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# 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

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# CONTENTS

S. No.	TITLE	Page No.
<b>DRDO News</b>		<b>1-9</b>
<b>DRDO Technology News</b>		<b>1-5</b>
1.	Indian Navy signs contract with BEL to procure naval anti-drone system	1
2.	Army to buy more than 100 armed drones from Bengaluru firm joint venture	2
3.	Madhya Pradesh: Jyotiraditya Scindia writes to Rajnath Singh over the construction of new DRDO campus in Gwalior	3
4.	ज्योतिरादित्य सिंधिया ने राजनाथ सिंह से की मुलाकात, अब जल्द ही ग्वालियर आएंगे रक्षा मंत्री, जानिए वजह	4
<b>COVID 19: DRDO's Contribution</b>		<b>6-9</b>
5.	Mission Sagar - INS Savitri arrives at Chittagong	6
6.	Bangladesh: INS Savitri arrives at Chittagong port with two medical oxygen plants	6
7.	Granules India gets licence from DRDO to manufacture, market 2-DG Covid drug	7
8.	Granules India receives license from DRDO to manufacture and market 2-DG	8
9.	Granules India gains after DRDO license to manufacture, market 2-DG COVID drug	8
10.	ग्रेनुअल्स इंडिया को डीआरडीओ से कोविड-19 दवा बनाने और विपणन का लाइसेंस मिला	9
<b>DRDO on Twitter</b>		<b>10-10</b>
<b>Defence News</b>		<b>11-18</b>
<b>Defence Strategic: National/International</b>		<b>11-18</b>
11.	Raksha Mantri Shri Rajnath Singh reviews DefExpo-2022 preparations at Kevadia, Gujarat	11
12.	रक्षा मंत्री श्री राजनाथ सिंह ने गुजरात के केवड़िया में डेफएक्सपो-2022 की तैयारियों की समीक्षा की	13
13.	Indian Army carries out live-fire exercise in Ladakh	15
14.	News analysis: Will India face U.S. sanctions for procuring Russia's S-400?	15
15.	Why is China ramping up construction of missile silos?	17
<b>Science &amp; Technology News</b>		<b>19-26</b>
16.	Quantum emitters: Beyond crystal clear to single-photon pure	19
17.	New Bayesian quantum algorithm directly calculates the energy difference of an atom and molecule	20
18.	Researchers find a way to check that quantum computers return accurate answers	22
19.	Paving the path to electrically-pumped lasers from colloidal-quantum-dot solutions	23
<b>COVID-19 Research News</b>		<b>25-26</b>
20.	Kidney damage another consequence of 'long covid,' Study Finds	25



Fri, 03 Sept 2021

## Indian Navy signs contract with BEL to procure naval anti-drone system

*The naval anti-drone system which can detect micro-drones uses the help of radar, electro-optical/infrared (EO/IR) sensors and radio frequency (RF) detectors to detect and jam the micro drones*

*By Shailaja Tripathi*

The Ministry of Defence announced that the Indian Navy on August 31, 2021, sealed a contract with defence PSU Bharat Electronics Limited for the supply of the first indigenously developed Naval Anti Drone System (NADS).

The Naval Anti-Drone system has been developed by the Defence Research and Development Organisation (DRDO) and manufactured by BEL. It will be the first indigenously developed anti-drone system to be inducted into the Indian armed forces.

The Defence Ministry in an official statement said that the Indian Navy has signed a contract with Navratna Defence Public Sector undertaking (PSU) BEL for the supply of the first indigenous comprehensive NADS with both hard-kill and soft-kill capabilities.



Naval Anti-Drone System

### **Naval Anti-Drone System (NADS): What do we know?**

- The Naval Anti-Drone System was first deployed to provide the security cover for the Republic Day parade in 2021 and later during PM Modi's address to the nation on Independence Day from the ramparts of Red Fort.
- As per the Ministry, the system, which offers 36-degree coverage, was also deployed in Ahmedabad for PM Modi and former US President Donald Trump roadshow.
- The NADS are capable of instantly detecting the micro-drones and uses a laser-based kill mechanism to terminate the targets.

### **Working of Naval Anti-Drone System**

NADS which can detect micro-drones uses the help of radar, electro-optical/infrared (EO/IR) sensors and radio frequency (RF) detectors to detect and jam the micro drones.

As per the Defence Ministry, the RF/Global Navigation Satellite System (GNSS) of DRDO detects the frequency which is being used by the controller and the signals are then jammed.

DRDO's anti-drone technology system will provide both 'soft kill' and 'hard kill' options to the Indian Armed Forces in order to tackle the fast-emerging aerial threats.

Both the mobile and static versions of NADS will be supplied to the Indian Navy within a short time from the signing of the contract with BEL.

## Rising aerial threats in India:

Serious concerns over the aerial threats from enemy drones had first emerged in June 2021 when two drones were used by the suspected Pakistan-based terrorists to attack the Indian Air Force (IAF) base in Jammu.

At the time, some explosives were dropped at the airbase with the use of an unmanned air vehicle that triggered an alarm among the national security planners.

<https://www.jagranjosh.com/current-affairs/indian-navy-signs-contract-with-bel-to-procure-naval-anti-drone-system-1630585823-1>

# THE TIMES OF INDIA

Fri, 03 Sept 2021

## Army to buy more than 100 armed drones from Bengaluru firm joint venture

By Chethan Kumar

Bengaluru: The Army, under emergency procurement powers, has signed a contract for more than 100 explosive-laden drones to be used as force multipliers in Balakot-like missions. To be manufactured in Bengaluru, the drones will have a range of about 100km, reports Chethan Kumar.

The requirement for what the Army calls “loitering munition” will be fulfilled by ‘SkyStriker’ drones to be made and supplied by Bengaluru-headquartered firm Alpha Design in a joint venture with Israeli firm Elbit Security Systems. The contract signed on Wednesday is worth around Rs 100 crore.

According to Elbit systems’ website, SkyStriker is a cost-effective loitering munition capable of long-range precise tactical strikes.

### Co bags 2 orders for radars, identification systems

The drone improves performance, situational awareness and survivability by providing direct-fire aerial-precision capabilities to manoeuvrable troops and special forces. The ‘suicide drone’ as some describe it — as it crashes into the target with the explosives — is an autonomous system that can locate, acquire and strike operator-designated targets with a 5kg warhead installed inside the fuselage. Its electric propulsion offers a minimal acoustic signature, allowing covert operations at low altitude, making it a silent, invisible and surprise attacker.

Col (retd) HS Shankar, CMD of Alpha Design, told TOI: “Location details (GPS) will be loaded onto the drone before launch. Upon launching, it will hover around the area, pick up the target, relay the information back to ground control equipment and



According to Elbit systems’ website, SkyStriker is a cost-effective loitering munition capable of long-range precise tactical strikes.

**SURPRISE ATTACKER**

- To be made in B'luru by joint venture led by Alpha Design
- The SkyStriker is a cost-effective loitering munition capable of long-range precise tactical strikes
- Can locate, acquire and strike operator-designated targets with a 5kg warhead
- Minimal acoustic signature makes it a silent, invisible and surprise attacker

Army places order for 100+ 'loitering munition' drones worth around ₹100 Cr

strike only after getting clearance. Ground control can change targets after the launch, and even call it back in case a mission has to be aborted.”

The Alpha-Elbit JV has already exported about 100 such drones — manufactured based on Elbit’s technology — and has orders for another 100 exports. Alpha owns 51% in the JV.

## 2 more defence contracts

Aside from the Army contract for its JV, Alpha Design has independently bagged two more defence contracts from the Indian Air Force in the past week. The first is for six Very High Frequency radars. the IAF already has long-distance surveillance radars — P18 radars — that can capture targets beyond 200km procured in 1980 and 1990s. Given their age, the IAF was looking at whether it should upgrade P18s or procure new ones at the same cost and decided to buy instead.

Under the emergency procurement powers, the IAF issued EOIs and RFPs which got responses from four companies: defence PSU BEL and three private firms — Alpha Design, Astra Microwave and Data Patterns. While all four companies met the technical requirements, Alpha emerged as the lowest bidder and bagged the Rs 200 crore contract signed last week.

The second, also an IAF contract, is for around 60 Identification of Friend-or-Foe (IFF) systems that will be integrated with ground radars. This technology was developed by the Centre for Airborne Systems (CABS) under DRDO and transferred to three firms: Alpha, BEL and Data Patterns. All of them had built prototypes that were approved by the authorities concerned but Alpha emerged as the lowest bidder to bag the Rs 80+ crore contract, signed on Sunday.

<https://timesofindia.indiatimes.com/city/bengaluru/army-to-buy-100-armed-drones-from-bluru-firm-jv/articleshow/85883391.cms>



Fri, 03 Sept 2021

## Madhya Pradesh: Jyotiraditya Scindia writes to Rajnath Singh over the construction of new DRDO campus in Gwalior

*Scindia, on the request of Gwalior MP Vivek Narayan Shejwalkar, has requested Rajnath Singh to come to Gwalior and lay the foundation stone of the new premises of the laboratory*

Gwalior: The Civil Aviation Minister Jyotiraditya Scindia has written a letter to the Defense Minister of the country, Rajnath Singh, appealing to lay the foundation stone for the new campus of DRDO to be built in Maharajpura area located in Gwalior and its construction. requested to start the work.

Scindia, on the request of Gwalior MP Vivek Narayan Shejwalkar, has requested Rajnath Singh to come to Gwalior and lay the foundation stone of the new premises of the laboratory.



Notably, being located in the city center area, thousands of crores of property falling within 200 meters of the laboratory was on the verge of collapse.

