

May  
2021

# समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

खंड : 46      अंक : 93      13 मई 2021

Vol.: 46      Issue : 93      13 May 2021



रक्षा विज्ञान पुस्तकालय  
Defence Science Library  
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र  
Defence Scientific Information & Documentation Centre  
मेटकॉफ हाउस, दिल्ली - 110 054  
Metcalf House, Delhi - 110 054

## CONTENTS

S. No.	TITLE	Page No.
	<b>DRDO News</b>	<b>1-21</b>
	<b>DRDO Technology News</b>	<b>1-3</b>
1.	DRDO tackles Covid-19 pandemic, but keeps focus on battlefield products	1
	<b>COVID 19: DRDO's Contribution</b>	<b>4-20</b>
2.	PM CARES fund approves procurement of 1.5 lakh units of SpO2 based oxygen supply system developed by DRDO	4
3.	पीएम केयर फंड ने डीआरडीओ द्वारा विकसित एसपीओ 2 आधारित ऑक्सीजन आपूर्ति प्रणाली की 1.5 लाख इकाइयों के अधिग्रहण को अनुमति प्रदान की	5
4.	MNS officers at the forefront in battle against second COVID-19 wave	6
5.	कोविड -19 की दूसरी लहर के खिलाफ अभियान में एमएनएस अधिकारी मजबूती से डटे	7
6.	Oral drug out to gobble up coronavirus	8
7.	Centre approves procurement of 1.5 lakh units of DRDO's 'Oxycare' system	9
8.	पीएम केयर फंड ने DRDO द्वारा विकसित SPO2 आधारित ऑक्सीजन आपूर्ति प्रणाली की 1.5 लाख इकाइयों के अधिग्रहण को अनुमति प्रदान की	10
9.	Covid-19 hospitals, oxygen generation, 2-DG drug: How DRDO has pitched in to tackle second wave	12
10.	DRDO's Covid hospital in Panipat to admit patients from May 16	13
11.	अपोलो से डीआरडीओ अस्पताल का करार, सुविधाओं के साथ प्रयोगों का मिलेगा लाभ	14
12.	वाराणसी में तैयार डीआरडीओ अस्पताल का अपोलो से करार, तीसरी लहर से निपटने की तैयारी शुरू	15
13.	दिल्ली के DRDO कोरोना अस्पताल को सबसे पहले दी जाएगी एंटी-कोविड ड्रग 2 DG, जानें इसकी खूबियां	16
14.	How exactly does defence ministry drug 2-DG work and who should get it?	18
15.	DRDO to set up oxygen generation plant at Chidambaram GH	19
16.	294 military nursing service officers mobilised for DRDO's 4 COVID hospitals	19
17.	बौखलाया ड्रेगन, भारत पर जैविक हमले की फ़िराक में	20
	<b>DRDO on Twitter</b>	<b>21-21</b>
	<b>Defence News</b>	<b>21-26</b>
	<b>Defence Strategic: National/International</b>	<b>21-26</b>
18.	Army Chief reviews security situation along LoC during visit to Jammu region	21
19.	Gen. Naravane speaks to U.S. Army Chief McConville	22
20.	नेवी चीफ एडमिरल करमबीर सिंह बोले- इस कठिन समय में नौसेना अपनी पूरी क्षमता से योगदान देगी	23
21.	Explained: How Israel's Iron Dome intercepts rockets	24
	<b>Science &amp; Technology News</b>	<b>27-32</b>
22.	Scientists create a new type of intelligent material	27
23.	Physicists extract proton mass radius from experimental data	29
24.	Observing individual atoms in 3D nanomaterials and their surfaces	30
	<b>COVID-19 Research News</b>	<b>32-32</b>
25.	Delaying second COVID-19 vaccine doses can help reduce deaths - study	32

## Business Standard

Thu, 13 May 2021

### **DRDO tackles Covid-19 pandemic, but keeps focus on battlefield products**

*DRDO's success over the last 15 months has been in its primary role  
of developing conventional defence equipment and technologies*

*By Ajai Shukla*

New Delhi: With an annual budget of about Rs 137,000 crore for this year and the last, the Defence R&D Organisation (DRDO), India's best-funded science and technology organisation, wasted no time in throwing its design and development expertise and manpower into combating the Covid-19 pandemic.

Since India's first Covid-19 case was reported on January 30, 2020, senior DRDO officials say they developed 19 technologies and over a hundred products to combat the pandemic. These include indigenous sanitiser and five-layered N-99 masks, four variants of personal protective equipment (PPE) of which 35 lakh units are currently on order, indigenous ventilators of which 30,000 are on order, and even an ingenious "medical oxygen plant" (MOP) derived from the Tejas fighter's on-board oxygen generator.

On Wednesday, the government announced it would spend Rs 322 crore from the PM CARES Fund on 1.5 lakh units of the DRDO's newly developed "Oxycare" system. Further, the DRDO has set up well-equipped Covid-care hospitals in Delhi, Patna and Muzaffarpur in double quick time.

As remarkable as the DRDO's contribution in containing and treating Covid-19 has been, its success over the last 15 months has been in its primary role of developing conventional defence equipment and technologies. While many private R&D centres and industries pulled down their shutters and others were prevented from working by successive lockdowns, the DRDO's 50 laboratories have continued announcing developmental successes almost on a weekly basis.

G Satheesh Reddy, the DRDO Chief, explains how this was done. "We first identified the DRDO labs that were working in technology areas whose offshoots could be useful against Covid-19. Those labs were tasked to use the technologies and develop products for anti-Covid applications," he said.



Work has continued through lockdowns and restrictions on developmental programmes (Photo: BrahMos final assembly plant in Hyderabad)

“For example, the Bengaluru-based Defence Bio-engineering and Electro-medical Laboratory (DEBEL), from its on-board oxygen generation technology that is going into the Tejas fighter, developed oxygen plants and worked with industry to produce those in large numbers.”

Similarly, he adds, the Delhi-based Institute of Nuclear Medicine and Allied Sciences (INMAS), which was working on therapeutic drug development for anti-radiation therapy, brought out an anti-Covid drug called 2-DG,” said Reddy.

But the DRDO chief ensured that other laboratories continued their work on defence related products and technologies.

### **Tejas fighter**

For the DRDO, 2020 began with a bang. As the Covid-19 pandemic was taking hold, the DRDO announced that the naval version of the Tejas had successfully landed on the aircraft carrier, INS Vikramaditya. It had earlier taken off and landed multiple times on a full-scale model of an aircraft carrier ramp in Goa called the Shore Based Test Facility (SBTF). But this was the real thing – the challenge of landing on the heaving deck of a moving aircraft carrier at sea.

Another triumph was the completion of 125 hours of testing of the Uttam Active Electronically Scanned Array (AESA) radar. The combat capability of a fighter aircraft depends largely on its radar. A quality AESA radar – which can track multiple targets in air-to-air, air-to-ground and air-to-sea modes – would establish the Tejas as a world-class fighter. The Uttam is slated to equip the Tejas Mark 2 and can be adapted to other aircraft too.

### **BrahMos missile**

The Indo-Russian BrahMos supersonic cruise missile was test-fired last September to validate its recently indigenised configuration, which had a “Made in India” booster, airframe and several other systems. The missile achieved its range configuration and a top speed of Mach 2.8 (3,500 km/hour).

A week later, a BrahMos ship-launched cruise missile was fired from a stealth destroyer, INS Chennai, in the Arabian Sea. According to the MoD, “the missile hit the target successfully with pin-point accuracy after performing high-level and extremely complex manoeuvres.”

A third BrahMos was test fired successfully in a ship-to-ship mode last December, striking and sinking a decommissioned ship that was the target.

### **Hypersonic vehicle**

On September 7, 2020, India became the fourth country (after the US, Russia and China) to successfully fly a vehicle at hypersonic speed, when the DRDO’s experimental Hypersonic Technology Demonstration Vehicle (HSTDV) took off from the APJ Abdul Kalam Launch Complex, off Odisha. “A proven solid-rocket motor took the HSTDV to an altitude of 30 km, where the aerodynamic heat shields were separated and it flew at Mach 6 for more than 22 seconds,” stated the DRDO.

Hypersonic flight, which is a speed faster than Mach 6 (7,500 kmph) yields enormous military advantages. Most cruise missiles fly today at sub-sonic speeds of about 1,000 kmph, making them vulnerable to interception by supersonic fighter jets. A hypersonic missile, which flies faster than any fighter, would strike its target before it can be intercepted. Further, the kinetic impact of a Mach 6 strike would utterly demolish the target.

### **Anti-Tank Guided Missiles (ATGMs)**

The DRDO also notched up significant successes in two anti-tank guided missile (ATGM) projects. In July 2020, the DRDO successfully conducted three flight tests of the Dhruvastra ATGM. “The helicopter-launched ATGM is one of the most advanced anti-tank weapons in the world,” announced the DRDO.

In September 2020, the so-called Laser Guided ATGM was successfully test fired from the DRDO’s Arjun tank in Ahmednagar. The Laser Guided ATGM rides a laser beam to the target, which is illuminated with a laser. While this missile will be capable of being fired from any tank with a laser, it is likely to first be fitted on the MBT Arjun.

### **Anti-Radiation Missile (RUDRAM)**

The DRDO successfully tested the country's first anti-radiation missile (RUDRAM) in October 2020. The missile, primarily designed to destroy enemy radars, was launched from a Sukhoi-30 MKI fighter aircraft at a "radiating target" located on Wheeler Island off the coast of Odisha. The missile is guided for the initial part of its journey by an "inertial navigation system" or by the "global positioning system." Close to its target, it follows a "passive homing head", riding the enemy's radar emissions all the way to the emitting radar. It is learnt that the RUDRAM hit the radiation target with pin-point accuracy.

### **Supersonic Missile Assisted Release of Torpedo (SMART)**

Torpedoes are often a warship's most potent threat, but they have the drawbacks of limited range and speed. The DRDO has mitigated these drawbacks in the SMART, a lightweight anti-submarine torpedo system that can strike targets far beyond conventional torpedo ranges. This is achieved by launching the torpedo on a missile; once close to the target, the torpedo separates from the missile and heads for the target autonomously.

The DRDO Chief is confident of delivering anti-Covid products, without compromising his conventional role. "The pandemic has not set back existing design and development projects, he says, adding, "Due to prevailing Covid cases and lockdown, attendance has come down and industry also is unable to work to its capacity. But the slowdown is only temporarily."

[https://www.business-standard.com/article/current-affairs/drdo-tackles-covid-19-pandemic-but-keeps-focus-on-battlefield-products-121051201472\\_1.html](https://www.business-standard.com/article/current-affairs/drdo-tackles-covid-19-pandemic-but-keeps-focus-on-battlefield-products-121051201472_1.html)

# COVID 19: DRDO's Contribution



Press Information Bureau  
Government of India

Ministry of Defence

Wed, 12 May 2021 2:40PM

## PM CARES fund approves procurement of 1.5 lakh units of SpO<sub>2</sub> based oxygen supply system developed by DRDO

PM CARES Fund has accorded sanction for procurement of 1,50,000 units of 'Oxycare' system developed by Defence Research and Development Organisation (DRDO) at a cost of Rs 322.5 crore. Oxycare is a SpO<sub>2</sub> based Oxygen Supply System which regulates the oxygen being administered to patients based on the sensed SpO<sub>2</sub> levels. Under this sanction, 1,00,000 manual and 50,000 automatic Oxycare systems along with non-rebreather masks are being procured.

The Oxycare system delivers supplemental oxygen based on the SpO<sub>2</sub> levels and prevents the person from sinking into a state of hypoxia which can be fatal. This system was developed by Defence Bio-Engineering & Electro Medical Laboratory (DEBEL), Bengaluru of DRDO for soldiers posted at extreme high-altitude areas. The system is indigenously developed for operation in field conditions and is robust. It can be effectively used to treat COVID-19 patients.

Two variants of the system have been configured. The basic version consists of a 10-litre oxygen cylinder, a pressure regulator cum flow controller, a humidifier and a nasal cannula. The oxygen flow is regulated manually based on the SpO<sub>2</sub> readings. In the second configuration, the oxygen cylinder is equipped with electronic controls which automatically regulates the oxygen flow through a low-pressure regulator and a SpO<sub>2</sub> probe.

The SpO<sub>2</sub> Based Oxygen Supply System optimises the consumption of oxygen based on the SpO<sub>2</sub> reading of the patient and effectively increases the endurance of portable oxygen cylinder. The threshold SpO<sub>2</sub> value for initiating flow from the system can be adjusted by the health staff. A display is provided for continuously monitoring the SpO<sub>2</sub> levels. Work load and exposure of healthcare providers is considerably reduced by eliminating the need of routine measurements and manual adjustments of oxygen flow.

