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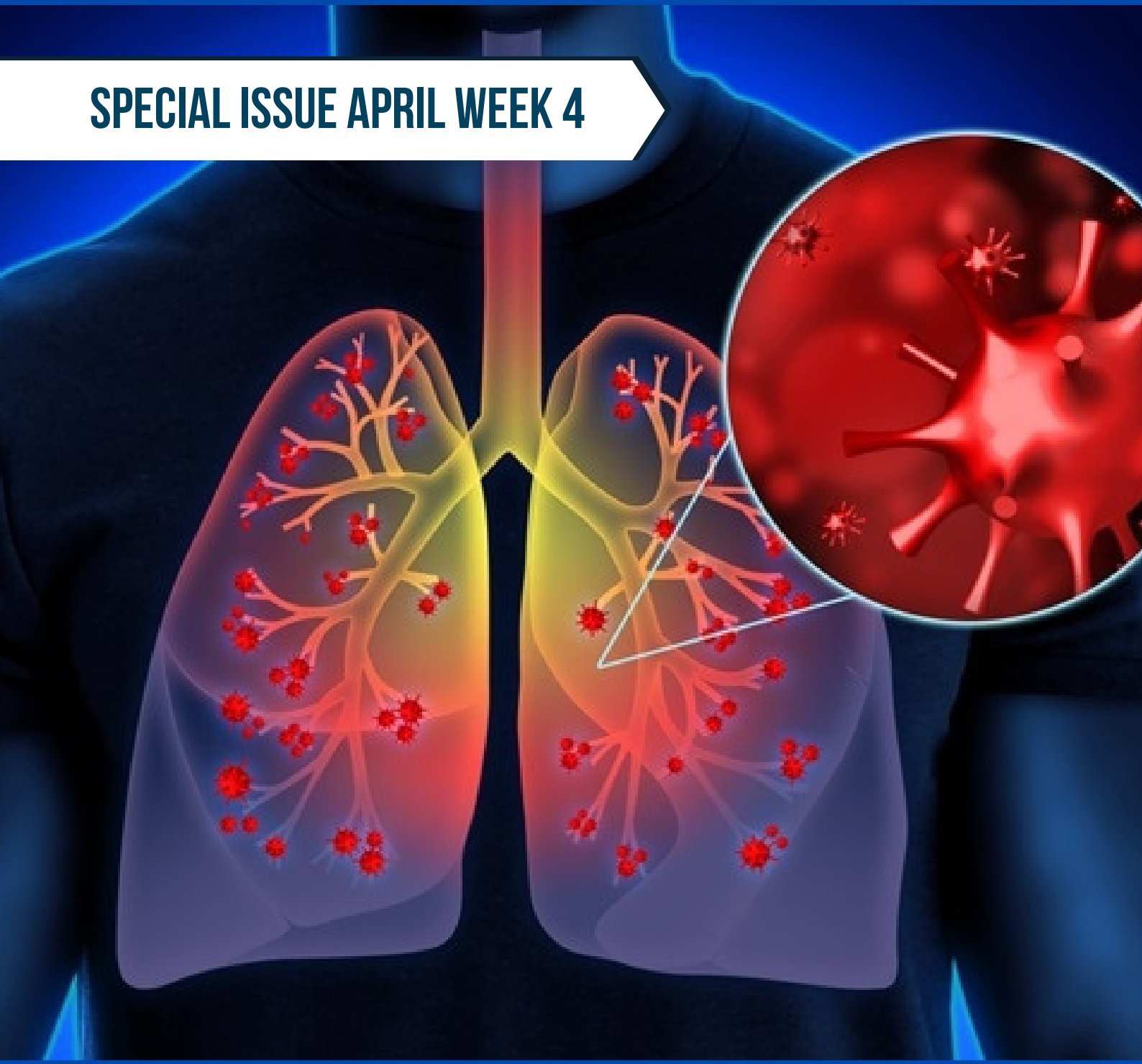
## SPECIAL ISSUE APRIL WEEK 4



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info@theprayasindia.com
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# Special Issue

**April (Week 4)**

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# Can nitric oxide fight coronavirus? All you need to know

(Source: Indian Express )

**Context:** *Till date, there is still no specific drug for controlling Covid-19. While scientists worldwide are working on effective antiviral drugs against SARS-CoV2, some are looking beyond drugs. For example, a multinational collaboration has recently announced results of phase 2 clinical trials indicating that a nitric oxide nasal spray can be an effective viral treatment. It is not, however, the first time nitric oxide has been studied as a therapy for infection or other illnesses.*

**What is this therapy?**

- Nitric oxide is known to have a broad antimicrobial effect against bacteria, fungi, helminths, protozoa and viruses.
- To assess the potential of NO as a treatment for SARS-CoV-2 infection, researchers evaluated its vitro antiviral effect on SARS-CoV-2 replication and published their findings in September 2020.

**And what is this spray?**

- It has been developed by a Vancouver-based biotech firm, SaNOtize Research and Development Corporations, along with St Peter's hospitals, NHS Foundation Trust in Surrey, and Berkshire and Surrey Pathology Services.
- The spray releases a small, topical amount of nitric oxide that is well known to kill viruses including SARS-CoV-2. It is non-specific and thus kills any virus.