So Rajnath Singh had approved to set up this laboratory outside the city. The district administration had then provided 140 acres of land in Maharajpura Gwalior for the construction of a new laboratory, whose possession has been received by DRDO. But till now the foundation stone has not been laid.

<https://www.freepressjournal.in/bhopal/madhya-pradesh-jyotiraditya-scindia-writes-to-rajnath-singh-over-the-construction-of-new-drdo-campus-in-gwalior>



## ज्योतिरादित्य सिंधिया ने राजनाथ सिंह से की मुलाकात, अब जल्द ही ग्वालियर आएंगे रक्षा मंत्री, जानिए वजह

केंद्रीय नागरिक उड्डयन मंत्री ज्योतिरादित्य सिंधिया ने रक्षा मंत्री राजनाथ सिंह से मुलाकात करके उन्हें ग्वालियर आने का न्योता दिया है  
By Faiz

ग्वालियर. केंद्रीय नागरिक उड्डयन मंत्री ज्योतिरादित्य सिंधिया ने रक्षा मंत्री राजनाथ सिंह से मुलाकात करके उन्हें ग्वालियर आने का न्योता दिया है। बता दें कि, मुलाकात के दौरान सिंधिया ने राजनाथ सिंह द्वारा ग्वालियर में DRDO की प्रयोगशाला DRDE के स्थानांतरण के लिए आभार व्यक्त किया। इस दौरान उन्होंने नए परिसर की आधारशिला रखने के लिए ग्वालियर आने का निमंत्रण दिया।

आपको बता दें कि, केंद्रीय मंत्री ज्योतिरादित्य सिंधिया नई दिल्ली में रक्षा मंत्री राजनाथ सिंह से व्यक्तिगत भेंट के लिये पहुंचे थे। ग्वालियर के सिटी सेंटर इलाके में बने DRDO की प्रयोगशाला DRDE को महाराजपुरा क्षेत्र में स्थानांतरित करने की स्वीकृति प्रदान करने के लिये ग्वालियर सांसद विवेक नारायण शेजवलकर एवं अपनी तरफ से आभार व्यक्त किया।

इस वजह से तोड़ना पड़ती शहरवासियों की करोड़ों की संपत्ति

गौरतलब है कि शहर के बीचों बीच में स्थित होने की वजह से सुप्रीम कोर्ट के आदेश पर DRDE के 200 मीटर के दायरे में आने वाली हज़ारों करोड़ की संपत्ति टूटने की कगार पर आ गई थी, लेकिन रक्षा मंत्री राजनाथ सिंह ने सिंधिया एवं सांसद शेजवलकर के अनुरोध पर ग्वालियरवासियों के हित देखते हुए DRDE को शहर से बाहर स्थापित करने की स्वीकृति दे दी है।

जल्द ही ग्वालियर आएंगे राजनाथ सिंह

राजनाथ सिंह से DRDE को शहर से बाहर स्थापित करने की स्वीकृति मिलते ही जिला प्रशासन की ओर से नई प्रयोगशाला के लिए ग्वालियर शहर के बाहर महाराजपुरा में 140 एकड़ भूमि दे दी है। इस भूमि का कब्जा भी DRDO को दिया जा चुका है। इस सब के बाद केंद्रीय मंत्री ज्योतिरादित्य सिंधिया ने रक्षा मंत्री राजनाथ सिंह से अनुरोध किया है कि, वो ग्वालियर आकर प्रयोगशाला के नए परिसर की आधारशिला रखें, ताकि ग्वालियर की जनता को आपके स्वागत एवं आभार का मौका मिल सके। सिंधिया के अनुरोध पर राजनाथ सिंह ने जल्द ही ग्वालियर आने की हामी भी भर दी है।



ज्योतिरादित्य सिंधिया ने राजनाथ सिंह से की मुलाकात, अब जल्द ही ग्वालियर आएंगे रक्षा मंत्री, जानिये वजह

<https://www.patrika.com/gwalior-news/cabinet-minister-jyotiraditya-scindia-met-defense-minister-rajnath-7045025/>

# COVID 19: DRDO's Contribution



Press Information Bureau  
Government of India

Ministry of Defence

Thu, 02 Sept 2021 6:34PM

## Mission Sagar - INS Savitri arrives at Chittagong

Indian Navy's Offshore Patrol Vessel INS Savitri arrived Chattogram harbour, Bangladesh on 02 September 2021 carrying two 960 LPM (Litres Per Minute) Medical Oxygen Plants (MOP) to support the ongoing efforts of the Bangladesh military and government agencies in combating the ongoing wave of the Covid pandemic in their country. The MOPs have been developed and manufactured by DRDO in India.

The ship was accorded a warm welcome by Bangladesh Navy and the mobile plants were received by Commanding Officer of BNS Patenga Navy Hospital and representatives from the Dhaka Medical College Hospital. On behalf of the Chief of Naval Staff, the Commanding Officer of the ship also called on the Commander Chittagong Naval Area, Commander BN Fleet and Chairman Chittagong Port Authority to reaffirm India's solidarity and partnership with Bangladesh. Following all Covid-19 protocols, the ship's crew will also participate in professional and social exchanges with their counterparts in the Bangladesh Navy, further enhancing synergy between the two navies. The ship is also scheduled to participate in a Maritime Partnership Exercise with BN ship on 03 September on departure from port.

India and Bangladesh have a close, long-standing relationship covering a wide spectrum of activities and interactions, which has strengthened over the years. The two countries have had regular maritime interactions in the past.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1751481>



Fri, 03 Sept 2021

## Bangladesh: INS Savitri arrives at Chittagong port with two medical oxygen plants

Indian Navy's Offshore Patrol Vessel INS Savitri arrived Chattogram harbour, Bangladesh today carrying two 960 Litres Per Minute Medical Oxygen Plants to support the ongoing efforts of the Bangladesh military and government agencies in combating the ongoing wave of the COVID pandemic in the country. The Medical Oxygen Plants have been developed and manufactured by DRDO in India.



The ship was accorded a warm welcome by Bangladesh Navy and the mobile plants were received by Commanding Officer of BNS Patenga Navy Hospital and representatives from the Dhaka Medical College Hospital. On behalf of the Chief of Naval Staff, the Commanding Officer of the ship also called on the Commander



Chittagong Naval Area, Commander of BN Fleet and Chairman Chittagong Port Authority to reaffirm India's solidarity and partnership with Bangladesh. Following all COVID-19 protocols, the ship's crew will also participate in professional and social exchanges with their counterparts in the Bangladesh Navy, further enhancing synergy between the two navies. The ship is also scheduled to participate in a Maritime Partnership Exercise with BN ship tomorrow on departure from port.

Defence Ministry said, India and Bangladesh have a close, long-standing relationship covering a wide spectrum of activities and interactions, which has strengthened over the years. The two countries have had regular maritime interactions in the past.

<https://newsonair.com/2021/09/02/bangladesh-ins-savitri-arrives-at-chittagong-port-with-two-medical-oxygen-plants/>

**mint**

Fri, 03 Sept 2021

## Granules India gets licence from DRDO to manufacture, market 2-DG Covid drug

*'Granules is working closely with DRDO team to launch the product in India at the earliest,' the drug firm said*

Pharma company Granules India on Thursday said it has received licence from Defence Research & Development Organisation (DRDO) to manufacture and market COVID-19 treatment drug, 2-Deoxy-D-Glucose (2-DG).

"Granules is working closely with DRDO team to launch the product in India at the earliest," the drug firm said in a regulatory filing.

The drug reduces a patient's average recovery time by two and half days and oxygen demand by up to 40 percent, the filing said.

Shares of Granules India closed at ₹344.20 per scrip on BSE, down 0.22 percent from the previous close.

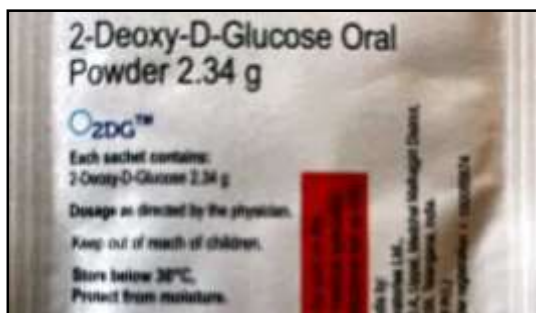
The Drugs Controller General of India (DCGI) approved the 2-deoxy-D-glucose (2-DG) drug for emergency use as an adjunct therapy in moderate to severe coronavirus patients in early May.

The first batch of this oral drug, developed by the DRDO was released on May 17 by Defence Minister Rajnath Singh and then Health Minister Harsh Vardhan.

The Defence Ministry on May 8 had said that the clinical trials of 2-DG showed that it helps in faster recovery of hospitalised patients and reduces supplemental oxygen dependence.

The drug comes in powder form in sachet and is taken orally by dissolving it in water.

<https://www.livemint.com/news/india/granules-india-gets-licence-from-drdo-to-manufacture-market-2-dg-covid-drug-11630587302339.html>



DCGI approved the 2-deoxy-D-glucose (2-DG) drug for emergency use as an adjunct therapy in moderate to severe coronavirus patients in early May

Fri, 03 Sept 2021

## **Granules India receives license from DRDO to manufacture and market 2-DG**

*2- Deoxy-D-Glucose has been granted permission by DCGI for emergency use of this drug as an adjunct therapy in moderate to severe Covid 19 patients*

Granules India Limited has received a licence from Defence Research & Development Organisation (DRDO), Ministry of Defence, Government of India, to manufacture and market 2- Deoxy-D-Glucose (2-DG). Developed by DRDO, 2-DG has been granted permission by the Drug Controller General of India (DCGI) for emergency use of this drug as an adjunct therapy in moderate to severe Covid 19 patients.