The automatic system also provides suitable audio warning for various failure scenarios including low SpO<sub>2</sub> values and probe disconnections. The non-rebreather masks are integrated with the Oxycare Systems for efficient use of oxygen which results in saving of Oxygen by 30-40%. The non-rebreather masks need to be changed for every patient. These Oxycare systems can be used at Homes, Quarantine Centres, COVID Care Centres and Hospitals.

The DRDO has transferred the technology to multiple industries in India which will be producing the Oxycare systems.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1717917>







## पीएम केयर फंड ने डीआरडीओ द्वारा विकसित एसपीओ 2 आधारित ऑक्सीजन आपूर्ति प्रणाली की 1.5 लाख इकाइयों के अधिग्रहण को अनुमति प्रदान की

पीएम केयर फंड ने रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) द्वारा 322.5 करोड़ रुपये की लागत से विकसित 'ऑक्सीकेयर' प्रणाली की 1,50,000 इकाइयों की खरीद के लिए मंजूरी प्रदान की है। ऑक्सीकेयर एक एसपीओ 2 आधारित ऑक्सीजन आपूर्ति प्रणाली है जो महसूस किए गए एसपीओ 2 के स्तर के आधार पर रोगियों को दी जा रही ऑक्सीजन को नियंत्रित करती है। इस मंजूरी के तहत नॉन रिब्रीदर मास्क के साथ 1,00,000 मैनुअल और 50,000 ऑटोमैटिक ऑक्सीकेयर प्रणालियां खरीदी जा रही हैं।

ऑक्सीकेयर प्रणाली एसपीओ 2 के स्तर के आधार पर न्यूनतापूरक ऑक्सीजन बचाती है और व्यक्ति को हाइपोकिसिया की स्थिति में पहुंचने से रोकती है जो कि घातक हो सकता है। यह प्रणाली अत्यधिक ऊंचाई वाले क्षेत्रों में तैनात सैनिकों के लिए डीआरडीओ की रक्षा जैव-इंजीनियरिंग और इलेक्ट्रो मेडिकल प्रयोगशाला (डीईबीईएल), बंगलुरु द्वारा विकसित की गई थी। यह प्रणाली समतल क्षेत्रों में इस्तेमाल करने के लिए स्वदेशी रूप से विकसित की गई है और मज़बूत है। इसका उपयोग कोविड-19 रोगियों के इलाज के लिए प्रभावी ढंग से किया जा सकता है।

सिस्टम के दो स्वरूपों को विन्यासित किया गया है। मूल संस्करण में 10 लीटर ऑक्सीजन सिलेंडर, एक दबाव नियामक सह प्रवाह नियंत्रक, एक ह्यूमिडिफायर और एक नैज़ल कैनुला शामिल हैं। ऑक्सीजन प्रवाह को एसपीओ 2 रीडिंग के आधार पर मैनुअल रूप से विनियमित किया जाता

है। दूसरे विन्यास में ऑक्सीजन सिलेंडर इलेक्ट्रॉनिक नियंत्रण से लैस है जो स्वचालित रूप से कम दबाव वाले नियामक एवं एसपीओ 2 जांच के माध्यम से ऑक्सीजन प्रवाह को नियंत्रित करता है।

एसपीओ 2 आधारित ऑक्सीजन आपूर्ति प्रणाली रोगी की एसपीओ 2 रीडिंग के आधार पर ऑक्सीजन की खपत को अनुकूलित करती है और प्रभावी रूप से पोर्टेबल ऑक्सीजन सिलेंडर की क्षमता में बढ़ोतरी करती है। प्रणाली से ऑक्सीजन का प्रवाह शुरू करने के लिए थ्रेशोल्ड एसपीओ 2 की मात्रा स्वास्थ्यकर्मियों द्वारा समायोजित की जा सकती है। एसपीओ 2 के स्तरों की लगातार निगरानी के लिए एक डिस्प्ले प्रदान किया जाता है। स्वास्थ्य सेवाएं प्रदान करने वाले कर्मचारियों का कार्यभार एवं एक्सपोज़र नियमित माप



और ऑक्सीजन प्रवाह के मैनुअल समायोजन की आवश्यकता को खत्म करने से काफी हद तक कम हो जाता है।

स्वचालित प्रणाली कम एसपीओ 2 वैल्यू और प्रोब डिस्कनेक्शन समेत विफलता की विभिन्न स्थितियों के लिए उपयुक्त ऑडियो चेतावनी भी प्रदान करती है। नॉन-रिब्रीदर मास्क को ऑक्सीजन के कुशल उपयोग के लिए ऑक्सीकेयर प्रणाली के साथ एकीकृत किया जाता है जिसके परिणामस्वरूप 30 से 40 प्रतिशत ऑक्सीजन की बचत होती है। हर मरीज के लिए नॉन रिब्रीदर मास्क बदलने की जरूरत होती है। इन ऑक्सीकेयर प्रणालियों का उपयोग घरों, क्वारंटाइन केंद्रों, कोविड केयर केंद्रों एवं अस्पतालों में किया जा सकता है।

डीआरडीओ ने इस तकनीक को भारत में कई उद्योगों को हस्तांतरित कर दिया है जो ऑक्सीकेयर प्रणालियों का उत्पादन करेंगे।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1718093>



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Wed, 12 May 2021 2:45PM*

## **MNS officers at the forefront in battle against second COVID-19 wave**

Nursing Officers of Military Nursing Service (MNS) are among the health care professionals who are at the forefront in the nation's ongoing fight against the second COVID-19 wave. The officers are deployed at various Armed Forces hospitals to provide medical care to the COVID-19 patients. Two hundred and ninety-four MNS Officers are being mobilised for the newly-raised COVID-19 hospitals by Defence Research and Development Organisation (DRDO) at Delhi, Lucknow, Ahmedabad, Varanasi and Patna.

Since the onset of the COVID-19 pandemic, the Nursing officers of MNS have been serving the nation with loyalty and courage. They played a vital role in various repatriation missions as part of Operation Namaste and Operation Samudra Setu.

The MNS Officers have been integral part of the country's war efforts, humanitarian assistance, rescue operations, ambulance trains, hospital ships and submarines. They are serving in advanced echelons such as Leh, Rajouri, Doda, Kargil and many other far-flung areas for the care for the troops in India. They are also deployed with UN Peace Keeping Force to countries namely Congo, Sudan, Lebanon, Friendly Foreign mission to Tajikistan etc. Comprehensive care to the combat troops in troubled areas of Jammu & Kashmir and North Eastern States add up to the preparedness and endurance of the Officers. The MNS Officers serve the Indian troops from the highest battle field to the vast dessert lands of India.

The Nursing Officers of MNS are extending their services to the people in need by upholding the theme of International Nurses Day 2021, *i.e.* 'Nurses A Voice to Lead, A Vision for Future Healthcare'. International Nurses Day is celebrated on 12<sup>th</sup> May every year.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1717918>





पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Wed, 12 May 2021 2:45PM

## कोविड -19 की दूसरी लहर के खिलाफ अभियान में एमएनएस अधिकारी मजबूती से डटे

मिलिट्री नर्सिंग सर्विस (एमएनएस) के नर्सिंग अधिकारी स्वास्थ्य देखभाल के कामकाज से जुड़े उन पेशेवरों में से हैं जो दूसरी कोविड-19 लहर के विरुद्ध देश की मौजूदा लड़ाई में सबसे आगे हैं। कोविड-19 रोगियों को चिकित्सा सुविधा प्रदान करने के लिए सशस्त्र बलों के विभिन्न अस्पतालों में अधिकारियों को तैनात किया जाता है। रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) द्वारा दिल्ली, लखनऊ, अहमदाबाद, वाराणसी और पटना में नए जुटाए गए कोविड-19 अस्पतालों के लिए 294 एमएनएस अधिकारियों को जुटाया जा रहा है।

कोविड-19 महामारी की शुरुआत के बाद से एमएनएस के नर्सिंग अधिकारी ईमानदारी और साहस के साथ राष्ट्र की सेवा कर रहे हैं। उन्होंने ऑपरेशन नमस्ते और ऑपरेशन समुद्र सेतु के सिलसिले में विभिन्न स्वदेश वापसी मिशनों में महत्वपूर्ण भूमिका निभाई।

एमएनएस अधिकारी देश के युद्ध प्रयासों, मानवीय सहायता, बचाव अभियान, एम्बुलेंस ट्रेनों, चिकित्सा जहाजों और पनडुब्बियों का अभिन्न हिस्सा रहे हैं। वे भारत में सैनिकों की देखभाल के लिए लेह, राजौरी, डोडा, कारगिल और कई अन्य दूर-दराज वाले क्षेत्रों में सेवा दे रहे हैं। उन्हें संयुक्त राष्ट्र शांति सेना के साथ कांगो, सूडान, लेबनॉन, ताजिकिस्तान आदि देशों में शांति मिशन के लिए तैनात किया जाता है। जम्मू-कश्मीर और पूर्वोत्तर राज्यों के अशांत क्षेत्रों में संघर्ष में शामिल सैनिकों को प्रदान की जा रही व्यापक देखभाल इन अधिकारियों की तैयारियों और धैर्य में योगदान देती है। एमएनएस अधिकारी सबसे ऊंचे युद्ध क्षेत्र से लेकर भारत की विशाल मरुभूमि तक भारतीय सैनिकों की सेवा करते हैं।

एमएनएस के नर्सिंग अधिकारी अंतरराष्ट्रीय नर्स दिवस 2021 के विषय यानी 'नर्सिंग ए वॉयस टू लीड, ए विजन फॉर फ्यूचर हेल्थकेयर' को कायम रखते हुए ज़रूरतमंद लोगों तक अपनी सेवाएं प्रदान कर रहे हैं। हर साल दिनांक 12 मई को अंतरराष्ट्रीय नर्सिंग दिवस मनाया जाता है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1718100>

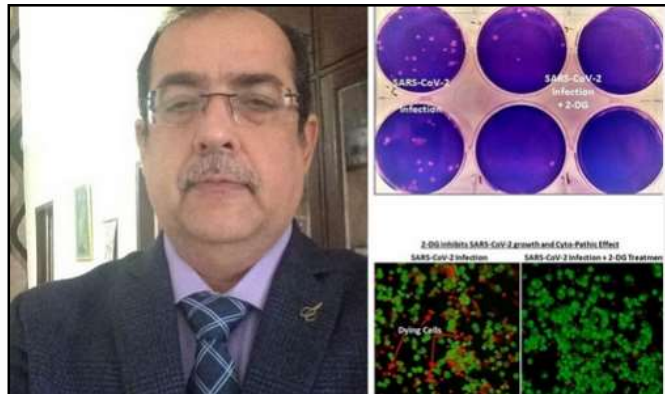
## Oral drug out to gobble up coronavirus

By Purna Singh

### Highlights

*At a time when the world is struggling with trial-and-error method to treat the novel Coronavirus and the new mutants causing great concern, the news that DRDO had developed an anti-Covid oral drug, 2-deoxy-D-glucose (2DG) in collaboration with Dr Reddy's lab comes as the best news of the century and boosts the confidence level of all Covid-19 patients*

At a time when the world is struggling with trial-and-error method to treat the novel Corona virus and the new mutants causing great concern, the news that DRDO had developed an anti-Covid oral drug, 2-deoxy-D-glucose (2DG) in collaboration with Dr Reddy's lab comes as the best news of the century and boosts the confidence level of all Covid-19 patients. The drug is likely to be available for the patients in about a week's time. In an exclusive interview with Purna Singh, DRDO Project Director and Scientist Dr Sudhir Chandana explains how the drug with no side effects would work on the patients.



DRDO Project Director and Scientist Dr Sudhir Chandana

**India is waiting with a bated breath for the rollout of the oral drug for Covid-19. The news that it would be rolled out soon gives great courage to people. But when will it be available for the Covid affected people?**

Dr Reddy's Lab is our industrial partner. They have already geared up their manufacturing process. We got emergency approval for the use of this drug. We can expect it to be on the floor within one week for the masses. Although the final status of production can be explained by Reddy's Lab.

