into any complaint made after seven years from the date on which the offence has been committed. This restricts the scope of Lokpal.
- The Lokpal has been deprived of the authority of taking suo moto cognizance of the cases of corruption and maladministration.

Conclusion

Despite its limitations, appointment of the Lokpal is an important step towards curbing evils prevalent in the administrative machinery, especially to deal with corruption and maladministration. In future, the institution of Lokpal can be given constitutional status to ensure greater autonomy.

MCQs

1. With reference to difference between Traditional vaccine and mRNA vaccine consider the following statements

1. mRNA vaccine are fragile and need to be stored at sub zero temperature
2. For covid-19 traditional vaccine are use Spike protein
3. Traditional vaccines do not use virus or a part of it where as mRNA vaccine inject the weakened virus and also use spike protein

Select the correct statement/s using the codes given below

- a) **1 and 2 only**
- b) 2 and 3 only
- c) 1 and 3 only
- d) All of the above

2. The term CAPSTONE recently seen in news is related to which of the following organisation?

- a) JAXA
- b) **NASA**
- c) ROSCOSMOS
- d) ISRO

3. With reference to Anthrax consider the following statement

1. It occurs naturally in both animals and humans
2. Through inhalation it can be spread from animal to human
3. Anthrax responds well to antibiotic treatment but antibiotic resistance can be develop if irregularities happen in antibiotic treatment

Select the correct statement/s using the codes given below

- a) 1 and 2 only
- b) 1 and 3 only
- c) 2 and 3 only
- d) **All of the above**

4. With reference to Primary Agricultural Cooperative credit societies (PACS) consider the following

1. Deposits can be made only by members of the societies
2. It can be formed by not less than ten members

Select the correct statement/s using the codes given below

- a) 1 only
- b) **2 only**
- c) Both 1 and 2
- d) Neither 1 no2

5. Consider the followings diseases

1. Polio
2. Rotavirus
3. Measles rubella

4. Adult Japanese encephalitis
5. Pneumonia
6. Adult diphtheria

Which of the above disease does have vaccine in India?

- a) 1,2,3, and 5 only
- b) 1,2,4, and 6 only
- c) 1,2, and 3 only

d) All of the above

6. Consider the following statements with regards to Vitamin A deficiency in India

1. Vitamin A deficiency contributes to blindness by making the cornea very dry, thus damaging the retina and cornea.
2. Under vitamin-A supplementation programme, all the children below the five years of age given Vitamin A supplement annually.

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

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

7. The term “Ind-SAT” recently seen in news is related to which of the following?

- a) Satellite dedicated for educational purpose
- b) Educational scholarship programme**
- c) Assessment report of NITI Ayog on Higher Education
- d) Educational Research Park

8. With reference to SAARC consider the following statements

1. Bhutan is the only landlocked country member to SAARC
2. Srilanka is the only island country member to SAARC
3. In the latest SAARC summit it has been decided to establish SAARC food bank.

Which of the above statement/s is /are correct?

- a) 1 and 2 only
- b) 2 and 3 only
- c) 1 and 3 only
- d) None of the above**

9. National MSMEs Award is given to which of the followings?

1. Aspirational Districts
2. States
3. Banks
4. UTs

Select the correct answer using the codes given below

- a) 1 and 2 only
- b) 1,2 and 3 only
- c) 1,2 and 4 only
- d) All of the above**

10. Udyami Bharat programme recently seen in news are related to

- a) Accessible India for Handicapped
- b) MSMEs sector**
- c) Space science development in early schooling
- d) Street vendors rehabilitation