2-DG works by accumulating in virus-infected cells and prevent the growth of the virus by stopping - energy production and viral synthesis. This drug reduces a patient's average recovery time by two and half days and oxygen demand by up to 40%. Granules is working closely with DRDO team to launch the product in India at the earliest, company said in a filing on Thursday.

At around 9.43 am, Granules India Ltd was trading at Rs346.30 per piece up by Rs2.1 or 0.61% from its previous closing of Rs344.20 per piece on the BSE. The scrip opened at Rs349 and has touched a high and low of Rs353.10 and Rs345.05 respectively.

[https://www.indiainfoline.com/article/news-top-story/granules-india-receives-license-from-drdo-to-manufacture-and-market-2-dg-121090300399\\_1.html](https://www.indiainfoline.com/article/news-top-story/granules-india-receives-license-from-drdo-to-manufacture-and-market-2-dg-121090300399_1.html)

## **Business Standard**

Fri, 03 Sept 2021

## **Granules India gains after DRDO license to manufacture, market 2-DG COVID drug**

Granules India rose 1.70% after the company said that it has received licence from Defence Research & Development Organisation (DRDO), Ministry of Defence, Government of India, to manufacture and market of 2- Deoxy-D-Glucose (2-DG).

Developed by DRDO, 2-DG has been granted permission by Drug Controller General of India (DCGI) for emergency use of this drug as adjunct therapy in moderate to severe Covid 19 patients.

2-DG works by accumulating in virus infected cells and prevent growth of the virus by stopping - energy production and viral synthesis. This drug reduces a patient's average recovery time by two and half days and oxygen demand by up to 40%.

Granules is working closely with DRDO team to launch the product in India at the earliest.

Granules India along with its subsidiaries has a global presence which extends to over 250 customers in over 75 countries through its offices in India, US & UK and has seven manufacturing facilities out of which six are located in India and one in the USA.

The drug company posted a 7.9% rise in consolidated net profit to Rs 120.2 crore on a 15.5% increase in net sales to Rs 849 crore in Q1 FY22 over Q1 FY21.

*(This story has not been edited by Business Standard staff and is auto-generated from a syndicated feed.)*

[https://www.business-standard.com/article/news-cm/granules-india-gains-after-drdo-license-to-manufacture-market-2-dg-covid-drug-121090300245\\_1.html](https://www.business-standard.com/article/news-cm/granules-india-gains-after-drdo-license-to-manufacture-market-2-dg-covid-drug-121090300245_1.html)

## ग्रेनुअल्स इंडिया को डीआरडीओ से कोविड-19 दवा बनाने और विपणन का लाइसेंस मिला

नयी दिल्ली: दवा निर्माता कंपनी ग्रेनुअल्स इंडिया ने बृहस्पतिवार को कहा कि उसे कोविड-19 के उपचार में काम आने वाली दवा 2-डी ऑक्सी-डी-ग्लूकोज (2-डीजी) के उत्पादन और विपणन के लिए रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) से लाइसेंस प्राप्त हुआ है।

ग्रेनुअल्स इंडिया ने शेयर बाजार को बताया कि डीआरडीओ द्वारा विकसित 2-डी ऑक्सी-डी-ग्लूकोज को ड्रग कंट्रोलर जनरल ऑफ इंडिया (डीसीजीआई) से मध्यम से गंभीर कोविड-19 रोगियों में सहायक चिकित्सा के रूप में आपातकालीन उपयोग के लिए अनुमति मिली है।

उसने कहा कि भारतीय बाजार में इस दवा को जल्द से जल्द लाने के लिए कंपनी डीआरडीओ की टीम के साथ लगातार काम कर रही है। यह दवा मरीज के ठीक होने में लगने वाले औसत समय को ढाई दिन और ऑक्सीजन की मांग को 40 प्रतिशत तक कम कर देती है।

ग्रेनुअल्स इंडिया के शेयर बीएसई पर बृहस्पतिवार को पिछले कारोबारी दिवस की तुलना में 0.22 प्रतिशत घटकर 344.20 रुपये प्रति शेयर पर बंद हुए।

<https://navbharattimes.indiatimes.com/business/business-news/granules-india-gets-license-to-manufacture-and-market-kovid-19-drug-from-drdo/articleshow/85873988.cms>

## DRDO on Twitter

 **Mint** @livemint · 15h  
'Granules is working closely with DRDO team to launch the product in India at the earliest,' the drug firm said

All details here



2-Deoxy-D-Glucose Oral Powder 2.34 g

O<sub>2</sub>DG™

Each sachet contains:  
2-Deoxy-D-Glucose 2.34 g

Dosage as directed by the physician.


Keep out of reach of children.

Store below 30°C,  
Protect from moisture.

Granules India gets licence from DRDO to manufacture, market 2-DG ...  
'Granules is working closely with DRDO team to launch the product in India at the earliest,' the drug firm said  
[livemint.com](https://livemint.com)

 **Jyotiraditya M. Scindia** @JM\_Scindia · Sep 1  
केंद्रीय रक्षा मंत्री माननीय श्री @rajnathsingh जी से मुलाकात कर ग्वालियर के सिटी सेंटर क्षेत्र के विकास में बाधक बन रही रक्षा अनुसंधान तथा विकास संस्थान की राष्ट्रीय महत्त्व की प्रयोगशाला को शहर के बाहरी क्षेत्र में स्थानांतरित करने के जन हितैषी निर्णय के लिए आभार व्यक्त किया।



 **Jyotiraditya M. Scindia** @JM\_Scindia · Sep 1  
2/2 साथ ही महाराजपुरा क्षेत्र में निर्मित होने वाले DRDO के नए परिसर की आधारशिला रखने के लिए ग्वालियर के नागरिकों की ओर से उन्हें आमंत्रित किया।

## Defence Strategic: National/International



Press Information Bureau  
Government of India  
Ministry of Defence

Thu, 02 Sept 2021 4:11PM

### Raksha Mantri Shri Rajnath Singh reviews DefExpo-2022 preparations at Kevadia, Gujarat

*Says, all efforts will be made to increase domestic & international participation*

*Our aim is to 'Make in India, Make for the World': Raksha Mantri*

*Expresses confidence that India will soon become global defence manufacturing hub*

#### **Key Highlights:**

- *The event to be held in Gandhinagar between March 10-13, 2022*
- *Defence Minister-level Conclave, Hybrid events, live demonstrations & business seminars being planned*
- *Aim is to achieve self-reliance in defence & increase exports*
- *To make India a major destination of land, naval, air & homeland security systems and defence engineering*

Raksha Mantri Shri Rajnath Singh and Gujarat Chief Minister Shri Vijay Rupani jointly reviewed the preparations of DefExpo-2022, at Kevadia, Gujarat on September 02, 2021. The 12<sup>th</sup> edition of DefExpo, which is India's flagship event showcasing the land, naval, air as well as homeland security systems, will be held in Gandhinagar, Gujarat between March 10-13, 2022.



During the meeting, Shri Rajnath Singh and senior officials of Ministry of Defence & Gujarat Government noted that the previous edition of DefExpo, which was held at Uttar Pradesh capital

Lucknow in February 2020, was a tremendous success due to the seamless jointmanship between Government of India and the State Government. It was agreed that as DefExpo-2022 is coinciding with the 75<sup>th</sup> year of Independence, being celebrated as 'Azadi Ka Amrit Mahotsav', the event needs more active participation and synchronised efforts at all levels.

Expressing satisfaction at the ongoing preparations, the Raksha Mantri urged all the stakeholders to ensure maximum participation in the upcoming event. He hoped that not just domestic but international representation will be much greater at DefExpo-2022 than its previous edition. Reiterating the resolve of the Government to 'Make in India, Make for the World', Shri Rajnath Singh expressed confidence that India will soon become a global manufacturing hub. "We are taking big strides towards 'Aatmanirbhar Bharat' as envisioned by our Prime Minister Shri



Narendra Modi. We will soon achieve self-reliance in defence. Our aim is to reduce dependency on imports and increase defence exports,” he said.

On the occasion, an MoU was signed between Ministry of Defence and Gujarat Government for organising DefExpo-2022, in the presence of Shri Rajnath Singh. The DefExpo-2022 will be a hybrid business event, with the exhibition planned at the Helipad Exhibition Centre and seminars at Mahatma Mandir Convention and Exhibition Centre. A live demonstration of weapons & defence platforms is also being planned at the Sabarmati River Front in Ahmedabad.

Secretary (Defence Production) Shri Raj Kumar, Additional Chief Secretary Industries & Mines, Gujarat Dr Rajiv Kumar Gupta, Joint Secretary (Aerospace) Shri Chandraker Bharti, Industries Commissioner and Chairman iNDEXTb Dr Rahul B Gupta were among those present in the review meeting.

The aim of DefExpo-2022 is to build upon the vision to achieve ‘Aatmanirbharta’ in defence and reach USD five billion defence exports target by 2024. The objective is to make India a major destination of land, naval, air & homeland security systems and defence engineering. Keeping with future warfare in mind, the event aims to recognise the impact of disruptive technologies on conflicts and its consequent impact on the equipment and platforms required.