**When did DRDO start clinical trials and how does this drug work? Is it just an immunity booster like a vaccine or a drug to cure Covid-19? Does it stop the mutation of the virus, or does it make the virus less effective?**

The clinical trials had started from May 2020 and in October 2020 we went in for phase 2 trials. The phase 3 trials started from December 2020 and went on till March 2021. The mechanism of this molecule is that it is a glucose analog. The virus-infected cell, the host cells are more dependent on glycolysis, and the glucose intake increases. 2DG is competing with glucose for uptake by the cell. So, the virus-infected cells take more of 2DG also which in turn leads to a higher intake of 2DG in the cells. Eventually, it inhibits the energy production in the virus cells. This finally results in replication or multiplication of the virus. This we have already established by in-vitro experiments and the efficacy and the effectiveness of the drug in the cell was quite good. In simple language, it reduces dependence on oxygen.

**When can the doctors administer this drug to the patient? Will the drug be able to cut down the number of patients in the ICU by saving their lives?**

We have conducted trials of this drug on 110 patients on oxygen supply in the third phase of the trials. All of them recovered pretty well. There was no death. In the phase 2 trials, we have seen that the recovery is faster and then in the larger sample size in phase 3 trials we could see that by third-day oxygen dependence reduces in more patients as compared to standard care. This drug has been administered along with standard care.

### **Are there any side effects of the drug either in the short or long run?**

No side effects were evident during trials. It is pretty safe drug to be administered.

### **What are the other chemicals needed to synthesise the drug? Will the same be easily available in our country?**

Yes. This is made from glucose, so anyone can start preparing it. Only the process thing is the issue with each company and Dr Reddy's lab had already collaborated with us and the previous trials of 2G were on brain tumour patient from 2004 onwards up to 2014 and they had also taken technology from DRDO Gwalior and made the process patent for the synthesis of the molecule. Dr Reddy's Lab has the Terms of Trade (ToT).

### **Everybody is eyeing a drug that would be saviour for mankind. Can we expect this drug to be one of the so-called "Ram-baan" drug to cure Covid?**

The kind of response we have seen in the clinical trials, definitely indicates that it has given good benefits in the recovery of patients. In both phase 2 and 3 trials, we have seen one indication that in none of the patients the disease was progressing further. All have recovered. So we can imply that this drug along with other standard care is giving benefits. And no patient has lost his life, so this is a very good indication. People have been calling it "Ram- Baan" but we would say it is a very good drug.

<https://www.thehansindia.com/news/national/oral-drug-out-to-gobble-up-coronavirus-686046?infinitescroll=1>



Thu, 13 May 2021

## **Centre approves procurement of 1.5 lakh units of DRDO's 'Oxycare' system**

*The DRDO has transferred the technology to multiple industries in India which will be producing the 'Oxycare' systems. Apart from this, the DRDO has also decided to set up seven medical oxygen plants in Odisha*

*Edited by Amit Chaturvedi*

New Delhi: The Centre on Wednesday approved the procurement of 1,50,000 units of 'Oxycare' system developed by Defence Research and Development Organisation (DRDO). The procurement will be done at a cost of ₹322.5 crore under the PM-Cares fund to help the Covid-19 patients.

After the approval, the government will procure 1,00,000 manual and 50,000 automatic 'Oxycare' systems along with non-rebreather masks.

'Oxycare' is a SpO<sub>2</sub>-based oxygen supply system which regulates the oxygen being administered to patients based on the sensed SpO<sub>2</sub> levels. It prevents the person from sinking into a state of hypoxia which can be fatal.

The 'Oxycare' system was originally developed for soldiers posted at extreme high-altitude areas. The indigenously developed system is robust and can be effectively used to treat Covid-19 patients

There are two variants of the DRDO system. The basic version consists of a 10-litre oxygen cylinder, a pressure regulator-cum-flow controller, a humidifier and a nasal cannula. In this model, the oxygen flow is regulated manually based on the SpO<sub>2</sub> readings. The second one is equipped with electronic controls which automatically regulates the oxygen flow through a low-pressure regulator and a SpO<sub>2</sub> probe.



**The DRDO recently installed high capacity medical oxygen plants at AIIMS Trauma Centre for Covid-19 patients.(ANI Photo)**

The DRDO has transferred the technology to multiple industries in India which will be producing the 'Oxycare systems.

Apart from this, the DRDO has also decided to set up seven medical oxygen plants in Odisha.

The plants will come up at Boudh, Cuttack, Bhadrak, Gajapati, Jharsuguda, Nayagarh and Koraput districts, CGM of National Highways Authority of India (NHAI), Odisha, Ram Prasad Panda, said. The civil and electrical works of the plants will be done by the NHAI while the DRDO will look after the technical aspect, he added.

The DRDO's move is a part of its massive drive under which it has decided to set up 500 medical oxygen plants in the country within three months with the help of its indigenous developed technology.

Once completed, each plant will generate 1,000 litres per minute (LPM) of oxygen and the life-saving gas will be supplied to hospitals through pipelines

<https://www.hindustantimes.com/india-news/centre-approves-procurement-of-1-5-lakh-units-of-drdo-s-oxycare-101620812006495.html>



Thu, 13 May 2021

## पीएम केयर फंड ने DRDO द्वारा विकसित SPO2 आधारित ऑक्सीजन आपूर्ति प्रणाली की 1.5 लाख इकाइयों के अधिग्रहण को अनुमति प्रदान की

पीएम केयर फंड ने रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) द्वारा 322.5 करोड़ रुपये की लागत से विकसित 'ऑक्सीकेयर' प्रणाली की 1,50,000 इकाइयों की खरीद के लिए मंजूरी प्रदान की है। ऑक्सीकेयर एक एसपीओ 2 आधारित ऑक्सीजन आपूर्ति प्रणाली है जो महसूस किए गए एसपीओ 2 के स्तर के आधार पर रोगियों को दी जा रही ऑक्सीजन को नियंत्रित करती है। इस मंजूरी के तहत नॉन रिब्रीडर मास्क के साथ 1,00,000 मैनुअल और 50,000 ऑटोमैटिक ऑक्सीकेयर प्रणालियां खरीदी जा रही हैं।

ऑक्सीकेयर प्रणाली एसपीओ 2 के स्तर के आधार पर न्यूनतापूरक ऑक्सीजन बचाती है और व्यक्ति को हाइपोक्सिया की स्थिति में पहुंचने से रोकती है जो कि घातक हो सकता है। यह प्रणाली अत्यधिक ऊंचाई वाले क्षेत्रों में तैनात सैनिकों के लिए डीआरडीओ की रक्षा जैव-इंजीनियरिंग और इलेक्ट्रो मेडिकल प्रयोगशाला (डीईबीईएल), बंगलुरु द्वारा



विकसित की गई थी। यह प्रणाली समतल क्षेत्रों में इस्तेमाल करने के लिए स्वदेशी रूप से विकसित की गई है और मज़बूत है। इसका उपयोग कोविड-19 रोगियों के इलाज के लिए प्रभावी ढंग से किया जा सकता है।

सिस्टम के दो स्वरूपों को विन्यासित किया गया है। मूल संस्करण में 10 लीटर ऑक्सीजन सिलेंडर, एक दबाव नियामक सह प्रवाह नियंत्रक, एक ह्यूमिडिफायर और एक नैज़ल कैनुला शामिल हैं। ऑक्सीजन प्रवाह को एसपीओ 2 रीडिंग के आधार पर मैनुअल रूप से विनियमित किया जाता है। दूसरे विन्यास में

ऑक्सीजन सिलेंडर इलेक्ट्रॉनिक नियंत्रण से लैस है जो स्वचालित रूप से कम दबाव वाले नियामक एवं एसपीओ 2 जांच के माध्यम से ऑक्सीजन प्रवाह को नियंत्रित करता है।

एसपीओ 2 आधारित ऑक्सीजन आपूर्ति प्रणाली रोगी की एसपीओ 2 रीडिंग के आधार पर ऑक्सीजन की खपत को अनुकूलित करती है और प्रभावी रूप से पोर्टेबल ऑक्सीजन सिलेंडर की क्षमता में बढ़ोतरी करती है। प्रणाली से ऑक्सीजन का प्रवाह शुरू करने के लिए थ्रेशोल्ड एसपीओ 2 की मात्रा स्वास्थ्यकर्मियों द्वारा समायोजित की जा सकती है। एसपीओ 2 के स्तरों की लगातार निगरानी के लिए एक डिस्प्ले प्रदान किया जाता है। स्वास्थ्य सेवाएं प्रदान करने वाले कर्मचारियों का कार्यभार एवं एक्सपोजर नियमित माप और ऑक्सीजन प्रवाह के मैनुअल समायोजन की आवश्यकता को खत्म करने से काफी हद तक कम हो जाता है।

स्वचालित प्रणाली कम एसपीओ 2 वैल्यू और प्रोब डिस्कनेक्शन समेत विफलता की विभिन्न स्थितियों के लिए उपयुक्त ऑडियो चेतावनी भी प्रदान करती है। नॉन-रिब्रीडर मास्क को ऑक्सीजन के कुशल उपयोग के लिए ऑक्सीकेयर प्रणाली के साथ एकीकृत किया जाता है जिसके परिणामस्वरूप 30 से 40 प्रतिशत ऑक्सीजन की बचत होती है। हर मरीज के लिए नॉन रिब्रीडर मास्क बदलने की जरूरत होती है। इन ऑक्सीकेयर प्रणालियों का उपयोग घरों, क्वारंटाइन केंद्रों, कोविड केयर केंद्रों एवं अस्पतालों में किया जा सकता है।

डीआरडीओ ने इस तकनीक को भारत में कई उद्योगों को हस्तांतरित कर दिया है जो ऑक्सीकेयर प्रणालियों का उत्पादन करेंगे।

<https://insamachar.com/pm-care-fund-allows-acquisition-of-1-5-lakh-units-of-spo2-based-oxygen-supply-system-developed-by-drdo/>



## **Covid-19 hospitals, oxygen generation, 2-DG drug: How DRDO has pitched in to tackle second wave**

*DRDO has made makeshift hospitals with negative pressure tents to help those need specialised medical care due to Covid-19. The specifications of the hospital infrastructure on the ICU beds, oxygen beds and normal beds was worked out in consultation with the state health authorities*

*By Shishir Gupta*

New Delhi: The Defence Research and Development Organisation (DRDO)'s primary task is to develop state of the art weapons, strategic missiles and ballistic missiles submarines, but the raging pandemic in India has forced the organisation to change its focus from missile test firing to deter adversaries to saving lives of Covid-hit Indians.

The organisation has made makeshift hospitals with negative pressure tents to help those need specialised medical care due to Covid-19. The specifications of the hospital infrastructure on the ICU beds, oxygen beds and normal beds was worked out in consultation with the state health authorities.

The equipment for Covid-19 care is provided as per specified standards, the DRDO said. The maintenance and upkeep of the equipment is round-the-clock at a time when the spread of Covid-19 has led to lockdown-like conditions in several states, it added

Nine hospitals for Covid-19 have been set up by the DRDO in cities like Delhi, Ahmedabad, Lucknow, Varanasi, Gandhi Nagar, Haldwani, Rishikesh, Jammu and Srinagar. The biggest among them is the Dhanvantri Covid Care Hospital in Gandhi Nagar which has 700 oxygen beds and 200 ICU beds. In Delhi, Sardar Patel Covid Care Centre has 500 ICU beds.

The DRDO has also ordered the installation of oxygen generation plants at various hospitals across the country. The organisation said that these oxygen plants can generate up to 1,000 litres of oxygen per minute which can cater up to 190 patients. These plants can also charge up to 195 cylinders per day.

The research organisation said that first two oxygen plants arrived in Delhi and were operationalised at AIIMS and Ram Manohar Lohia (RML) hospitals in the city on May 6. The next three plants arriving in Delhi will be installed at Lady Hardinge Medical College, Safdarjung hospital and AIIMS in Jhajjar.

The DRDO has also taken an initiative to rope in more industry partners for ramping up the production of lower capacity medical oxygen plants for smaller hospitals.

To give further boost to oxygen production, DRDO also developed its own oxygen supply system based on SpO<sub>2</sub> (oxygen saturation) level. The system - called Oxycare - consists of two variants - manual and automatic. It was developed by the DRDO's Bengaluru-based Defence Bio-Engineering and Electro Medical Laboratory (DEBEL) for soldiers posted at extreme high-altitude areas.

The government on Wednesday approved the procurement of 1,50,000 units of the 'Oxycare' system. The DRDO has already transferred the technology to multiple industries in India for large-scale production of the system.

Apart from this, the DRDO's laboratory working on safety research has given more than 100, large cylinders of 1,200 litres to hospitals made by the government agency. One of the DRDO's



Amit Shah, Rajnath Singh visit 1000 bed DRDO-built Sardar Vallabhbhai Patel Covid-19 hospital in Delhi.(ANI file photo)



labs has developed an anti-Covid-19 therapeutic application of the drug 2-deoxy-D-glucose (2-DG). Clinical trial results have shown that this molecule helps in faster recovery of hospitalised patients and reduces supplemental oxygen dependence.