**What were the trial results?**

- It was a randomised, double-blinded, placebo-controlled phase 2 trial. It evaluated 79 confirmed cases of Covid-19.
- According to the announced results, early treatment helped reduce the level of SARS-CoV2. Patients treated with the spray saw an average reduction of around 95% in viral load in the first 24 hours, and more than 99% within 72 hours. No side effects or adverse events were observed.
- A majority of the patients had been infected with the variant first detected in the UK.

**With the virus airborne, how long does the effect of the spray last?**

- It is a 'post-exposure' prevention — just like the hand sanitiser is.
- The self-administered nasal spray releases a small topical amount of nitric oxide and aims to kill the virus in the upper airways, preventing it from incubating and making its way to the lungs.
- If you are outside, around people, and could be infected, you could use the spray and reduce the number of viruses in the nose, before it is becoming a full-blown infection. We have shown that even when people have a very high load of virus, the spray can significantly reduce the viral load.

**Has it got any kind of clearance?**

- The World Health Organization has yet to give an emergency use authorisation (EUA).
- Israel and Bahrain have given EUA to the spray, as a medical device. The developers have also applied for EUA in the UK, Dr Winchester said.
- A phase 3 trial is being planned, although it would be for regulators to decide if it was needed.

**How do scientists in India view this?**

- Prof Ram Vishwakarma, Advisor, Council of Scientific and Industrial Research (CSIR), said that as a scientist he was open to these developments. And Indian companies too are working on similar ideas.

- Several molecules are in clinical trials, and at CSIR, too, there are 15 molecules in the preclinical stage of development. One or two may go into clinical trials in a few months, Prof Vishwakarma said.

## All you need to know about production of oxygen on mars

(Source: Indian Express )

**Context:** *Since reaching the Martian surface in February, NASA's Perseverance mission has earned admiration for achieving feats that were only thought possible in science fiction, such as flying a helicopter there, which it did this week. The pioneering Mars rover has now added another feather to its cap. The US space agency has announced that, a device aboard the rover was able to produce oxygen from the thin Martian atmosphere for the first time – a development that has brought cheer among the scientific community, as it promises hope for future crewed missions that can rely on this technology for astronauts to breathe and return to Earth.*

**How did Perseverance produce oxygen on Mars?**

- In its first operation since arriving on the Red Planet, the Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE) produced 5 grams of oxygen from carbon dioxide in the Martian atmosphere, enough for an astronaut to breathe for 10 minutes.
- On Mars, carbon dioxide makes up ~96% of the gas in the planet's atmosphere. Oxygen is only 0.13%, compared to 21% in Earth's atmosphere. Like a tree on Earth, MOXIE inhales carbon dioxide and exhales oxygen.
- To produce oxygen, MOXIE separates oxygen atoms from carbon dioxide molecules. It does so by using heat at a temperature of around 800 degrees Celsius, and in the process also produces carbon monoxide as a waste product, which it releases in the Martian atmosphere.
- A technology demonstrator, MOXIE is designed to generate up to 10 grams of oxygen per hour, and is placed inside the Perseverance rover. It is the size of a car battery, weighing 37.7 pounds (17.1 kg) on Earth, but just 14.14 pounds (6.41 kg) on Mars.
- Through its first successful run, MOXIE was able to demonstrate that it survived its launch from Earth, an almost seven-month journey through deep space, and landing on the Martian surface with Perseverance. Over the next two years, MOXIE is expected to extract oxygen nine more times.
- MOXIE is only a test model. Future oxygen generators that descend from its technology need to be about 100 times larger to support human missions on Mars.

**Why is producing oxygen on the Red Planet so important?**

- A substantial amount of oxygen supply on Mars is essential for crewed missions that plan to go there– not just for astronauts to breathe but for rockets to use as fuel while coming back to Earth.
- As per the NASA press release, for four astronauts to take off from Mars, a future mission would require around 7 metric tons of rocket fuel and 25 metric tons of oxygen– around the weight of an entire space shuttle. In contrast, astronauts living and working on Mars would require far less oxygen to breathe, maybe around one metric ton.
- Scientists believe that it will be an enormous challenge to haul the 25 metric tons of oxygen from Earth to Mars for the return journey, and that their job would become significantly easier if the liquified oxygen can be produced on the Red Planet. This is where MOXIE's role comes in.
- "When we send humans to Mars, we will want them to return safely, and to do that they need a rocket to lift off the planet. Liquid oxygen propellant is something we could make there and not have to bring with

us. One idea would be to bring an empty oxygen tank and fill it up on Mars," said Michael Hecht, MOXIE's Principal Investigator.

- NASA hopes to build a larger technological descendant of the experimental MOXIE that can do this job. A one-ton oxygen converter of this kind would be much more economical and practical to take to Mars, instead of 25 metric tons of oxygen, the agency argues.
- MOXIE has more work to do, but the results from this technology demonstration are full of promise as we move toward our goal of one day seeing humans on Mars.
- Oxygen isn't just the stuff we breathe. Rocket propellant depends on oxygen, and future explorers will depend on producing propellant on Mars to make the trip home.