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DRDO News

COVID-19: DRDO's Contribution

Business Today

Sat, 25 July 2020

COVID-19 test results in 30 secs? India, Israel to develop new rapid testing kit

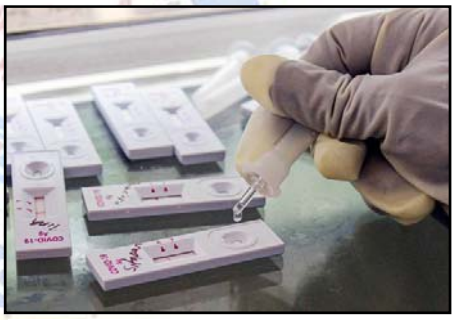
In the coming weeks, Israel will send a high ranking defence ministry research and development team (R&D) to India in a special flight for an unprecedented anti-COVID-19 operation

India and Israel have come together to develop a new kind of coronavirus rapid testing kit that would give results in a few seconds. Israel's ministries of foreign affairs, defence and health have been working with India's chief scientist K Vijay Raghavan and Defence Research and Development Organisation (DRDO) to develop rapid testing for COVID-19 that would produce results within 30 seconds.In the coming weeks, Israel will send a high ranking defence ministry research and development team (R&D) to India in a special flight for an unprecedented anti-COVID-19 operation, an Israel Embassy statement said.

"Merging Israeli technology with Indian development and production capabilities aims to allow a swift resumption of normal life alongside the virus," the embassy added.

The team of Israeli expertise will also bring emerging technologies like mechanical ventilators which have been donated by Israel's foreign ministry and private sector.

"Finally, the plane will deliver mechanical ventilators which were given special permission by the Government of Israel for export to India," the statement said.



The team of Israeli expertise will bring emerging technologies like mechanical ventilators to India. (Representational image)

Since the outbreak of novel coronavirus, Israeli Prime Minister Benjamin Netanyahu and Prime Minister Narendra Modi have held three telephonic conversations. Both the leaders have promised mutual assistance in dealing with the virus and committed to joint technological and scientific research between the countries.

Noting that India is facing more than a million cases of COVID-19, Israel has told India to integrate advanced technologies in its hospitals. Israeli technologies can be mass-produced at a lower cost, according to the embassy.

The Israel embassy added that, when its country was reeling under coronavirus pandemic, India gave special authorisation to provide medicine, masks and protective gear. "Now, Israel is proud to reciprocate this significant gesture and grant authorisation for purchasing of respirators to its great friend in the east," it said.

Israeli Ambassador to India Ron Malka said, "I am proud to lead this Israeli delegation to India. It is at times like this that our friendship is tested, and the State of Israel is happy to lend a helping hand to India in this complicated and difficult time".

"I am confident that India and Israel can work together to find innovative and cheap solutions to help the world overcome this crisis," he said.

India and Israel's military R&D cooperation is well known for its success, he added.

https://www.businesstoday.in/sectors/pharma/covid-19-test-results-in-30-secs-india-israel-to-develop-new-rapid-testing-kit/story/410879.html

DRDO Technology News

DEFENCE AVIATION POST
Your Connect To The World Of Defence And Aviation

Sat, 25 July 2020

India accelerates AMCA fighter development

The Indian Air Force (IAF) is working feverishly with Hindustan Aeronautics Limited (HAL) and the Aeronautical Development Agency to develop the indigenous Advanced Multirole Combat Aircraft (AMCA).

The modular design of the fifth-generation twin-engine single-seat aircraft is said to be finalised.

'That is what we are putting our energies into,' ACM Rakesh Kumar Singh Bhadauria said recently. More than most of his predecessors, Bhadauria has supported the need to focus on indigenous design and manufacturing.

Six squadrons of AMCAs are planned initially. The first flight is expected in 2024-25, followed by trials and tests. It will be in full production by 2029, to be followed by the Mk2 version by 2036.