On May 1, the Drugs Controller General of India's (DCGI) granted permission for emergency use of the drug as adjunct therapy in moderate to severe Covid-19 patients after successful phase 3 trials. The drug comes in powder form in sachet, which is taken orally by dissolving it in water.

<https://www.hindustantimes.com/india-news/covid19-hospitals-oxygen-generation-2-dg-drug-how-drdo-has-pitched-in-to-tackle-second-wave-101620872205874.html>



Thu, 13 May 2021

## **DRDO's Covid hospital in Panipat to admit patients from May 16**

*The first phase of 500-bed dedicated Covid hospital near Panipat refinery  
will be made operational to admit patients from May 16*

Karnal: The first phase of 500-bed dedicated Covid hospital near Panipat refinery will be made operational to admit patients from May 16.

The first phase of the hospital will have capacity to admit 300 patients and the second phase for 200 patients will be completed by the end of this month, officials said.

Panipat deputy commissioner Dharmender Singh said nearly 80% work for the first phase of 300-beds has completed and doctors and paramedical staff from different hospitals and other medical colleges across state have started arriving to join duty.

He said that the hospital will admit patients from May 16 after a trail of two days.

This temporary hospital, around 500m from the oxygen plant of IOC's Panipat refinery is being set up by the Defence Research and Development Organisation (DRDO) in collaboration with the Haryana government.

The hospital will be funded by the Centre and the state government will make arrangements for doctors, nurses and other staff of EASI hospitals and students from medical and nursing colleges.

The Hospital will have direct piped supply of oxygen from the oxygen plant and opening of the hospital will come as a major relief to people in Covid-hit NCR districts of Haryana, who are facing acute shortage of hospital beds.

<https://www.hindustantimes.com/cities/others/drdo-covid-hospital-in-panipat-to-admit-patients-from-may-16-101620838664784.html>

## अपोलो से डीआरडीओ अस्पताल का करार, सुविधाओं के साथ प्रयोगों का मिलेगा लाभ

वाराणसी: कोरोना संकट काल में मरीजों की सुविधाओं के लिए बने डीआरडीओ अस्पताल का अपोलो अस्पताल से करार हो गया है। अब अपोलो की सुविधाओं, संसाधनों के साथ पर प्रयोगों का लाभ बीएचयू के अस्थायी अस्पताल को मिलेगा। एक महीने में वाराणसी में 35 एचएफएनसी भी बढ़ गया है। कोविड प्रभारी और एमएलसी एके शर्मा ने बुधवार को सर्किट हाउस में तीसरी लहर की आशंका से पहले तैयारी और वर्तमान कोरोना संकट के बीच किए गए कार्यों की जानकारी साझा की।

एमएलसी एके शर्मा ने बताया कि कोरोना की दूसरी लहर में संक्रमण दर कम होने के साथ ही वाराणसी में तीसरी लहर से निपटने की तैयारियां शुरू कर दी गईं हैं। इसके लिए बीएचयू, स्वास्थ्य विभाग के साथ सामाजिक संगठनों और प्रशासनिक अधिकारियों की टीम गठित होगी। यह टीम भविष्य की जरूरतों के साथ तीसरी लहर से निपटने के लिए सलाहों पर काम करेगी।

एमएलसी एके शर्मा ने बताया कि प्रधानमंत्री नरेंद्र मोदी के संसदीय क्षेत्र होने के कारण प्रधानमंत्री कार्यालय ने वाराणसी की सुविधाओं पर विशेष ध्यान दिया। अब तीसरी लहर की आशंका में बच्चों पर प्रभाव की बात कही जा रही है। ऐसे में कुछ अस्पतालों को बच्चों के हिसाब से विकसित करने की तैयारी है। इसमें एक्सपर्ट टीम अध्ययन के आधार पर सुझाव भी देगी। काशी कोविड कमांड सिस्टम ने संक्रमण की रोकथाम के लिए बहुत अच्छा काम किया।

मंडलायुक्त दीपक अग्रवाल ने बताया कि डीआरडीओ के अस्पताल का अपोलो हास्पिटल से करार हुआ है। इसमें प्रशिक्षण आदि के साथ नए प्रयोगों का लाभ यहां मिलेगा। कोरोना संक्रमण की रफ्तार बढ़ने के दौरान 54 एचएफएनसी था, अब उसमें 35 का इजाफा हो गया है। उन्होंने बताया कि आरएनए मशीन लगने से अब 10 हजार सैंपल की जांच की जा रही है। पीएमओ की निगरानी के चलते प्रतिदिन 700 रेमडेसिविर उपलब्ध हुआ और अस्पतालों में बेड की सुविधा के चलते अब आसपास के जिलों को भी लाभ मिल रहा है।

सीएससी भी अत्याधुनिक सुविधाओं से होगा लैस

जिलाधिकारी कौशल राज शर्मा ने बताया कि जिले के आठ सीएससी में ऑक्सीजन कंसंटेटर दिए गए हैं। 24 घंटे यहां सुविधाएं मिल रही हैं और सीएससी प्रभारियों को प्रशिक्षण दिया जा रहा है। गांवों में टीम अब तक 70 हजार लक्षण वाले मरीजों को दवा किट पहुंचाई गई है। सीएसआर और लोगों की मदद से आक्सीजन प्लांट से लेकर बहुत सुविधाएं मुहैया हो पाईं।

<https://www.amarujala.com/uttar-pradesh/varanasi/drdo-hospital-s-agreement-with-apollo-benefit-from-experiments-with-facilities-city-news-vns5892109147>

## वाराणसी में तैयार डीआरडीओ अस्पताल का अपोलो से करार, तीसरी लहर से निपटने की तैयारी शुरू

सार

कोरोना संकट काल में मरीजों की सुविधाओं के लिए बने वाराणसी में बने डीआरडीओ अस्पताल का अपोलो अस्पताल से करार हो गया है। कोरोना की दूसरी लहर में संक्रमण दर कम होने के साथ ही वाराणसी में तीसरी लहर से निपटने की तैयारियां शुरू कर दी गई हैं।

विस्तार

वाराणसी: कोरोना संकट काल में मरीजों की सुविधाओं के लिए वाराणसी में बने डीआरडीओ अस्पताल का अपोलो अस्पताल से करार हो गया है। अब अपोलो की सुविधाओं, संसाधनों के साथ पर प्रयोगों का लाभ बीएचयू के अस्थायी अस्पताल को मिलेगा। एक महीने में वाराणसी में 35 एचएफएनसी भी बढ़ गया है।

कोविड प्रभारी और एमएलसी एके शर्मा ने बुधवार को सर्किट हाउस में तीसरी लहर की आशंका से पहले तैयारी और वर्तमान कोरोना संकट के बीच किए गए कामों की जानकारी साझा की। एके शर्मा ने बताया कि कोरोना की दूसरी लहर में संक्रमण दर कम होने के साथ ही वाराणसी में तीसरी लहर से निपटने की तैयारियां शुरू कर दी गई हैं।

इसके लिए बीएचयू, स्वास्थ्य विभाग के साथ सामाजिक संगठनों और प्रशासनिक अधिकारियों की टीम गठित होगी। यह टीम भविष्य की जरूरतों के साथ तीसरी लहर से निपटने के लिए सलाहों पर काम करेगी। बताया कि प्रधानमंत्री नरेंद्र मोदी के संसदीय क्षेत्र होने के कारण प्रधानमंत्री कार्यालय ने वाराणसी की सुविधाओं पर विशेष ध्यान दिया।

पीएमओ की निगरानी से बेहतर हुआ काम

अब तीसरी लहर की आशंका में बच्चों पर प्रभाव की बात कही जा रही है। ऐसे में कुछ अस्पतालों को बच्चों के हिसाब से विकसित करने की तैयारी है। इसमें एक्सपर्ट टीम अध्ययन के आधार पर सुझाव भी देगी। काशी कोविड कमांड सिस्टम ने संक्रमण की रोकथाम के लिए बहुत अच्छा काम किया।

मंडलायुक्त दीपक अग्रवाल ने बताया कि डीआरडीओ के अस्पताल का अपोलो हास्पिटल से करार हुआ है। इसमें प्रशिक्षण आदि के साथ नए प्रयोगों का लाभ यहां मिलेगा। कोरोना संक्रमण की रफ्तार बढ़ने के दौरान 54 एचएफएनसी था, अब उसमें 35 का इजाफा हो गया है।

उन्होंने बताया कि आरएनए मशीन लगने से अब 10 हजार सैंपल की जांच की जा रही है।



वाराणसी में डीआरडीओ का कोविड अस्पताल तैयार, कई सुविधाओं से है लैस - फोटो: अमर उजाला

पीएमओ की निगरानी के चलते प्रतिदिन 700 रेमडेसिविर उपलब्ध हुआ और अस्पतालों में बेड की सुविधा के चलते अब आसपास के जिलों को भी लाभ मिल रहा है।

बनारस के 8 सीएससी भी अत्याधुनिक सुविधाओं से होगा लैस

वाराणसी डीएम कौशल राज शर्मा ने बताया कि जिले के आठ सीएससी में ऑक्सीजन कंसंटेन्टर दिए गए हैं। 24 घंटे यहां सुविधाएं मिल रही हैं और सीएससी प्रभारियों को प्रशिक्षण दिया जा रहा है। गांवों में टीम अब तक 70 हजार लक्षण वाले मरीजों को दवा किट पहुंचाई गई है। सीएसआर और लोगों की मदद से आक्सीजन प्लांट से लेकर बहुत सुविधाएं मुहैया हो पाईं।

<https://www.amarujala.com/uttar-pradesh/varanasi/drdo-hospital-varanasi-contract-with-apollo-for-fight-against-corona-action-plan-start-for-corona-virus-third-wave?pageId=2>



Thu, 13 May 2021

## दिल्ली के DRDO कोरोना अस्पताल को सबसे पहले दी जाएगी एंटी-कोविड ड्रग 2 DG, जानें इसकी खूबियां

*DRDO-developed anti-Covid oral drug: देश में कोरोना वायरस से बिगड़ते हालातों को देखते हुए ड्रग्स कंट्रोलर जनरल ऑफ इंडिया ने गंभीर कोविड -19 मरीजों के लिए एक सहायक चिकित्सा के रूप में दवा 2-डीऑक्सी-डी-ग्लूकोज (2-डीजी) के इमरजेंसी इस्तेमाल को मंजूरी दे दी है।*

नई दिल्ली: देश में कोरोना के बिगड़े हालात को काबू में करने के लिए सरकार का पूरा अमला जुटा हुआ है। कोरोना महामारी (Corona Pandemic) के खिलाफ जंग में सरकार, सेना और आम लोग भी अपनी भूमिका निभाने में लगे हैं। डीआरडीओ ने भी अपने वैज्ञानिकों को कोरोना से निपटने के लिए और दवा पर शोध करने के लिए पहले दिन ही लगा दिया था। तकरीबन एक साल के शोध और क्लिनिकल ट्रायल के बाद जो दवा बनकर आई वो है 2-डीऑक्सी-डी-ग्लूकोज (drug 2-deoxy-D-glucose (2-DG))।

डीआरडीओ द्वारा बनाई गई 2-डीऑक्सी-डी-ग्लूकोज दवा को कोरोना को फैलने से रोकने के लिए रामबाण माना जा रहा है। सफल ट्रायल के बाद इस दवा को सबसे पहले दिल्ली के



2-डीजी एक जेनेरिक मॉलीक्यूल है और ग्लूकोज से मिलता जुलता है, इसलिए इसका उत्पादन आसान होगा और देश में बड़े पैमाने पर उपलब्ध कराई जा सकती है।

डीआरडीओ कोविड अस्पतालों (DRDO Covid Hospital) में दिया जाएगा। सूत्रों के मुताबिक अगले एक-दो दिन में 2 डीजी को कोरोना पीड़ितों के इलाज के लिए अस्पताल में भेजा जाएगा। डीआरडीओ के वैज्ञानिकों के मुताबिक ये दवा एक पाउडर के रूप में होगी, जिसका इस्तेमाल भी बहुत आसान होगा।