The DefExpo-2022 will be organised keeping with the COVID-19 protocols and aims to ensure maximum international and domestic participation. The events planned include:

- A conclave at the level of Defence Minister to accelerate decision making process.
- A hybrid system for attendees to join the events virtually and participate in seminars, hold B2B meetings, view products and exchange ideas/business propositions, etc.
- Live demonstrations by the Services, Defence Public Sector Undertakings and industry to showcase land, naval, air and homeland security systems.
- Business seminars by both international and Indian industry chambers to capture the intellectual capital of renowned subject matter experts.

The Gujarat Government aims to utilise the opportunity to further its aerospace & defence vision and seek foreign investments.

The DefExpo, the premier event in the international aerospace and defence calendar, has witnessed year-on-year growth, both in the quantity and quality of participation. The DefExpo 2020 had the exhibition expanse of over 75,000 square metres, with participation of more than 1,000 exhibitors. The event also witnessed participation of 70 nations with presence of Defence Ministers of 40 different countries. Two hundred partnerships were forged during the event that provided tremendous boost and visibility to the Uttar Pradesh Defence Industrial Corridor. Over 12 lakh people visited the event, with a unique tent city accommodation being another feature.

In February 2021, India was the first country to conduct a hybrid aerospace exhibition, Aero India-2021 at Bengaluru, in compliance with strict COVID-19 protocols. The event, under the aegis of Department of Defence Production, Ministry of Defence, had witnessed tremendous global response.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1751405>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Thu, 02 Sept 2021 4:11PM

## रक्षा मंत्री श्री राजनाथ सिंह ने गुजरात के केवडिया में डेफएक्सपो-2022 की तैयारियों की समीक्षा की

उन्होंने कहा कि घरेलू व अंतरराष्ट्रीय भागीदारी बढ़ाने के लिए हर संभव प्रयास किए जाएंगे

हमारा उद्देश्य 'मेक इन इंडिया, मेक फॉर द वर्ल्ड': रक्षा मंत्री

उन्होंने विश्वास जताया कि भारत जल्द ही वैश्विक रक्षा विनिर्माण केंद्र बन जाएगा

प्रमुख बातें:

- कार्यक्रम 10-13 मार्च, 2022 के बीच गांधीनगर में आयोजित होगा
- रक्षा मंत्री स्तर के सम्मेलन, हाइब्रिड कार्यक्रम, लाइव प्रदर्शन और व्यापार सम्मेलनों की योजना बनाई जा रही है
- आयोजन का उद्देश्य रक्षा में आत्मनिर्भरता हासिल करना और निर्यात बढ़ाना है
- भारत को भूमि संचालित, नौसेना व वायुसेना संबंधी तथा होमलैंड सुरक्षा प्रणालियों एवं रक्षा इंजीनियरिंग का एक प्रमुख गंतव्य बनाना उद्देश्य

रक्षा मंत्री श्री राजनाथ सिंह और गुजरात के मुख्यमंत्री श्री विजय रूपानी ने दिनांक 2 सितंबर, 2021 को केवडिया, गुजरात में डेफएक्सपो-2022 की तैयारियों की संयुक्त रूप से समीक्षा की। डेफएक्सपो का 12वां संस्करण, जो भारत का प्रमुख कार्यक्रम है, जिसमें भूमि संचालित, नौसेना एवं वायुसेना संबंधी तथा होमलैंड सुरक्षा प्रणालियों को प्रदर्शित किया जाता है, को दिनांक 10-13 मार्च, 2022 के बीच गुजरात के गांधीनगर में आयोजित किया जाएगा।

बैठक के दौरान श्री राजनाथ सिंह एवं रक्षा मंत्रालय और गुजरात सरकार के वरिष्ठ अधिकारियों ने उल्लेख किया कि फरवरी 2020 में उत्तर प्रदेश की राजधानी लखनऊ में आयोजित डेफएक्सपो का पिछला संस्करण भारत सरकार और राज्य सरकार के बीच सहज तालमेल के कारण जबरदस्त सफल रहा था। इस बात पर सहमति हुई कि डेफएक्सपो-2022 स्वतंत्रता के 75वें वर्ष के साथ मेल खा रहा है, जिसे 'आजादी का अमृत महोत्सव' के रूप में मनाया जा रहा है, इस आयोजन को सभी स्तरों पर अधिक सक्रिय भागीदारी तथा समन्वित प्रयासों की आवश्यकता है।



आयोजन के लिए जारी तैयारियों पर संतोष व्यक्त करते हुए रक्षा मंत्री ने सभी हितधारकों से आगामी कार्यक्रम में अधिकतम भागीदारी सुनिश्चित करने का आग्रह किया। उन्होंने आशा व्यक्त की कि डेफएक्सपो-2022 में इसके पिछले संस्करण की तुलना में न केवल घरेलू बल्कि अंतरराष्ट्रीय प्रतिनिधित्व बहुत अधिक होगा। 'मेक इन इंडिया, मेक फॉर द वर्ल्ड' के सरकार के संकल्प को दोहराते हुए श्री राजनाथ सिंह ने विश्वास व्यक्त किया कि भारत जल्द ही एक वैश्विक विनिर्माण केंद्र बन जाएगा। उन्होंने कहा, "हम अपने प्रधानमंत्री श्री नरेन्द्र मोदी की कल्पना के अनुसार 'आत्मनिर्भर भारत' की दिशा में बड़ा कदम

उठा रहे हैं। हम जल्द ही रक्षा में आत्मनिर्भरता हासिल करेंगे। हमारा उद्देश्य आयात पर निर्भरता कम करना और रक्षा निर्यात बढ़ाना है।" इस अवसर पर रक्षा मंत्रालय और गुजरात सरकार के बीच रक्षा प्रदर्शनी-2022 के आयोजन के लिए श्री राजनाथ सिंह की उपस्थिति में एक समझौता ज्ञापन पर हस्ताक्षर किए गए। डेफएक्सपो-2022 एक हाइब्रिड बिजनेस इवेंट होगा, जिसमें हेलीपैड प्रदर्शनी केंद्र में प्रदर्शनी और महात्मा मंदिर सम्मेलन एवं प्रदर्शनी केंद्र में सेमिनार की योजना है। अहमदाबाद में साबरमती रिवर फ्रंट पर हथियारों और रक्षा प्लेटफार्मों के लाइव प्रदर्शन की भी योजना बनाई जा रही है।

समीक्षा बैठक में सचिव (रक्षा उत्पादन) श्री राज कुमार, अतिरिक्त मुख्य सचिव उद्योग एवं खनन, गुजरात डॉ राजीव कुमार गुप्ता, संयुक्त सचिव (एयरोस्पेस) श्री चंद्राकर भारती, उद्योग आयुक्त और INDEXTbके अध्यक्ष डॉ राहुल बी गुप्ता शामिल थे।

डेफएक्सपो-2022 का उद्देश्य रक्षा में 'आत्मनिर्भर भारत' को प्राप्त करना और 2024 तक पाँच बिलियन अमरीकी डालर के रक्षा निर्यात लक्ष्य तक पहुँचना है। इसका उद्देश्य भारत को भूमि संचालित, नौसैनिक व वायुसैनिक नौसेना एवं होमलैंड सुरक्षा तथा रक्षा इंजीनियरिंग प्रणालियों का एक प्रमुख गंतव्य बनाना है। भविष्य के युद्ध को ध्यान में रखते हुए इस आयोजन का उद्देश्य संघर्षों पर विघटनकारी प्रौद्योगिकियों के प्रभाव और आवश्यक उपकरणों एवं प्लेटफार्मों पर इसके परिणामी प्रभाव को पहचानना है।

डेफएक्सपो-2022 का आयोजन कोविड-19 प्रोटोकॉल को ध्यान में रखते हुए किया जाएगा और इसका उद्देश्य अधिकतम अंतरराष्ट्रीय और घरेलू भागीदारी सुनिश्चित करना है। इस कार्यक्रम के दौरान आयोजित होने वाले कार्यक्रमों में शामिल हैं:

- निर्णय लेने की प्रक्रिया में तेजी लाने के लिए रक्षा मंत्री के स्तर पर एक सम्मेलन।
- उपस्थित होने वाले लोगों के लिए आभासी तरीके से घटनाओं में शामिल होने और संगोष्ठियों में भाग लेने, बी2बी बैठकें आयोजित करने, उत्पादों को देखने और विचारों/व्यावसायिक प्रस्तावों का आदान-प्रदान करने आदि के लिए एक हाइब्रिड प्रणाली।
- भूमि आधारित, नौसैनिक तथा वायुसैनिक एवं होमलैंड सुरक्षा प्रणालियों का प्रदर्शन करने के लिए सेवाओं, रक्षा सार्वजनिक क्षेत्र के उपकरणों और उद्योग द्वारा लाइव प्रदर्शन।
- प्रसिद्ध विषयवस्तु विशेषज्ञों की बौद्धिक पूंजी का उपयोग करने के लिए अंतरराष्ट्रीय और भारतीय उद्योग मंडलों दोनों द्वारा व्यावसायिक सेमिनार।
- गुजरात सरकार का लक्ष्य अपने एयरोस्पेस और रक्षा दृष्टिकोण को आगे बढ़ाने और विदेशी निवेश की तलाश करने के अवसर का उपयोग करना है।

अंतरराष्ट्रीय एयरोस्पेस और रक्षा कैलेंडर में प्रमुख आयोजन डेफएक्सपो में भागीदारी की मात्रा व गुणवत्ता दोनों में साल-दर-साल वृद्धि देखी गई है। डेफएक्सपो 2020 में प्रदर्शनी का विस्तार 75,000 वर्ग मीटर से अधिक था, जिसमें 1,000 से अधिक प्रदर्शकों की भागीदारी थी। इस कार्यक्रम में 40 विभिन्न देशों के रक्षा मंत्रियों की उपस्थिति के साथ 70 देशों की भागीदारी थी। इस आयोजन के दौरान दो सौ साझेदारियां बनाई गईं जिसने उत्तर प्रदेश रक्षा औद्योगिक गलियारे को जबरदस्त बढ़ावा और दृश्यता प्रदान की। कुल 12 लाख से अधिक लोगों ने इस आयोजन का दौरा किया, जिसमें अनोखा टेंट सिटी आवास एक अन्य विशेषता है।

फरवरी 2021 में, भारत सख्त कोविड-19 प्रोटोकॉल के अनुपालन में, बंगलुरु में एक हाइब्रिड एयरोस्पेस प्रदर्शनी, एयरो इंडिया-2021 आयोजित करने वाला पहला देश था। रक्षा मंत्रालय के रक्षा उत्पादन विभाग के तत्वावधान में आयोजित इस कार्यक्रम में विश्व समुदाय की जबरदस्त प्रतिक्रिया देखी गई थी।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1751584>

## **Indian Army carries out live-fire exercise in Ladakh**

*The exercise was carried out in super high altitude areas close to 15,000 feet*

*By Abhishek Bhalla*

The Indian Army on Thursday carried out an integrated manoeuvre and live-fire exercise in Ladakh amid a year-long tension with China in the region.

The exercise was carried out in super high altitude areas close to 15,000 feet, as the operational preparedness was reviewed by Corps Commander Lt. Gen PGK Menon.

India and China have been locked in a military tussle since May 2020 in Ladakh with a deployment of nearly 50,000 troops on both sides. After 12 rounds of military talks at the Corps Commander level to find a resolution, there has been a disengagement in friction points but there is yet to be a de-induction of troops.

As of now, disengagement has taken place in Galwan, Gogra and Pangong Tso. The Hot Springs area around PP15 still remains tense.

Indian and Chinese troops disengaged in the Pangong Lake area in February this year but there had been slow movement, with further easing of tensions after that.

<https://www.indiatoday.in/india/story/indian-army-carries-out-live-fire-exercise-in-ladakh-1848624-2021-09-03>



Indian Army carries out live-fire exercise in Ladakh. (Photo credit: Abhishek Bhalla)



## **News analysis: Will India face U.S. sanctions for procuring Russia's S-400?**

*By Dinakar Peri*

While the possibility of United States' sanctions looms large once India receives the first set of S-400 long-range air defence system in a couple of months, India and Russia, which have several other deals lined up, are broadbasing cooperation for the maintenance of Russian military hardware in service and the possibility of exporting Russian-origin equipment from India to third countries.

Experts say Russia will continue to remain India's top defence partner for sometime to come while the U.S. is unlikely



Indian Ambassador in Russia D.B. Venkatesh Varma (in pic) said that there were specific defence and national security considerations that led India to conclude the contract for the supply of S-400s. | Photo Credit: SPECIAL ARRANGEMENT

to impose sanctions under the Countering America's Adversaries Through Sanctions Act (CAATSA) over the S-400 deal, given the nature of relations.

According to Victor Kladov, Head of International Cooperation and regional policy of Rostec state corporation, the defence trade between India and Russia was \$15 billion because of some big ticket deals. In addition, deals for the manufacture of Ka-226T utility helicopters and Ak-203 assault rifles in India under technology transfer were in advanced stages among others.

### **National security considerations**

In contrast, as of 2020, the U.S. had authorised over \$20 billion in defence sales to India, said an official. According to Indian and Russian officials, the deal was in line with India's national security considerations. "This contract is under implementation. It is on schedule. And we expect the deliveries to take place as per what is mentioned in the contract," Indian Ambassador to Russia D.B. Venkatesh Varma told *The Hindu* last week.

There were specific defence and national security considerations that led India to conclude the contract for the supply of S-400s, he stated. "All I can say is that this contract will be implemented. We will do what we have to do and necessary for India to preserve and protect its national security interests. Russia will remain a key defence partner for India for decades to come."

In October 2018, India signed a \$5.43 billion deal with Russia for five S-400 Triumfregiments despite objections from the U.S.

On the broader defence cooperation, Mr. Varma said the two sides were implementing the Inter-Governmental Agreement signed in 2019 for creating joint ventures for the manufacture of spare parts of Russian-origin equipment in service with the Indian armed forces and also looking at using India as a production base for exporting to third countries Russian-origin equipment and services.

A senior Russian official said such sanctions had "zero percent effectiveness" on them. "We are finding ways to take care of sanctions and unfriendly actions of our competitors like the US..." said Dmitry Shugaev, Director of the Federal Service for Military Technical Cooperation of Russia. India and Russia have also secured their payment channels to pay for the deals, which was confirmed by Mr. Kladov. "For instance, we protect our banking systems by doing payments in national currencies," he had stated.

### **Technical and political aspects**

Ruslan Pukhov, Director of the Moscow based Centre for Analysis of Strategies and Technologies (CAST), observed that the issue had two aspects, technical and political. India was a country that had an independent foreign and defence policy. "Therefore, it cannot afford to take decisions under foreign pressure, no matter which one, the U.S., Russia or anyone else," he told *The Hindu*.

On the political aspect, Mr. Pukhov said the U.S. imposed sanctions on countries which were "weak and less important" for them. "More a country is important to the U.S., more likely it is to turn a blind eye."

Referring to the case of Turkey, Mr. Pukhov said there was a split in the foreign policy community on imposing sanctions. India "is far more important to the U.S. than Turkey." "In a future confrontation for the U.S. with China, India will be playing a key role. The U.S. will do their best to attract India in their campaign with China. So I don't think the U.S. will risk relations with India by imposing these sanctions," he added.

Harsh V. Pant, Head of the Strategic Studies Programme, Observer Research Foundation, said, "There is no getting away from Russia in India's defence matrix for the foreseeable future". While Russia's role position was not the same as it was in the cold war, it remained a very important player for India as Afghanistan had shown for strategic reasons, he noted. "So India always has this idea of keeping relations on an even keel. The S-400 deal exemplifies the twists and turns in India's relations with Russia and the U.S.," he added.

<https://www.thehindu.com/news/national/news-analysis-will-india-face-us-sanctions-for-procuring-russias-s-400/article36256516.ece>



Fri, 03 Sept 2021

## Why is China ramping up construction of missile silos?

By Ron Huiskens

Earlier this year, freelance analysts in the United States confirmed vague Pentagon speculation since around 2018 that China intended to expand its force of land-based strategic missiles capable of reaching most or all of the US. These analysts found 120–145 newly constructed silos for such missiles—probably the DF-41, the newest in the Chinese arsenal. China has roughly 350 nuclear weapons of which about 100 are operational missiles capable of reaching the US, all with a single warhead. The DF-41 has been designed to carry multiple warheads, so these developments, taken together, foreshadow an uncharacteristically large and sudden surge in a critical Chinese nuclear capability.



What might have triggered this build-up? The most obvious possibility—and certainly a contributing factor—is that China fears falling too far behind the US (and Russia). US offensive nuclear forces have experienced relative neglect since the end of the Cold War—relative, in particular, to defences against strategic nuclear missiles. But Russia’s determined efforts to thwart these defences and maintain a viable deterrent, combined with the growing inefficiency and safety concerns associated with ageing US systems and the demise both of several arms-control agreements and of shared instincts to probe for new agreements, have resulted in a US commitment to a comprehensive modernisation program. These developments will certainly have major consequences for China as well.

But another unprecedented package of considerations might also be coming into play. In recent times China has openly portrayed its system of governance as a viable alternative to liberal democracy. It has declared its intent to seek reform of the so-called rules-based order and reaffirmed its intention to persist with its more spectacular aspirations for geopolitical change, notably bringing Taiwan formally into the People’s Republic of China and confirming Chinese sovereignty over the South China Sea. Beijing will certainly be aware that each of these aspirations will constitute a supreme test of the tools available to sustain stability and peace and may well have concluded that a nuclear order more supportive of its interests would be a prudent investment.

China was the last of the five permanent members of the UN Security Council (China, France, Russia, the UK and the US) to acquire nuclear weapons—in 1964, nearly 20 years after the first US test. The PRC initially sought refuge under the wing of the USSR but concluded from the experience of the Korean War and China’s probing in 1954–55 of US resolve with respect to Taiwan that Moscow was an unreliable security partner. Mao Zedong reportedly resolved in 1955 that China would develop its own nuclear weapons. Thereafter, Sino-Soviet relations descended towards an emphatic rupture.

Moscow threatened in 1964 (when China conducted its first nuclear test) and in 1969 (following major infantry clashes along the Sino-Soviet border in Siberia) to destroy China’s nascent nuclear facilities, to which the US signalled its strong opposition. Later, in 1972, we saw the rapprochement between Beijing and Washington, a relationship that acquired rather surprising breadth and depth and which survived several major shocks to endure until 2017.

Over the years 1950 to 1966, America’s nuclear posture (set out in what became known as the Single Integrated Operational Plan, or SIOP) viewed China as inseparable from the USSR and

therefore a primary target for the nuclear forces the US maintained on continuous alert. Between 1966 and 1982, China was detached from the Soviet Union but remained a primary target. Under the Reagan administration, China was reclassified as a secondary target under the SIOP (and the Pentagon was even directed to prepare to provide military assistance to China in the event of renewed Sino-Soviet conflict). More than a decade later, however, in the second term of the Clinton administration, China was reinstated in the SIOP as a primary nuclear target. Then, in what could be regarded as America's primary pivot to Asia and China, the succeeding Bush administration elected to switch the centre of gravity of America's nuclear posture from the Atlantic to the Pacific—including switching the home ports of five nuclear-powered ballistic missile submarines from the Atlantic to Bangor, Washington, on the Pacific Ocean.