ट्रायल के दौरान दवा के मिले बेहतर परिणाम

डीआरडीओ की प्रयोगशाला इनमास ने हैदराबाद की एक निजी कंपनी डॉ। रेड्डीज लैब के साथ मिलकर ये दवा तैयार की है। क्लिनिकल रिसर्च के दौरान 2 डीजी दवा के 5.85 ग्राम के पाउच तैयार किये गये थे, जिन्हें सुबह शाम को एक-एक पाउच पानी में घोलकर रोगी को दिया गया और उसके परिणाम काफी बेहतर आए। जिन मरीजों पर इस दवा का ट्रायल किया गया, उनमें तेजी से रिकवरी देखी गई। इसी आधार पर ड्रग कंट्रोलर जनरल ऑफ इंडिया ने इसके इमरजेंसी इस्तेमाल की मंजूरी दी है।

सिर्फ डॉक्टरों की सलाह पर दी जाएगी ये दवा

सूत्रों की मानें तो देशभर के जिन 27 कोविड अस्पतालों में इस दवा के फ़ाइनल ट्रायल किए गए थे, वहां से बचा हुआ स्टॉक भी इकट्ठा कर लिया गया है और जल्द ही इसे दिल्ली के डीआरडीओ के कोविड अस्पताल में रोगियों को देने का काम शुरू होगा। बताया जा रहा है कि इन दवाओं को दिल्ली लाने का काम तेजी से जारी है। इस दवा के इस्तेमाल और बाजारों में इसकी उपलब्धता के बारे में लोगों की जिज्ञासा बहुत है, लेकिन डीआरडीओ के अधिकारियों की मानें तो इस दवा को इमरजेंसी इस्तेमाल के लिए मंजूरी मिली है यानी की ये दवा फिलहाल अस्पतालों में डॉक्टर की सलाह पर दी जाएगी।

सूत्रों की मानें तो डॉ. रेड्डीज लैब बड़ी तादाद में इस दवा को बनाने के काम में लगा हुआ है और माना जा रहा है कि अगले 10 से 15 दिनों में व्यवसायिक इस्तेमाल के लिए दवा को अस्पतालों में भेजा जाना भी शुरू किया जाएगा। हालांकि बाजारों में बिकने के लिए सबसे पहले इसे DCGI से हरी झंडी की जरूरत होगी क्योंकि ये ड्रग अभी फिलहाल इमरजेंसी इस्तेमाल के लिए मंजूर की गई है।

क्या अब भी होगी वैक्सीनेशन की जरूरत?

2-डीऑक्सी-डी-ग्लूकोज के आने के बाद इस बात की चर्चा शुरू हो गई है कि अब वैक्सीनेशन की जरूरत शायद नहीं पड़ेगी। इस मामले पर डीआरडीओ के वैज्ञानिकों का कहना है कि इस दवा का ट्रायल अस्पतालों में भर्ती सिर्फ गंभीर और कम गंभीर मरीजों पर ही किया गया था, जिसके नतीजे बेहतर आए और दवा का इस्तेमाल कारगर साबित हुई है। नतीजों में ये सामने आया कि जिस तेजी से शरीर में कोरोना का वायरस फैल रहा था, उसके फैलने की रफ़्तार पर इस दवा ने ब्रेक लगा दिया और 6-7 दिन तक लगातार दवा मिलने के बाद मरीज के हालात में सुधार हुआ और बाहर से दी जा रही ऑक्सीजन की जरूरत भी कम हो गई। आखिर इन सभी की आरटीपीसीआर रिपोर्ट नेगेटिव आ गई। ये दवा कोरोना के संक्रमण से बचने के लिए नहीं बल्कि संक्रमित होने के बाद उसे फैलने न देने के लिए है तो ये कहना की टीके की जरूरत नहीं ये फिलहाल गलत होगा।

<https://hindi.news18.com/news/nation/drdo-covid-hospital-in-delhi-will-be-the-first-to-offer-2dg-anti-covid-drug-3586172.html>



## How exactly does defence ministry drug 2-DG work and who should get it?

*Clinical trials suggest patients come off supplemental oxygen faster and their recovery may be quicker*

*By Penny Macrae*

The defence ministry says its Covid-19 drug, 2-DG, will be of “immense benefit” to patients. The drug was developed by the defence ministry in collaboration with Dr Reddy’s Laboratories for use in moderately-to-seriously-ill Covid-19 patients. If it does what clinical trials suggest, patients could come off supplemental oxygen faster and their recovery time may be quicker. Another piece of good news is that the drug, which comes in a soluble oral powder, is made from a generic molecule similar to glucose and can be mass-produced relatively cheaply. The sachets are expected to sell in the Rs 500-to-Rs 600 range.

The medicine, 2-DG (short for 2-deoxy-D-glucose), has just been cleared by India’s drug regulator for Covid-19 use and it’s described as an adjunct therapy -- meaning it should be used on patients in conjunction with other therapies. It works by accumulating in virus-infected cells in the body and preventing the virus from replicating. The defence ministry says 2-DG will be of “immense benefit” to Covid-19 patients.

Researchers in different countries were already studying 2-DG as a potential cancer treatment as it can kill cancer cells by blocking the supply of vital glucose molecules to them. Then, in April of last year, the Defence Research and Development Organisation found in experiments that DG-2 appeared also to stop the spread of the SARS-CoV-2 virus inside the body’s cells. It decided to conduct further studies, resulting in the repurposing of the molecule for Covid-19 treatment. Phase-III clinical trials, involving 220 patients across India, indicated that 2-DG helped speed up the recovery of hospitalised patients and reduced the length of their dependence on supplemental oxygen.

A “significantly higher proportion” of patients of all ages given the drug improved symptomatically and became free from supplemental oxygen dependence by the third day, the study found. Under standard treatment, just 31 per cent of patients come off oxygen support by the third day. But using 2-DG, 42 per cent of patients came off oxygen support by Day 3. And it took a “significantly favourable” two-and-a-half median days less for 2-DG Covid patients’ symptoms to normalise compared with those receiving “standard of care treatment.”

2-DG spreads like glucose through the body and occupies the virus-infected cells. It prevents virus growth by stopping viral synthesis and destroys the protein's energy production. The drug also works on virus infections that have spread into the lungs, thereby helping to decrease patients’ supplemental oxygen reliance. 2-DG is expected “to save precious lives and reduce hospital stays,” says the defence ministry.

*(PS: The contents of this column (source: defence ministry, WHO, CDC) is intended as general information. For specific concerns, especially those with comorbidities, it is advisable to consult your family physician.)*

<https://www.telegraphindia.com/health/how-exactly-does-defence-ministry-drug-2-dg-work-and-who-should-get-it/cid/1815342>



Phase-III clinical trials, involving 220 patients across India, indicated that 2-DG helped speed up the recovery of hospitalised patients and reduced the length of their dependence on supplemental oxygen. The Telegraph Online



## DRDO to set up oxygen generation plant at Chidambaram GH

*The 1,000 LPM capacity tank will not only help in meeting the oxygen requirements of Chidambaram GH, but the administration may also be able to supply to other hospitals in the region, an official said*

Cuddalore: The Defence Research and Development Organisation (DRDO) is planning to set up an oxygen generation plant on the premises of the Chidambaram General Hospital in Cuddalore district soon. The proposed plant in Chidambaram is among the 500 medical-oxygen generating plants to be set up by DRDO across the country.

A senior official of the district administration said the site in Chidambaram was selected from a list submitted by the State Government. "The National Highways Authority of India (NHAI) held discussions with officials and identified three sites on the NH-45 A including Chidambaram in Cuddalore district and Sirkazhi and Mayiladuthurai in Mayiladuthurai district. Work on constructing a shed for the oxygen plant and electrical works for an oxygen generator, of 1,000 LPM (Litres Per Minute) would be taken up by the Public Works Department shortly," the official said.

The electrical work including construction of a transformer has been estimated to cost ₹1.33 crore. The district administration has placed a formal request with Public Sector Undertaking (PSU) NLC India Ltd (NLCIL) to fund the electrical work.

The 1,000 LPM capacity tank will not only help in meeting the oxygen requirements of Chidambaram GH, but the administration may also be able to supply to other hospitals in the region, the official said.

<https://www.thehindu.com/news/national/tamil-nadu/drdo-to-set-up-oxygen-generation-plant-at-chidambaram-gh/article34540019.ece>

## Outlook

## 294 military nursing service officers mobilised for DRDO's 4 COVID hospitals

New Delhi: A total of 294 military nursing service (MNS) officers were being mobilised for the four newly-raised COVID-19 hospitals of the Defence Research and Development Organisation (DRDO), the Defence Ministry said on Wednesday.

India has been badly hit by the second wave of coronavirus infections and hospitals in several states are reeling under shortage of health workers, vaccines, oxygen, drugs and beds.

"The MNS officers are deployed at various armed forces hospitals to provide medical care to the COVID-19 patients," the Defence Ministry said in a statement.

"Two hundred and ninety-four MNS Officers are being mobilised for the newly-raised COVID-19 hospitals by DRDO at Delhi, Lucknow, Ahmedabad, Varanasi and Patna," it added.

India saw a record rise in COVID-19 deaths with 4,205 fresh fatalities taking the country's death toll to 2,54,197, while 3,48,421 new coronavirus infections were reported, according to the Union Health Ministry data updated on Wednesday. The tally of COVID-19 cases in the country now stands at 2,33,40,938.

<https://www.outlookindia.com/newscroll/294-military-nursing-service-officers-mobilised-for-drdo-4-covid-hospitals/2081933>

## बौखलाया ड्रैगन, भारत पर जैविक हमले की फ़िराक में

■ कुणाल

नई दिल्ली । एसएनबी

भारतीय सेना से बार बार मुंह की खाने और कूटनीति में भारत से मात खाने से चीन (ड्रैगन) बौखला गया है। ड्रैगन को तब और पटखनी पड़ी जब भारत की सफल कूटनीति से विश्व के ताकतवर देशों ने भारत का समर्थन किया। चीन समझ गया कि अब के भारत से आमने-सामने भिड़ना संभव नहीं। लिहाजा चीन जैविक हमला (वायोलॉजिकल अटैक) कर सकता है। इस बात से खुफिया एजेंसी ने सरकार को पिछले साल ही अलर्ट कर दिया था।

सूत्रों के अनुसार, खुफिया विभाग ने सरकार को दिए अपनी रिपोर्ट में कहा था कि अंतरराष्ट्रीय दवाव में चीन सीधे तौर पर हमला

न कर अन्य भारत विरोधी देशों या आतंकियों के माध्यम से भी ऐसा करा सकता है। कोरोना वायरस को लेकर चीन की भूमिका पहले ही शक के घेरे में है। केंद्र ने भी सतर्कता बरती। रसायनिक और जैविक खतरों पर शोध करने वाली डीआरडीओ की ग्वालियर स्थित प्रयोगशाला (डीआरडीई) में जैविक हमले से निपटने के लिए खोज के साथ सेना के पास पर्याप्त संसाधन जुटाना शुरू कर दिया गया था।

भारत की वर्तमान में पड़ोसी मुल्कों के साथ कूटनीति और सैन्य घेराबंदी से चीन बौखलाया हुआ है। सीमा पर पाकिस्तान से भी रह रह कर गोलावारी चीन करवा रहा है। नेपाल का रवैया भी ठीक नहीं है। खुफिया सूत्रों ने बताया, अंतरराष्ट्रीय नियमों का उल्लंघन कर चीन जैविक हमले जैसी



■ खुफिया एजेंसी ने पिछले साल चीन के जैविक हमले को लेकर किया था आगाह

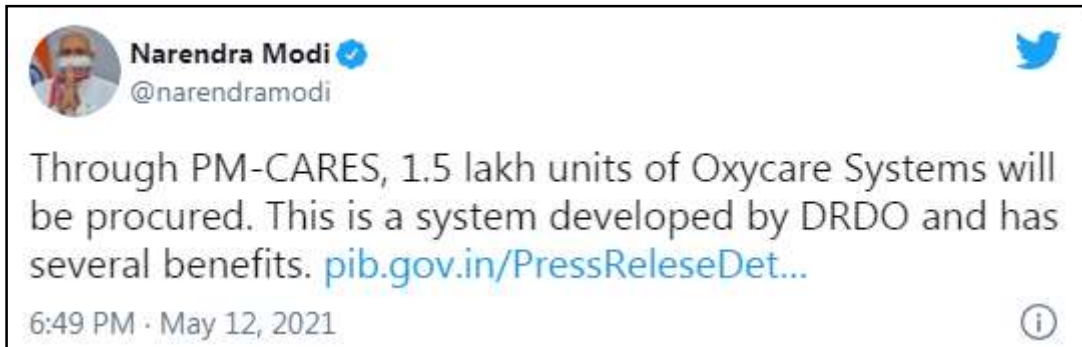
■ खुफिया रिपोर्ट के बाद डीआरडीओ हुआ सतर्क

कायराना हरकत कर सकता है। पिछले दिनों सेना ने आतंकियों के लिए हथियार लेकर आए एक ड्रोन को मार गिराया था। ड्रोन के

जरिए भी जैविक हमला संभव है। इस तरह के हमले का पता कुछ समय बाद चलता है और नुकसान भी अधिक होता है।

मंत्रालय सूत्रों के अनुसार, खुफिया सूचना और चीन की हरकत के बाद से डीआरडीओ की अलग-अलग लैब में खास उपकरण तैयार किए जा रहे हैं। जिनका उपयोग सैनिक कर रहे हैं। समय-समय पर उन्हें विशेष ट्रेनिंग भी दी जाती है। हमले के दौरान सबसे पहले यह पता लगाया जाता है कि किस प्रकार के जीवाणु ने हमला किया है। इसके बाद उसे निष्क्रिय करने पर जोर रहता है। फिर डिक्टैमिनेट किया जाता है। इस प्रक्रिया के लिए खुफिया सूचना के आधार पर डीआरडीओ द्वारा खास कैमिकल एजेंट मॉनिटर तैयार किए गए हैं।

## DRDO on Twitter



## Defence News

### Defence Strategic: National/International

## THE WEEK

*Thu, 13 May 2021*

### Army Chief reviews security situation along LoC during visit to Jammu region

Jammu: Army chief General M M Naravane visited forward areas of the Jammu division and reviewed security situation along the LoC and in the hinterland during his two-day visit to the region, a defence spokesperson said on Wednesday.