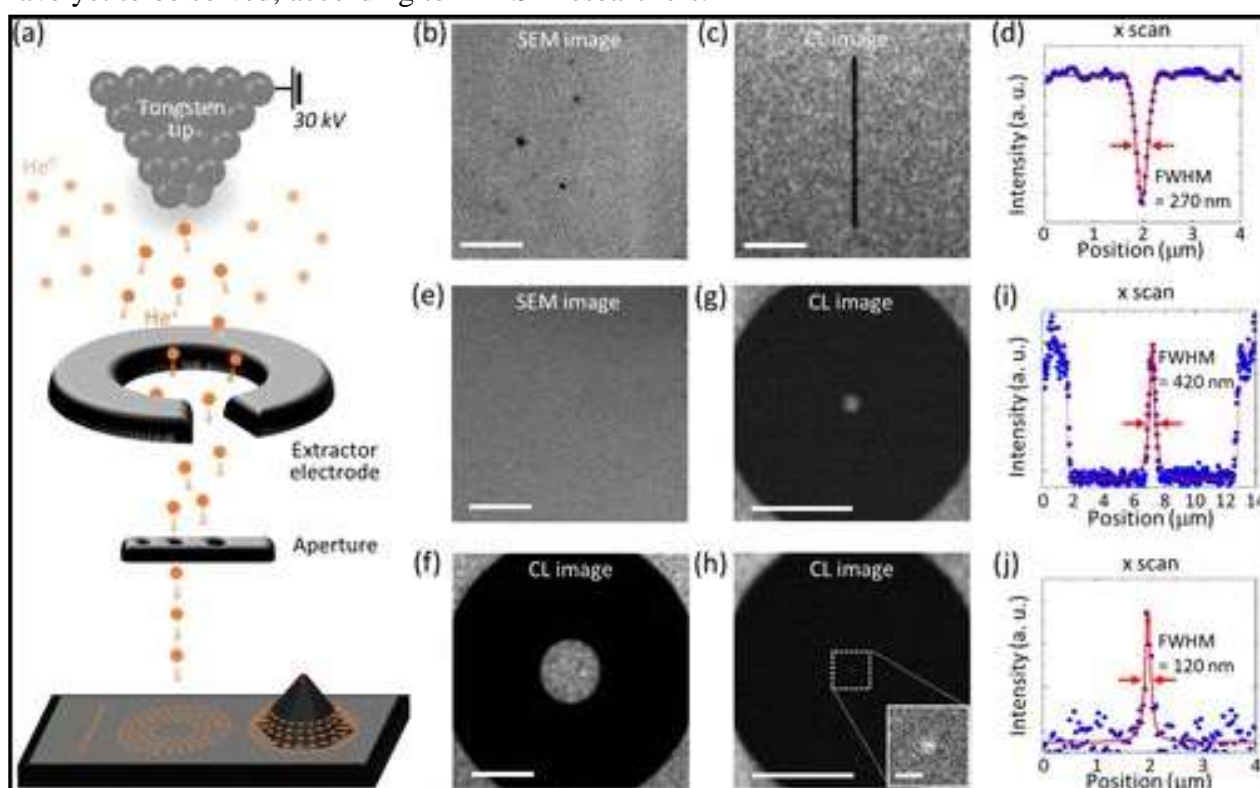
The key point is that this trajectory of events allowed China to develop its own nuclear capabilities at a leisurely pace and to keep its aspirations modest in terms of numbers and variety. Nuclear-induced tensions with the US arose from time to time, but they stemmed primarily from various proliferation pressures (Pakistan, North Korea and Iran) rather than from nuclear threats that China could direct at the US.

This is the context that makes the discovery of the new missile silos unusual and worrying. This is true even if, as some analysts suspect, China intends to deploy a much smaller number of missiles and move them randomly between neighbouring silos to enhance their probability of surviving a counterforce attack. We may have to prepare ourselves for more of the same as China seeks a nuclear posture vis-à-vis the US (and Russia) that it feels can more reliably support not only its strategic objectives but also the prominent or pre-eminent role in the international system that it envisages for itself.

<https://www.aspistrategist.org.au/why-is-china-ramping-up-construction-of-missile-silos/>

## Quantum emitters: Beyond crystal clear to single-photon pure

Photons, fundamental particles of light, are carrying these words to your eyes via the light from your computer screen or phone. Photons play a key role in the next-generation quantum information technology, such as quantum computing and communications. A quantum emitter, capable of producing a single, pure photon, is the crux of such technology but has many issues that have yet to be solved, according to KAIST researchers.



**Figure 1.** Concept of the NFP technique using HIM. (a) Schematic illustration of the helium ion source and the various implantation patterns on planar/pyramidal samples. (b, c) SEM and monochromatic CL (at the wavelength of QW emission, 400 nm) images of the planar QW after line-patterned helium ion implantation. (d) Line scan of the CL intensity and fitting curve. (e–h) SEM and monochromatic CL images of the planar QW after doughnut-patterned helium ion implantation. (i, j) Line scan of the monochromatic CL intensity of (g) and (h), respectively. All the scale bars except the inset image have a length of 4  $\mu\text{m}$ , while the scale bar of the inset image in (h) has a length of 0.5  $\mu\text{m}$ . Credit: DOI: 10.1021/acsnano.1c00587

A research team under Professor Yong-Hoon Cho has developed a technique that can isolate the desired quality emitter by reducing the noise surrounding the target with what they have dubbed a 'nanoscale focus pinspot.' They published their results on June 24 in *ACS Nano*.

"The nanoscale focus pinspot is a structurally nondestructive technique under an extremely low dose ion beam and is generally applicable for various platforms to improve their single-photon purity while retaining the integrated photonic structures," said lead author Yong-Hoon Cho from the Department of Physics at KAIST.

To produce single photons from solid state materials, the researchers used wide-bandgap semiconductor quantum dots—fabricated nanoparticles with specialized potential properties, such

as the ability to directly inject current into a small chip and to operate at room temperature for practical applications. By making a quantum dot in a photonic structure that propagates light, and then irradiating it with helium ions, researchers theorized that they could develop a quantum emitter that could reduce the unwanted noisy background and produce a single, pure photon on demand.

Professor Cho explained, "Despite its high resolution and versatility, a focused ion beam typically suppresses the optical properties around the bombarded area due to the accelerated ion beam's high momentum. We focused on the fact that, if the focused ion beam is well controlled, only the background noise can be selectively quenched with high spatial resolution without destroying the structure."

In other words, the researchers focused the ion beam on a mere pin prick, effectively cutting off the interactions around the quantum dot and removing the physical properties that could negatively interact with and degrade the photon purity emitted from the quantum dot.

"It is the first developed technique that can quench the background noise without changing the optical properties of the quantum emitter and the built-in photonic structure," Professor Cho asserted.

Professor Cho compared it to stimulated emission depletion microscopy, a technique used to decrease the light around the area of focus, but leaving the focal point illuminated. The result is increased resolution of the desired visual target.

"By adjusting the focused ion beam-irradiated region, we can select the target emitter with nanoscale resolution by quenching the surrounding emitter," Professor Cho said. "This nanoscale selective-quenching technique can be applied to various material and structural platforms and further extended for applications such as optical memory and high-resolution micro displays." Korea's National Research Foundation and the Samsung Science and Technology Foundation supported this work.

**More information:** Minho Choi et al, Nanoscale Focus Pinpoint for High-Purity Quantum Emitters via Focused-Ion-Beam-Induced Luminescence Quenching, *ACS Nano* (2021). DOI: [10.1021/acsnano.1c00587](https://doi.org/10.1021/acsnano.1c00587)

**Journal information:** [ACS Nano](https://phys.org/news/2021-09-quantum-emitters-crystal-single-photon-pure.html)  
<https://phys.org/news/2021-09-quantum-emitters-crystal-single-photon-pure.html>



Fri, 03 Sept 2021

## New Bayesian quantum algorithm directly calculates the energy difference of an atom and molecule

As newly reported by the journal *Physical Chemistry Chemical Physics*, researchers from the Graduate School of Science at Osaka City University have developed a quantum algorithm that can understand the electronic states of atomic or molecular systems by directly calculating the energy difference in their relevant states. Implemented as a Bayesian phase different estimation, the algorithm breaks from convention by not focusing on the difference in total energies calculated from the pre- and post-phase evolution, but by following the evolution of the energy difference itself.

"Almost all chemistry problems discuss the energy difference, not the total energy of the molecule itself," says research lead and Specially-Appointed Lecturer Kenji Sugisaki, "also, molecules with heavy atoms that appear at the lower part of the periodic table have large total energies, but the size of the energy difference discussed in chemistry, such as electronic excitation

states and ionization energies, does not depend much on the size of the molecule." This idea led Sugisaki and his team to implementing a quantum algorithm that directly calculates energy differences instead of total energies, creating a future where scalable or practical quantum computers enable us to carry out actual chemical research and materials development.