General Naravane arrived at the headquarters of the Nagrota-based 16-corps (White Knight Corps) on Tuesday and visited the forward areas including Aknoor, Rajouri and Naushera in the Jammu region, the spokesman said.

On arrival at the headquarters, Gen Naravane, accompanied by Northern Army Commander Lt Gen Y K Joshi, was briefed by Lt Gen Suchendra Kumar, General Officer Commanding (GOC), White Knight Corps, regarding the prevailing security situation, operational preparedness, COVID-19 management and the assistance provided to the veterans and the people of the region "in our fight against the pandemic", he said.

The spokesman said Chief of the Army Staff (COAS) Gen Naravane, accompanied by the Northern Army Commander and the GOC White Knight Corps, visited the forward areas at Akhnoor, Naushera and Rajouri.

General Naravane interacted with troops deployed in the forward areas and appreciated the sustained efforts of all ranks of the White Knight Corps towards "maintaining the sanctity of the Line of Control (LoC)" as well as wholeheartedly assisting the civil administration, veterans and civilian population, especially in the border areas, to combat the spread of the COVID-19 pandemic, the spokesman said.

Later in the day, the three officials visited the military hospital in Jammu and reviewed the medical preparedness for COVID-19, he said, adding the Army chief appreciated critical care being provided by the doctors and healthcare workers.

*(This story has not been edited by THE WEEK and is auto-generated from PTI)*

<https://www.theweek.in/wire-updates/national/2021/05/12/des17-jk-army-chief-visit.html>



Thu, 13 May 2021

## Gen. Naravane speaks to U.S. Army Chief McConville

*They discussed ways to expand cooperation between the two armies  
in specific areas in view of the evolving regional security scenario*

New Delhi: Chief of Army Staff Gen. M.M. Naravane held a telephonic conversation with his American counterpart Gen. James C. McConville on Tuesday, focusing on bilateral military cooperation as well as effectively dealing with the coronavirus pandemic.

Officials said Gen. Naravane and Gen. McConville discussed ways to expand cooperation between the two armies in specific areas in view of the evolving regional security scenario.

They also deliberated on effectively dealing with the coronavirus pandemic.

"General MM Naravane #COAS had telephonic interaction with General James C. McConville, Chief of Staff of the Army #USArmy on Tuesday and discussed issues of bilateral defence cooperation," the Indian Army said in a tweet.



Chief of Army Staff Gen. M.M. Naravane. File | Photo Credit: R.V. Moorthy

The Indo-U.S. defence ties have been on an upswing in the last few years.

In October last year, India and the U.S. sealed the BECA (Basic Exchange and Cooperation Agreement) agreement to further boost bilateral defence ties. The pact provides for sharing of high-end military technology, logistics and geospatial maps between the two countries. The firming up of the BECA came two years after the two countries signed another pact called COMCASA (Communications Compatibility and Security Agreement) that provides for interoperability between the two militaries and provides for sale of high end technology from the U.S. to India.

In June 2016, the U.S. had designated India a "Major Defence Partner" intending to elevate defence trade and technology sharing with India to a level commensurate with that of its closest allies and partners.

The two countries had also signed the Logistics Exchange Memorandum of Agreement (LEMOA) in 2016 that allows their militaries use each other's bases for repair and replenishment of supplies as well as provides for deeper cooperation.

<https://www.thehindu.com/news/national/gen-naravane-speaks-to-us-army-chief-mcconville/article34542069.ece>



## नेवी चीफ एडमिरल करमबीर सिंह बोले- इस कठिन समय में नौसेना अपनी पूरी क्षमता से योगदान देगी

नौसेना प्रमुख एडमिरल करमबीर सिंह (Naval Chief Admiral Karambir Singh) ने कहा कि इस बार कोरोना की महामारी गांवों में फैल रही है इसलिए ग्रामीण इलाकों में लोगों को मदद की जरूरत है। उन्होंने हर मदद का भरोसा दिया है।

By Shashank pandey

नई दिल्ली: नौसेना प्रमुख एडमिरल करमबीर सिंह ने बुधवार को कहा कि कोरोना महामारी की वजह से देश संभवतः आजादी के बाद सबसे बड़ी मानवीय चुनौती का सामना कर रहा है और भारतीय नौसेना सामूहिक रूप से पूरी क्षमता के साथ देश के समक्ष इस संकट का सामना करेगी। नौसेना कर्मियों को अपने संदेश में एडमिरल सिंह ने कहा कि चिकित्सा सहायता उपलब्ध कराने में नौसेना अपनी कोशिशों को बढ़ाएगी क्योंकि महामारी ग्रामीण इलाकों में फैल रही है और इन इलाकों में रह रहे लोगों को मदद की जरूरत है। उन्होंने कहा, 'मुझे लगता है, संभवतः हम में से ऐसा कोई नहीं है जिसके परिवार में या हमारा कोई बेहद करीबी कोरोना संक्रमित नहीं हुआ है या अस्पताल में भर्ती नहीं हुआ है या अभी भी उसकी हालत खराब नहीं है या उसकी बीमारी से मौत नहीं हुई है।' नौसेना प्रमुख ने कहा, 'कोई नहीं जानता कि यह महामारी कब खत्म होगी। लेकिन मैं पूरे विश्वास के साथ कह सकता हूँ कि हमारा साहस और हमारा दृढ़ संकल्प कभी खत्म नहीं होगा। इस संकट में हम सामूहिक रूप से नौसेना की एक टीम की तरह खड़े होंगे और देश, नौसेना और हमारे समुदायों के लिए अपना सर्वश्रेष्ठ करेंगे।'



रिटायरमेंट से 3 माह पहले आर्मी बेस अस्पताल के कमांडेंट का तबादला

भारतीय सेना के बेस हॉस्पिटल, दिल्ली के कमांडेंट मेजर जनरल वासु वर्धन को रिसर्च एंड रेफरल हॉस्पिटल में स्थानांतरित किया गया है। वासु का स्थानांतरण तब हुआ है जब उनके रिटायरमेंट के तीन महीने बाकी बचे हैं। अगस्त के अंत में वह सेवा से रिटायर हो जाएंगे। दिल्ली का आर्मी बेस हॉस्पिटल इस समय 650 बिस्तरों वाले कोविड अस्पताल के रूप में कार्य कर रहा है, जिसमें महामारी के शिकार सुरक्षा बलों के जवानों और पूर्व जवानों का इलाज चल रहा है। वासु की जगह मेजर जनरल एसके सिंह ने दिल्ली बेस हॉस्पिटल के कमांडेंट का पदभार ग्रहण कर लिया है।

<https://www.jagran.com/news/national-indian-navy-chief-admiral-karambir-singh-said-navy-will-contribute-to-its-full-potential-in-this-difficult-time-21639437.html>

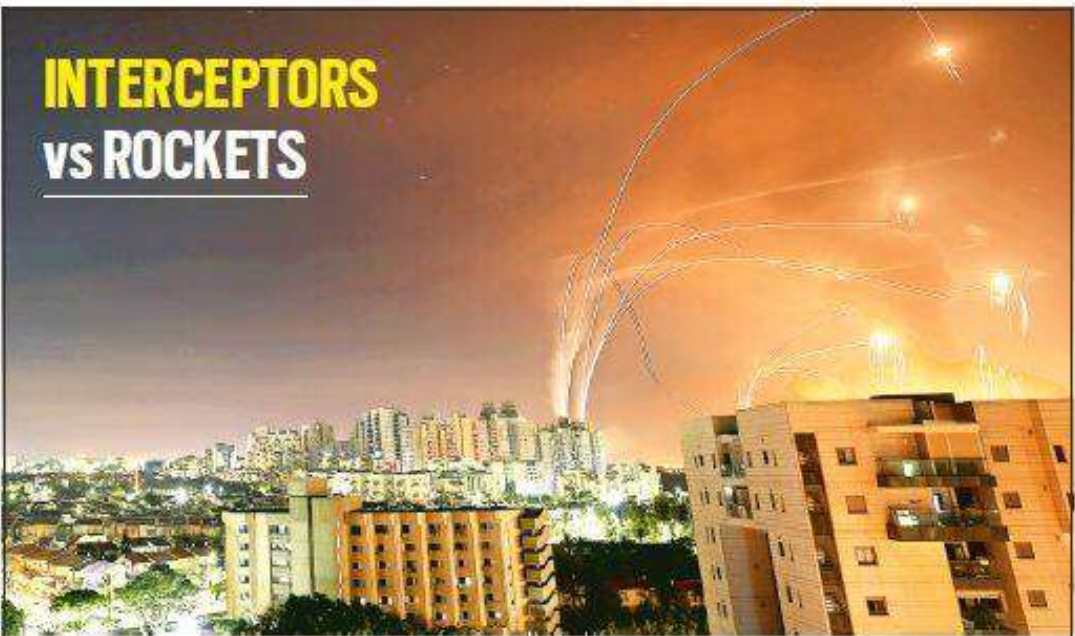
## Explained: How Israel's Iron Dome intercepts rockets

Videos on social media showed rockets fired from Gaza being intercepted by the Israeli Iron Dome air defence system. It appeared that the rockets were hitting an invisible shield

By Krishn Kaushik

New Delhi: In the conflict between Israel and Palestine, both sides have taken to air strikes and rocket attacks. On Tuesday evening, videos on social media showed rockets fired from Gaza being intercepted by the Israeli Iron Dome air defence system. It appeared that the rockets were hitting an invisible shield.

### INTERCEPTORS vs ROCKETS

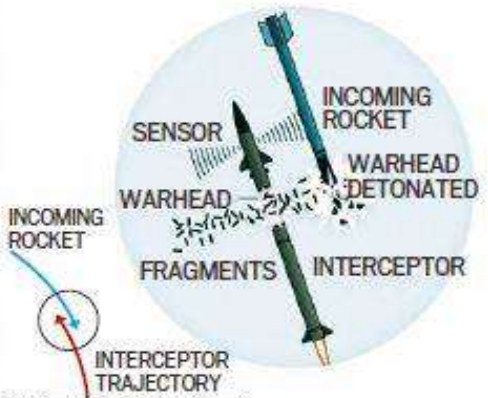


■ Streaks of light show in Ashkelon as the Iron Dome intercepts rockets launched from the Gaza towards Israel on Wednesday. *Reuters*

In videos on social media, rockets from Gaza can be seen intercepted by Israel's Iron Dome system in Tel Aviv. When an interceptor's sensor detects an incoming rocket, it detonates its own rocket, sending out fragments. If the timing is right, fragments will hit the rocket's warhead, detonating it. How the interceptor approaches the rocket is critical; here, we look at three different approaches.