Currently, quantum computers are capable of performing the full configuration interaction (full-CI) calculations which afford optimal molecular energies with a quantum algorithm called quantum phase estimation (QPE), noting that the full-CI calculation for sizable

molecular systems is intractable with any supercomputers. QPE relies on the fact that a wave function,  $|\Psi\rangle$  which denotes the mathematical description of the

quantum state of a microscopic system—in this case the mathematical solution of the Schrödinger equation for the microscopic system such as an atom or molecule—time-evolutionally changes its phase depending on its total energy. In the conventional QPE, the quantum superposition state  $(|0\rangle|\Psi\rangle + |1\rangle|\Psi\rangle)/\sqrt{2}$  is prepared, and the introduction of a controlled time evolution operator makes  $|\Psi\rangle$  evolve in time only when the first qubit designates the  $|1\rangle$  state. Thus, the  $|1\rangle$  state creates a quantum phase of the post-evolution in time whereas the  $|0\rangle$  state that of the pre-evolution. The phase difference between the pre- and post-evolutions gives the total energy of the system.

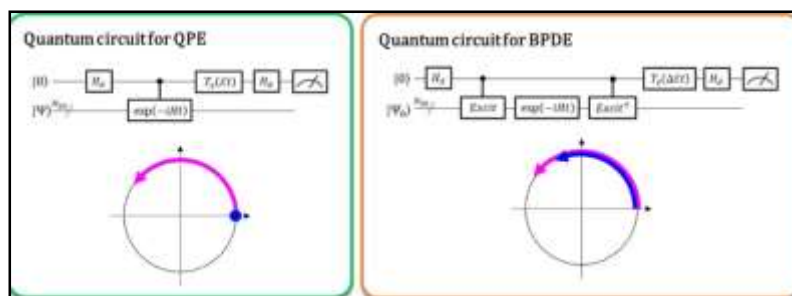
The researchers of Osaka City University generalize the conventional QPE to the direct calculation of the difference in the total energy between two relevant quantum states. In the newly implemented quantum algorithm termed Bayesian phase difference estimation (BPDE), the superposition of the two wave functions,  $(|0\rangle|\Psi_0\rangle + |1\rangle|\Psi_1\rangle)/\sqrt{2}$ , where  $|\Psi_0\rangle$  and  $|\Psi_1\rangle$  denote the wave function relevant to each state, respectively, is prepared, and the difference in the phase between  $|\Psi_0\rangle$  and  $|\Psi_1\rangle$  after the time evolution of the superposition directly gives the difference in the total energy between the two wave functions involved. "We emphasize that the algorithm follows the evolution of the energy difference over time, which is less prone to noise than individually calculating the total energy of an atom or molecule. Thus, the algorithm suits the need for chemistry problems which require precise accuracy in energy." states research supervisor and Professor Emeritus Takeji Takui.

Previously, this research group developed a quantum algorithm that directly calculates the energy difference between electronic states (spin states) with different spin quantum numbers (K. Sugisaki, K. Toyota, K. Sato, D. Shiomi, T. Takui, *Chem. Sci.* 2021, 12, 2121–2132.). This algorithm, however, requires more qubits than the conventional QPE and cannot be applied to the energy difference calculation between the electronic states with equal spin quantum numbers, which is important for the spectral assignment of UV-visible absorption spectra. The BPDE algorithm developed in the study overcomes these issues, making it a highly versatile quantum algorithm.

**More information:** Kenji Sugisaki et al, Bayesian phase difference estimation: a general quantum algorithm for the direct calculation of energy gaps, *Physical Chemistry Chemical Physics* (2021). DOI: [10.1039/d1cp03156b](https://doi.org/10.1039/d1cp03156b)

**Journal information:** [Physical Chemistry Chemical Physics](https://pubs.rsc.org/journal/phys)

<https://phys.org/news/2021-09-bayesian-quantum-algorithm-energy-difference.html>

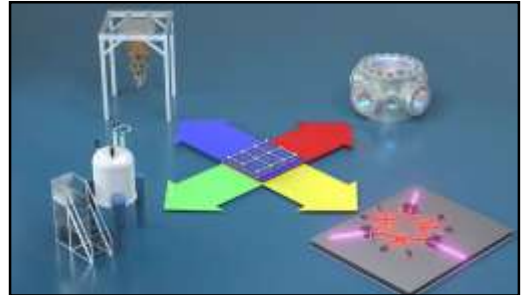


Left: The phase difference between  $|0\rangle|\Psi\rangle$  and  $\exp(-iEt)|1\rangle|\Psi\rangle$  affords the total energy  $E$ . The curved arrow in purple indicates the phase evolution of  $|\Psi\rangle$  in time. Right: The phase difference between  $\exp(-iE_0t)|0\rangle|\Psi_0\rangle$  and  $\exp(-iE_1t)|1\rangle|\Psi_1\rangle$  affords the energy difference  $E_1 - E_0$ , directly. The curved arrows in blue and in purple indicate the phase evolution of  $|\Psi_0\rangle$  and that of  $|\Psi_1\rangle$ , respectively. Credit: K. Sugisaki, K. Sato and T. Takui



## Researchers find a way to check that quantum computers return accurate answers

Quantum computers are advancing at a rapid pace and are already starting to push the limits of the world's largest supercomputers. Yet, these devices are extremely sensitive to external influences and thus prone to errors which can change the result of the computation. This is particularly challenging for quantum computations that are beyond the reach of our trusted classical computers, where we can no longer independently verify the results through simulation. "In order to take full advantage of future quantum computers for critical calculations we need a way to ensure the output is correct, even if we cannot perform the calculation in question by other means," says Chiara Greganti from the University of Vienna.



Multiple quantum computers using different hardware are tested against each other by letting them perform random-looking calculations, which are linked by a hidden graph structure. Credit: Ella Maru Studio

### Let the quantum computers check each other

To address this challenge, the team developed and implemented a new cross-check procedure that allows the results of a calculation performed on one device to be verified through a related but fundamentally different calculation on another device. "We ask different quantum computers to perform different random-looking computations," explains Martin Ringbauer from the University of Innsbruck. "What the quantum computers don't know is that there is a hidden connection between the computations they are doing." Using an alternative model of quantum computing that is built on graph structures, the team is able to generate many different computations from a common source. "While the results may appear random and the computations are different, there are certain outputs that must agree if the devices are working correctly."

### A simple and efficient technique

The team implemented their method on 5 current quantum computers using 4 distinct hardware technologies: superconducting circuits, trapped ions, photonics, and nuclear magnetic resonance. This goes to show that the method works on current hardware without any special requirements. The team also demonstrated that the technique could be used to check a single device against itself. Since the two computations are so different, the two results will only agree if they are also correct. Another key advantage of the new approach is that the researchers do not have to look at the full result of the computation, which can be very time consuming. "It is enough to check how often the different devices agree for the cases where they should, which can be done even for very large quantum computers", says Tommaso Demarie from Entropica Labs in Singapore. With more and more quantum computers becoming available, this technique may be key to making sure they are doing what is advertised

### Academia and industry joining forces to make quantum computers trustworthy

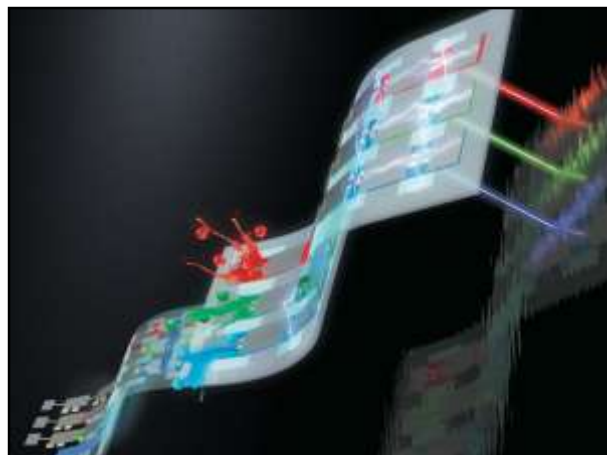
The research aiming to make quantum computers trustworthy is a joint effort of university researchers and quantum computing industry experts from multiple companies. "This close collaboration of academia and industry is what makes this paper unique from a sociological perspective", shares Joe Fitzsimons from Horizon Quantum Computing in Singapore. "While there's a progressive shift with some researchers moving to companies, they keep contributing to the common effort making quantum computing reliable and useful."

**More information:** C. Greganti et al, Cross-verification of independent quantum devices, *PRX Quantum* (2021). DOI: [10.1103/PhysRevX.11.031049](https://doi.org/10.1103/PhysRevX.11.031049)  
<https://phys.org/news/2021-09-quantum-accurate.html>

## Paving the path to electrically-pumped lasers from colloidal-quantum-dot solutions

In a new review article in *Nature Photonics*, scientists from Los Alamos National Laboratory assess the status of research into colloidal quantum dot lasers with a focus on prospective electrically pumped devices, or laser diodes. The review analyzes the challenges for realizing lasing with electrical excitation, discusses approaches to overcome them, and surveys recent advances toward this objective.

"Colloidal quantum dot lasers have tremendous potential in a range of applications, including integrated optical circuits, wearable technologies, lab-on-a-chip devices, and advanced medical imaging and diagnostics," said Victor Klimov, a senior researcher in the Chemistry division at Los Alamos and lead author of the cover article in *Nature Photonics*. "These solution-processed quantum dot laser diodes present unique challenges, which we're making good progress in overcoming."



Colloidal quantum dot diodes can be created on the laboratory benchtop and have great potential in a wide range of practical applications. Researchers at Los Alamos National Laboratory are developing approaches to overcoming the remaining challenges for practically realizing these devices. Credit: *Nature Photonics*

Heeyoung Jung and Namyoung Ahn, also of Los Alamos' Chemistry division, are coauthors.

Semiconductor lasers, or laser diodes, are an essential part of many common consumer products as well as sophisticated equipment used in telecommunication, scientific research, medicine, and space exploration. Usually, these devices employ ultrathin semiconductor films, or quantum wells, grown via vacuum-based layer-by-layer atomic deposition.