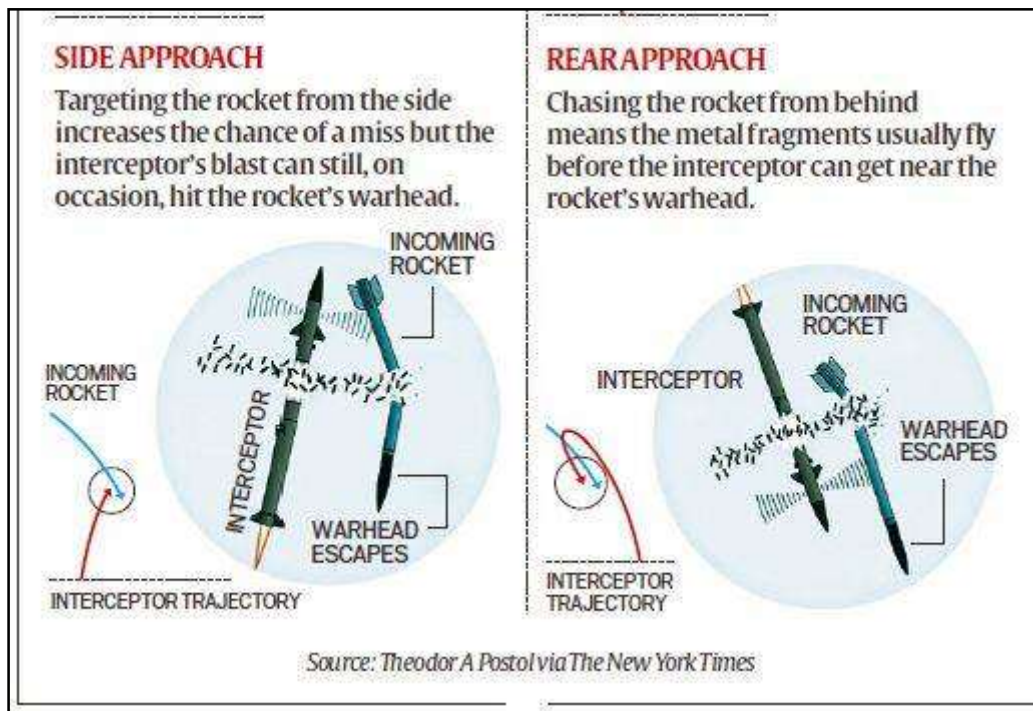
#### FRONT APPROACH

The most effective tactic. The interceptor's warhead is in the best position to have its fragments strike the rocket's warhead and blow it up.



Interceptors vs rockets





Source: Theodor A Postol via The NYT

### What is the Iron Dome?

It is a short-range, ground-to-air, air defence system that includes a radar and Tamir interceptor missiles that track and neutralise any rockets or missiles aimed at Israeli targets. It is used for countering rockets, artillery & mortars (C-RAM) as well as aircraft, helicopters and unmanned aerial vehicles.

The genesis of the Iron Dome goes back to the 2006 Israeli-Lebanon war, when the Hezbollah fired thousands of rockets into Israel. The following year, Israel announced that its state-run Rafael Advance Systems would come up with a new air defence system to protect its cities and people. It was developed with Israel Aerospace Industries.

The Iron Dome was deployed in 2011. While Rafael claims a success rate of over 90%, with more than 2,000 interceptions, experts agree the success rate is over 80%. Rafael says on its website that it can “protect deployed and manoeuvring forces, as well as the Forward Operating Base (FOB) and urban areas, against a wide range of indirect and aerial threats”.

### How does it work, and what makes it so effective?

The Iron Dome has three main systems that work together to provide a shield over the area where it is deployed, handling multiple threats. It has a detection and tracking radar to spot any incoming threats, a battle management and weapon control system (BMC), and a missile firing unit. The BMC basically liaises between the radar and the interceptor missile.

It is capable of being used in all weather conditions, including during the day and night.

Retired Air Marshal Anil Chopra, who heads the Centre for Air Power Studies (CAPS) think tank in New Delhi, explained that in any air defence system there are two main elements. “One is the radar, which should have the capability to see small objects, and to be able to accurately track it.”

He said there are usually two to three radars in any air defence system to spot and track incoming objects. “When you launch the weapon, it is the tracking radar that will help the weapon reach there.” After that, he said, the “the weapon’s own head will take over”.

Once the missile is fired, it “should be able to manoeuvre, should be able to see the small target on her own and thereafter go and shoot”. But it is impossible to hit the target directly each time, which is why “there is something in each missile called proximity fuse” which is a “laser-controlled fuse”. When passing within ten metres of the target, this activates and blasts the missile

with shrapnel that destroys the target. “The warhead is exploded in such a way that it caters for the velocity of the missile and the target.” Chopra said.

### **How much does it cost?**

Each battery, or the full unit, can cost over \$50 million, and one interceptor Tamir missile costs around \$80,000. In contrast, a rocket can cost less than \$1,000. The system dispatches two Tamir missiles to intercept each rocket.

However, Chopra said that is not a good measure to judge cost-effectiveness. “If I have to take... rockets, which cost very little, and I am firing any missile, then it’s an expensive exercise.”

But it proves a deterrent, he said. Also, he said, cost-effectiveness is each life saved. Second, he added, is about the morale of the nation in not being intimidated by rockets.

### **What kind of systems does India have?**

Chopra said Israel, along with the US and Russia, is the leader. “Israel had to master it because of the threat around them and they work very closely with the Americans.”

As India is in the process of buying S-400 air defence systems from Russia for over \$5 billion, “Iron Dome was one of the systems that was being spoken of”, he said.

While India is continent-sized, Israel is smaller and has to deal with threats that are relatively close around it. “We have got S-400, which also caters to the three threats (rockets, missiles and cruise missiles). But they have much longer range. S400 has to cater to shooting down missiles, aircraft in some 300 to 400 km range.” Chopra said the S-400 “has a much larger air defence bubble to knock off threats”.

India and Israel have significant cooperation in missiles, including the Barak-8. “We have also done a lot of work with Israel on air defence radars,” he said.

At the moment, India has Akash short-range surface-to-air missiles, and Russian systems including Pechora. “All are being gradually replaced with more modern systems,” Chopra said, adding that India is buying two National Advanced Surface to Air Missile System-II from the US to protect Delhi.

<https://indianexpress.com/article/explained/explained-how-israels-iron-dome-intercepts-rockets-7312743/>



Streaks of light are seen as Israel's Iron Dome anti-missile system intercepts rockets launched from the Gaza Strip towards Israel, as seen from Ashkelon, Israel. (Reuters)



Thu, 13 May 2021

## Scientists create a new type of intelligent material

Intelligent materials, the latest revolution in the field of materials science, can adapt their properties depending on changes in their surroundings. They can be used in everything from self-healing mobile phone screens, to shape-shifting airplane wings, and targeted drug delivery. Delivering drugs to a specific target inside the body using intelligent materials is particularly important for diseases like cancer, as the smart material only releases the drug payload when it detects the presence of a cancer cell, leaving the healthy cells unharmed.

Now, researchers from the Center for Advanced 2D Materials (CA2DM) at the National University of Singapore (NUS) have created a new class of intelligent materials. It has the structure of a two-dimensional (2D) material, but behaves like an electrolyte—and could be a new way to deliver drugs within the body.

Just like traditional electrolytes, these new "2D-electrolytes" dissociate their atoms in different solvents, and become electrically charged. Furthermore, the arrangement of these materials can be controlled by external factors, such as pH and temperature, which is ideal for targeted drug delivery. The 2D-electrolytes also show promise for other applications that require a material to be responsive to environmental changes, such as artificial muscles and energy storage.

The team behind the 2D-electrolytes is led by Professor Antonio Castro Neto, Director of CA2DM, and comprised researchers from CA2DM, as well as the NUS Department of Physics, and the NUS Department of Materials Science and Engineering.

Their results were published in *Advanced Materials* on 12 May 2021.

### Changing the behavior of 2D materials

In materials science, a 2D material is a solid material that exists in a single layer of atoms. It can be thought of as an atomically-thin sheet that has a specific height and width, but effectively no depth, hence, it is essentially two-dimensional. On the other hand, an electrolyte is a substance that produces an electrically conducting suspension when dissolved in a solvent, such as water.

There are numerous 2D materials in existence today, and electrolytic behavior has been well-established in countless other compounds. However, the results from the NUS researchers show the first instance of materials that have both 2D structure and properties of electrolytes, with a particular trend to shapeshift their form reversibly in liquid medium. The NUS team achieved this feat by using organic molecules as reactive species to add different functionalities to 2D materials such as graphene and molybdenum disulfide (MoS<sub>2</sub>).

"By adding different chemical groups that become positively or negatively electrically charged in solvents, we altered traditional 2D materials and came up with a novel class of smart materials that have their electronic properties controlled by morphological conformation," explained Prof Castro Neto.



The team that created the 2D-electrolytes was led by Prof Antonio Castro Neto (right), Director of CA2DM. With him is Ms Mariana Costa (left), the first author of the publication. Credit: National University of Singapore

The methods used by the researchers to create 2D-electrolytes are only a few possible examples among many potential options, making this discovery an exciting new research area to explore.

### **From a flat sheet to a rolled-up scroll**

A major breakthrough of this research was that the orientation of the 2D-electrolytes could reversibly change by tweaking the external conditions. Currently, the electrical repulsion between the surface charge in a 2D material leads to it be laid out in a flat sheet. By altering the pH, the temperature, or the ionic concentration of the suspensions, the NUS researchers demonstrated the ability of the 2D-electrolyte sheet to shapeshift and form scroll-like arrangements. These experimental results are supported by detailed theoretical analysis in which they explain the physical mechanism behind the scroll formation and stability.

These scroll orientations have such a small diameter that they could be described as one-dimensional (1D), leading to different physical and chemical properties. Moreover, this transition from 2D to 1D is reversible by altering the external conditions back to their original values

"One can think of 2D-electrolytes as the higher dimensional analogs of 1D electrolytes, commonly known as polyelectrolytes," said Prof Castro Neto. Important examples of polyelectrolytes include many biologically relevant materials, such as DNA and RNA.

"When acids, bases, or salts are added, these electrically charged polymers also undergo conformational transitions from molecular chains that are 1D, to globular objects of 0D, and vice versa. Our 2D-electrolytes, in analogy with polyelectrolytes, show reversible transitions from 2D to 1D, as a function of external factors. As stimuli-responsive materials, they are suitable for the creation of cutting-edge technology," he added.

### **Next steps**

Discovering this class of materials has opened up new areas of exploration for materials scientists, since it brings together two fields of research that have been traditionally unlinked, namely, 2D materials in the field of Physics, and electrolytes (in the area of Electrochemistry).

"There is an uncountable number of ways to functionalise graphene and other 2D materials to transform them into 2D-electrolytes. We hope that our work will inspire scientists from different fields to further explore the properties and possible applications of 2D-electrolytes. We anticipate that as 2D-electrolytes have similarities with biological or natural systems, they are capable of spontaneously self-assemble and cross-link to form nanofibers that are promising for applications in filtration membranes, drug delivery, and smart e-textiles," explained Prof Castro Neto.

**More information:** Mariana C. F. Costa et al. 2D Electrolytes: Theory, Modeling, Synthesis, and Characterization, *Advanced Materials* (2021). DOI: [10.1002/adma.202100442](https://doi.org/10.1002/adma.202100442)

**Journal information:** [Advanced Materials](https://phys.org/news/2021-05-scientists-intelligent-material.html)  
<https://phys.org/news/2021-05-scientists-intelligent-material.html>



## Physicists extract proton mass radius from experimental data

Researchers have recently extracted the proton mass radius from experimental data. A research group at the Institute of Modern Physics (IMP) of the Chinese Academy of Sciences (CAS) presented an analysis of the proton mass radius in *Physical Review D* on May 11. The proton mass radius is determined to be  $0.67 \pm 0.03$  femtometers, which is obviously smaller than the charge radius of the proton.

In the Standard Model, the proton is a composite particle made of quarks and gluons and it has a non-zero size. The radius of the proton is a global and fundamental property of the proton. It is related to the color confinement radius—a property governed by quantum chromodynamics (QCD).

The radius of the proton is approximately 100,000 times smaller than that of the atom, and the sizes of the quark and gluon are several orders smaller than the proton radius. Scientists use various distributions to describe the shape of the proton, such as charge distribution and mass distribution.

The charge radius of the proton has been precisely measured by scientists via Lamb shift of the muonic hydrogen or the high energy electron-proton elastic scattering, with the average value of  $0.8409 \pm 0.0004$  femtometers provided by the Particle Data Group. Nevertheless, knowledge of proton gravitational properties such as proton mass radius has still been very limited.