While allowing for exquisite control of the material's properties, this growth method is highly demanding and requires a clean-room environment. In addition, it is restricted to a fairly small number of mutually compatible materials used as a lasing medium and an underlying substrate. Specifically, compatibility issues greatly complicate integration of existing semiconductor lasers with standard silicon-based microelectronics.

"These problems can, in principle, be resolved with inexpensive solution-processable light emitters," Klimov said. "In particular, an attractive alternative to standard quantum wells is semiconductor particles prepared via bench-top colloidal chemistry."

Many key milestones of direct relevance to the development of colloidal quantum dot lasers have been achieved in Los Alamos, in the Nanotechnology and Advanced Spectroscopy team of the Chemistry division. This team has been engaged in state-of-the-art quantum dot research for more than two decades and has been responsible for numerous contributions in the areas of quantum dot synthesis, their fundamental studies and device applications.

Colloidal quantum dots can be synthesized in bulk quantities in a standard wet-chemistry lab using inexpensive, readily available precursors. Further, they can be combined with virtually any substrate that would resolve the issue of compatibility with silicon microelectronics and open new areas of applications not accessible with traditional laser diodes.

There are also additional advantages derived from the unique quantum nature of colloidal nanocrystals. In particular, due to their ultrasizes, their emission wavelength can be readily tuned by varying nanocrystal dimensions. This powerful capability could enable laser diodes with

an ultra-wide range of accessible colors. Further, the discrete structure of quantum-dot atomic-like states inhibits thermal depopulation of the lowest-energy emitting states and thereby reduces lasing thresholds and improves temperature stability of a lasing device.

"Despite these potential benefits, the colloidal quantum dots are difficult lasing materials," Klimov said. "High-quality nanocrystals have been available since the early '90s. However, they would not lase until around 2000, when our team at Los Alamos demonstrated for the first time the effect of light amplification with cadmium selenide nanocrystals."

The key to this demonstration was two important discoveries made at Los Alamos. One was the realization that optical gain relies not on single excitons (as in a standard light emission process), but on biexcitons and other states of higher multiplicity. The other identified challenge was that the primary deactivation channel of biexciton states was very fast nonradiative Auger recombination whereby biexcitons generate heat instead of light.

To resolve these challenges, Los Alamos researchers utilized densely packed quantum dot solids, which allowed them to boost the rate of stimulated emission so it could outpace Auger decay. Further, they employed very short (about 100 femtosecond) pulses to populate quantum dots with biexcitons before they had a chance to decay via the Auger process. This approach produced a long-awaited result—the realization of amplified spontaneous emission, proof-of-principle for colloidal quantum dot lasing.

Auger recombination still represents a major obstacle for the realization of technologically viable quantum dot lasers. Another serious challenge is the development of practical devices that can sustain ultra-high current densities of hundreds of amperes per centimeter squared required for lasing. The realization of such structures is greatly complicated by poor charge-transport properties of granular quantum dot solids and high resistivity of solution-processed charge-transport layers. As a result, devices are quickly overheated at high current densities and eventually fail due to heat-induced breakdown.

To resolve the thermal damage problem, Los Alamos developed a new device architecture in which current flow was restricted to a small area of 50 by 300 microns. This current-focusing approach boosts current density and simultaneously reduces the heat generation volume and improves heat exchange with the environment. An additional trick was to deliver carriers in short bursts of current between which the active volume had a chance to dump heat into a surrounding medium.

These measures allowed for boosting the current densities to unprecedented levels of about 1,000 amperes per square centimeter, more than a hundred-fold enhancement compared to previous records. This was sufficient to achieve broadband optical gain capable of sustaining lasing across a wide range of wavelengths spanning from red to yellow with a single quantum dot sample.

Another challenge is incorporation of an optical resonator so as it does not disrupt charge injection pathways and, at the same time, maintains lasing despite the presence of "optically lossy" charge transport layers. This problem also has been recently resolved by Los Alamos researchers.

In particular, they applied an interesting approach wherein an optical resonator was prepared as a periodic grating engraved into a layer serving as an electron injector. In this way, they preserved a standard architecture of a light emitting diode (LED) but endowed it with an additional function of lasing device. The developed dual-function structures performed as a standard LED operating under electrical pumping and a laser activated optically.

The final step is to combine all of these strategies in a single device capable of lasing with electrical excitation. Given recent advances in ultrahigh current density architectures and successful recipes for cavity integration, this objective seems to be within close reach, suggesting that colloidal quantum dot laser diodes soon may become a reality.

**More information:** Heeyoung Jung et al, Prospects and challenges of colloidal quantum dot laser diodes, *Nature Photonics* (2021). [DOI: 10.1038/s41566-021-00827-6](https://doi.org/10.1038/s41566-021-00827-6)

**Journal information:** *Nature Photonics*  
<https://phys.org/news/2021-09-paving-path-electrically-pumped-lasers-colloidal-quantum-dot.html>



*Fri, 03 Sept 2021*

## **Kidney damage another consequence of 'long covid,' Study Finds**

People hospitalized for COVID-19, and even some with milder cases, may suffer lasting damage to their kidneys, new research finds.

The study of more than 1.7 million patients in the U.S. Veterans Affairs system adds to concerns about the lingering effects of COVID -- particularly among people sick enough to need hospitalization.

Researchers found that months after their initial infection, COVID survivors were at increased risk of various types of kidney damage -- from reduced kidney function to advanced kidney failure.

People who'd been most severely ill -- requiring ICU care -- had the highest risk of long-term kidney damage.

Similarly, patients who'd developed acute kidney injury during their COVID hospitalization had higher risks than COVID patients with no apparent kidney problems during their hospital stay.

But what's striking is that those latter patients were not out of the woods, said Dr. F. Perry Wilson, a kidney specialist who was not involved in the study.

They were still about two to five times more likely to develop some degree of kidney dysfunction or disease than VA patients who were not diagnosed with COVID.

"What stood out to me is that across the board, you see these risks even in patients who did not have acute kidney injury when they were hospitalized," said Wilson, an associate professor at Yale School of Medicine in New Haven, Conn.

There is some question about the degree to which the kidney problems are related to COVID specifically, or to being sick in the hospital, according to Wilson. It's unclear, for instance, how their kidney function would compare against that of patients hospitalized for the flu.

But the study found that even VA patients who were sick at home with COVID were at increased risk of kidney problems.

### **Inflammation to blame?**

"There were risks, albeit smaller, among these patients who never had major problems when they were sick," said senior researcher Dr. Ziyad Al-Aly, an assistant professor at Washington University School of Medicine in St. Louis.

Wilson said the "big question" is why?

"Is this reflecting some ongoing immune system stimulation and inflammation?" he said. "It will take more research to figure that out."

The findings -- published Sept. 1 in the *Journal of the American Society of Nephrology* -- are based on medical records from more than 1.7 million VA patients. Of those, 89,216 were diagnosed with COVID between March 2020 and March 2021, and were still alive 30 days later.

The study looked at patients' risk of developing various types of kidney problems in the months after that 30-day mark.

Overall, COVID patients were more likely to show a substantial drop in the kidneys' glomerular filtration rate (GFR), a measure of how well the organs are filtering waste from the blood.

Just over 5% of COVID patients had a GFR decline of 30% or more, the study found. And compared with the general VA patient population, their risk was 25% higher.

Since adults naturally lose about 1% of their kidney function per year, a 30% decline in GFR is akin to losing 30 years of kidney function, according to Wilson.

The study also examined the risk of acute kidney injury, where the organs suddenly lose function. It can cause symptoms such as swelling in the legs, fatigue and breathing difficulty, but sometimes causes no overt problems.

COVID patients were nearly twice as likely to develop acute kidney injury, though it varied according to initial COVID severity.

### **Will the damage last?**

Those who'd been hospitalized were five to eight times more likely than non-COVID patients to develop acute kidney injury; people who'd been sick at home with COVID had a 30% higher risk, versus the non-COVID group.

It's not yet known what it all means for COVID patients' long-term kidney health, Al-Aly said.

One question now, he noted, is whether the GFR declines in some patients will level off.

As for acute kidney injury, people can recover from it with no lasting harm, Wilson said. And if a drop in GFR is related to acute kidney injury, he noted, it may well rebound.

Some patients in the study did develop end-stage kidney failure. Those odds were greatest among COVID patients who'd been in the ICU: They developed the disease at a rate of about 21 cases per 1,000 patients per year -- making their risk 13 times higher than other VA patients'. Smaller risks were also seen among other COVID patients, hospitalized or not.

A limitation of the study is that the VA patients were mostly older men. It's unclear how the results apply more broadly, according to Al-Aly.

The risks presented to non-hospitalized patients are also somewhat murky. They are far from a uniform group, both doctors said.

Wilson suspects that people only mildly affected by COVID would be unlikely to develop kidney problems, whereas those who are "really knocked out for weeks" might have a relatively greater risk.

The good news, Al-Aly said, is that kidney dysfunction is readily detectable through basic blood work done at primary care visits.

Wilson said that kind of check-up might be worthwhile for people who were more severely ill with COVID.

### **More information**

The National Kidney Foundation has more on [COVID-19 and kidney disease](#).

SOURCES: Ziyad Al-Aly, MD, assistant professor, medicine, Washington University School of Medicine in St. Louis; F. Perry Wilson, MD, associate professor, medicine, Yale School of Medicine, New Haven, Conn.; *Journal of the American Society of Nephrology*, online, Sept. 1, 2021

<https://www.usnews.com/news/health-news/articles/2021-09-02/kidney-damage-another-consequence-of-long-covid-study-finds>