"According to recent theoretical studies by Dmitri Kharzeev, the proton mass radius is related to the scalar gravitational form factor of the proton," said Dr. Wang Rong, first author of the paper. By investigating the vector meson photoproduction data for omega, phi and J/psi from the SAPHIR (Spectrometer Arrangement for PHoton Induced Reactions) experiment at Bonn University, the LEPS (Laser Electron Photons) experiment at SPring-8 facility, and the GlueX experiment at Jefferson Lab, the researchers determined the scalar gravitational form factor and the proton mass radius.

Meanwhile, Prof. Dmitri Kharzeev, a theoretical physicist at Stony Brook University, obtained a similar result by using GlueX J/psi data. The proton mass radius was estimated to be  $0.55 \pm 0.03$  femtometers.

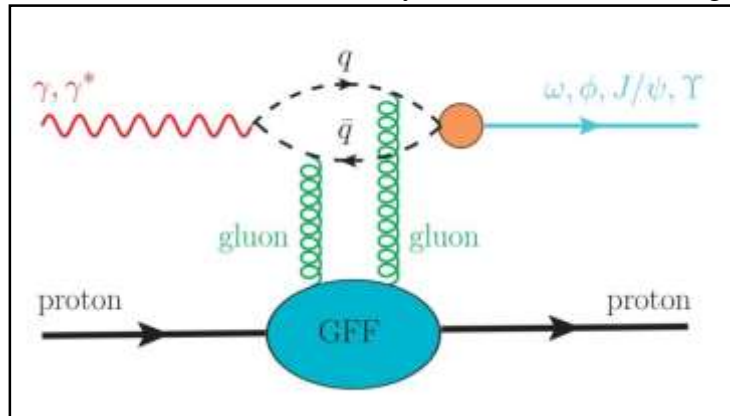


Fig. 1. Vector meson near threshold photoproduction process on the proton target. Credit: KOU Wei

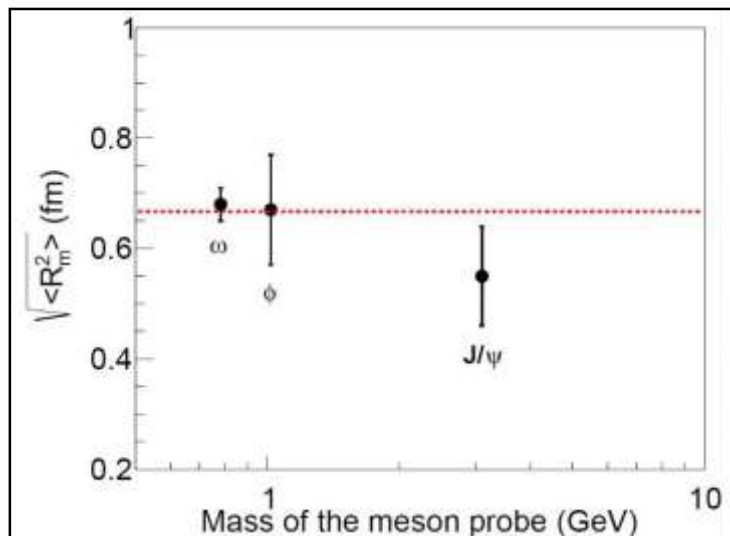


Fig. 2. Proton mass radius extracted from experimental data. Credit: Physical Review D

"Both results might be the first-ever values of the proton mass radius with experimental evidence," said Wang. "The determination of the proton mass radius will improve our understanding of the origins of proton mass and the color confinement mechanism of strong interaction."

A lot of questions still remain. "The smaller mass radius implies that the mass distribution is significantly different from the charge distribution of the proton," said Prof. Chen Xurong, a researcher at IMP.

Scientists are now trying to get a clearer picture of the proton mass radius and the proton structure. The GlueX experiment at Jefferson Lab will provide more data in the near future. Even more exciting, future electron-ion colliders both in the United States and in China will provide Upsilon vector meson electroproduction data for researchers to better understand these questions.

**More information:** Rong Wang et al, Extraction of the proton mass radius from the vector meson photoproductions near thresholds, *Physical Review D* (2021). DOI: [10.1103/PhysRevD.103.L091501](https://doi.org/10.1103/PhysRevD.103.L091501)

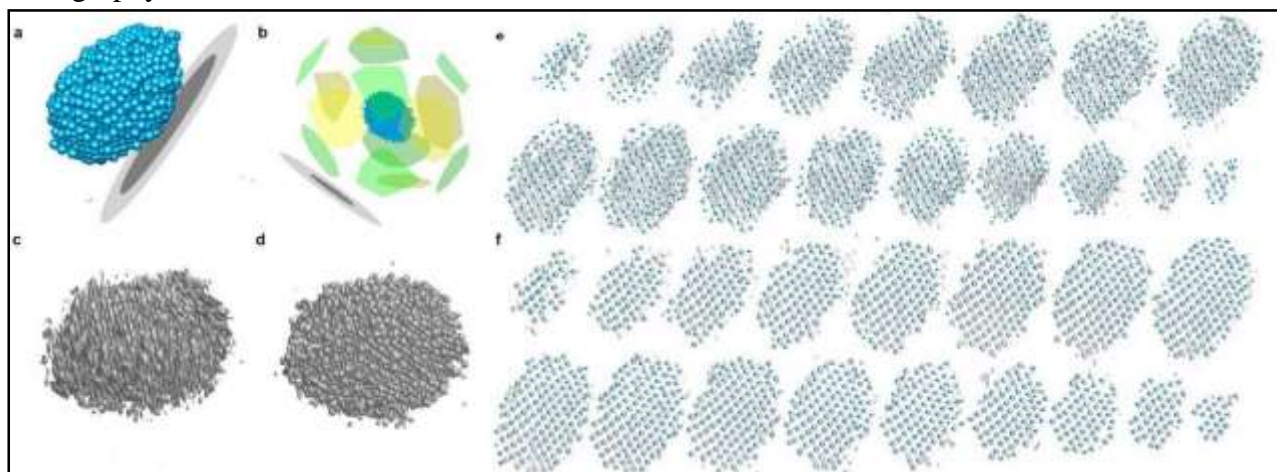
**Journal information:** [Physical Review D](https://phys.org/news/2021-05-physicists-proton-mass-radius-experimental.html)  
<https://phys.org/news/2021-05-physicists-proton-mass-radius-experimental.html>



Thu, 13 May 2021

## Observing individual atoms in 3D nanomaterials and their surfaces

Atoms are the basic building blocks for all materials. To tailor functional properties, it is essential to accurately determine their atomic structures. KAIST researchers observed the 3D atomic structure of a nanoparticle at the atom level via neural network-assisted atomic electron tomography.



a. Overall atomic structure of a Pt nanoparticle determined in this study, with SiN substrate represented as black and gray disks. b. Identified facet structure of the Pt nanoparticle, showing all facets. c, d. Iso-surfaces of reconstructed 3D density from the electron tomography, before (c) and after (d) the deep-learning based augmentation, respectively. e, f. Tomographic reconstruction volume intensity and traced atom positions. Each slice represents an atomic layer, and the blue dots indicate the traced 3D atomic positions before (e) and after (f) the deep-learning based augmentation. The grayscale backgrounds are iso-surfaces of 3D density. Credit: KAIST

Using a platinum nanoparticle as a model system, a research team led by Professor Yongsoo Yang demonstrated that an atomicity-based deep learning approach can reliably identify the 3D surface atomic structure with a precision of 15 picometers (only about 1/3 of a hydrogen atom's radius). The atomic displacement, strain, and facet analysis revealed that the surface atomic



structure and strain are related to both the shape of the nanoparticle and the particle-substrate interface. This research was reported in *Nature Communications*.

Combined with quantum mechanical calculations such as density functional theory, the ability to precisely identify surface atomic structure will serve as a powerful key for understanding catalytic performance and oxidation effect.

"We solved the problem of determining the 3D surface atomic structure of nanomaterials in a reliable manner. It has been difficult to accurately measure the surface atomic structures due to the 'missing wedge problem' in electron tomography, which arises from geometrical limitations, allowing only part of a full tomographic angular range to be measured. We resolved the problem using a deep learning-based approach," explained Professor Yang.

The missing wedge problem results in elongation and ringing artifacts, negatively affecting the accuracy of the atomic structure determined from the tomogram, especially for identifying the surface structures. The missing wedge problem has been the main roadblock for the precise determination of the 3D surface atomic structures of nanomaterials.

The team used atomic electron tomography (AET), which is basically a very high-resolution CT scan for nanomaterials using transmission electron microscopes. AET allows individual atom level 3D atomic structural determination.

"The main idea behind this deep learning-based approach is atomicity—the fact that all matter is composed of atoms. This means that true atomic resolution electron tomogram should only contain sharp 3D atomic potentials convolved with the electron beam profile," said Professor Yang.

"A deep neural network can be trained using simulated tomograms that suffer from missing wedges as inputs, and the ground truth 3D atomic volumes as targets. The trained deep learning network effectively augments the imperfect tomograms and removes the artifacts resulting from the missing wedge problem."

The precision of 3D atomic structure can be enhanced by nearly 70% by applying the deep learning-based augmentation. The accuracy of surface atom identification was also significantly improved.

Structure-property relationships of functional nanomaterials, especially the ones that strongly depend on the surface structures, such as catalytic properties for fuel-cell applications, can now be revealed at one of the most fundamental scales: the atomic scale.

Professor Yang concluded, "We would like to fully map out the 3D atomic structure with higher precision and better elemental specificity. And not being limited to atomic structures, we aim to measure the physical, chemical, and functional properties of nanomaterials at the 3D atomic scale by further advancing electron tomography techniques."

**More information:** Juhyeok Lee et al, Single-atom level determination of 3-dimensional surface atomic structure via neural network-assisted atomic electron tomography, *Nature Communications* (2021). DOI: [10.1038/s41467-021-22204-1](https://doi.org/10.1038/s41467-021-22204-1)

**Journal information:** [Nature Communications](https://www.nature.com/articles/s41467-021-22204-1)  
<https://phys.org/news/2021-05-individual-atoms-3d-nanomaterials-surfaces.html>



*Thu, 13 May 2021*

## **Delaying second COVID-19 vaccine doses can help reduce deaths - study**

Giving a first dose of COVID-19 vaccine but delaying a second dose among people younger than 65 could lead to fewer people dying of the disease, but only if certain conditions are met, a predictive modelling study showed.

As the coronavirus pandemic continues, there is debate over whether to extend the gap between doses to give as many people as possible some protection, or stick to the intervals designated in clinical trials.

For example, Pfizer (PFE.N) has said there is no clinical evidence to support Britain's decision to extend the gap between doses of its vaccine to 12 weeks, but data from the rollout in England shows protection against death of around 80% from one dose, with a 70% decline in infections. [read more](#)

The U.S. study, published in the BMJ British medical journal, used a simulation model based on a "real-world" sample of 100,000 U.S. adults and ran a series of scenarios to forecast potentially infectious interactions under different conditions.

These included varying levels of vaccine efficacy and immunisation rates, and varying assumptions as to whether the vaccine prevents transmission and serious symptoms or only prevents serious symptoms, including death.

"The results suggest that under specific conditions a decrease in cumulative mortality, infections, and hospital admissions can be achieved when the second vaccine dose is delayed," wrote the researchers, led by the Thomas C Kingsley of the Mayo Clinic in Rochester, Minnesota.

The specific conditions include having a vaccine with a one dose efficacy of at least 80% and having daily immunisation rates of between 0.1% and 0.3% of a population - but if they are met, a delayed second-dose strategy could prevent between 26 and 47 deaths per 100,000 people compared to the usual schedule. The study did not recommend an optimum schedule.

"Decision makers will need to consider their local vaccination rates and weigh the benefits of increasing these rates by delaying a second dose versus the risks associated with the remaining uncertainty in this strategy," the team said.

Separately, an Oxford University-led study on giving shots from different manufacturers for the two doses reported its first findings - on the frequency of common post-vaccination symptoms such as sore arm, chills or fatigue.

It found that people vaccinated with a shot of Pfizer's vaccine followed by a dose of AstraZeneca's, or vice versa, were more likely to report mild or moderate symptoms such as headaches or chills than if they received two of the same type.

Pfizer and AstraZeneca were the first vaccines available in Britain to be trialled in the "mix-and-match" study. Shots by Novavax and Moderna have since been added to the research. [read more](#)

Key data on immune responses generated by the different combinations of mixed or regular dose schedules is expected to be reported in the coming months, according to Matthew Snape, the Oxford University professor leading the trial.

<https://www.reuters.com/business/healthcare-pharmaceuticals/delaying-second-covid-19-vaccine-doses-can-help-reduce-deaths-study-2021-05-12/>