Amid the 'Make in India' mantra, HAL could soon announce a JV along with the Defence Research and Development Organisation (DRDO) and a private company to progress the AMCA programme.

https://www.defenceaviationpost.com/2020/07/india-accelerates-amca-fighter-development/

hindustantimes

Sat, 25 July 2020

Air Marshal Vivek Ram Chaudhari to take charge of Western Air Command amid tension at LAC

Air Marshal Vivek Ram Chaudhari will replace Air Marshal B Suresh who will retire on July 31. Chaudhari is currently serving as the Senior Air Staff Officer at the Shillong-based Eastern Air Command

By Rahul Singh

New Delhi: The Indian Air Force's Western Air Command (WAC), whose responsibilities include the sensitive Ladakh sector, is set to get a new Chief even as the IAF remains on its highest state of alert to deal with any military provocation by the Chinese forces amid tension along the Line of Actual Control (LAC) in eastern Ladakh, people familiar with the upcoming change of guard said on Friday.

Air Marshal Vivek Ram Chaudhari will take charge of the Delhi-based WAC on August 1, said one of the officials cited above. Chaudhari was closely associated with the Rafale programme in a previous role, and the IAF is inducting its first batch of the fighters imported from France next week.

Air Marshal Vivek Ram Chaudhari is assuming command of the WAC at a time when the IAF is inducting its new Rafale fighter jets and operationalising them at the earliest is a top priority for the air force. (ANI)

He will replace Air Marshal B Suresh who will retire on July 31. Chaudhari is currently serving as the Senior Air Staff Officer at the Shillong-based Eastern Air Command. He earlier held the appointment of IAF deputy chief at the Air Headquarters in Delhi and steered a raft of key procurements.

An experienced pilot, Chaudhari has logged more than 3,800 hours of flying on a variety of fighter planes such as MiG-21, Mig-29 and Sukhoi-30. He has commanded important fighter bases in his military career including one in Kashmir. He also flew air defence missions during the 1999 Kargil war with Pakistan.

Chaudhari, who was commissioned into air force's fighter stream in December 1982, is assuming command of the WAC at a time when the IAF is inducting its new Rafale fighter jets and operationalising them at the earliest is a top priority for the air force.

He was closely associated with the Rafale programme as IAF deputy chief --- he was the head of the bilateral high-level group monitoring the progress of the fighter jet project, said a second official.

The IAF will induct its first batch of five Rafale jets at the Ambala air base, which comes under the WAC, on July 29. The air force could deploy the new fighters in the Ladakh sector as part of India's overarching plan to strengthen its military posture in the region, officials previously indicated to Hindustan Times.

India is looking at arming its Rafale jets with an all-weather smart weapon of French origin that will allow combat pilots to engage ground targets from a standoff range of up to 60 km, as reported by HT on Thursday.

The IAF is likely to initiate the purchase of Hammer (Highly Agile Modular Munition Extended Range) using the emergency financial powers granted to the military by the government at a time of heightened military tension with China.

The other weapons that the Rafales will be armed with include Meteor beyond visual range air-to-air missiles, Mica multi-mission air-to-air missiles and Scalp deep-strike cruise missiles.

India ordered 36 Rafale jets from France in a deal worth Rs 59,000 crore in September 2016 as an emergency purchase to plug gaps in the IAF's combat capabilities.

India-specific enhancements on the jets include cold engine start capability to operate from high-altitude bases including Leh, radar warning receivers, flight data recorders with storage for 10 hours of data, infrared search and track systems, jammers and towed decoys to ward off incoming missiles.

https://www.hindustantimes.com/india-news/air-marshal-vivek-ram-chaudhari-to-take-charge-of-western-air-command-amid-tension-at-lac/story-XVW25BvpR7LYyGSQVgZyyH.html

The Indian EXPRESS

Sat, 25 July 2020

Air Force Commanders' meet ends, IAF Chief outlines Vision 2030

During the conference, a "series of discussions and reviews on operational preparedness and strategies for countering security threats envisaged across the entire spectrum" were taken up

The Air Force Commanders' Conference, the biannual meet of the Air Force leadership, concluded on Friday. During the meeting, the situation along eastern Ladakh was discussed in detail, along with how to prepare the Indian Air Force (IAF) for the next decade.

During the three-day conference, IAF commanders and Principal Staff Officers were addressed by Defence Minister Rajnath Singh, Chief of Defence Staff General Bipin Rawat, and Army Chief General M M Naravane on matters of jointness and integrated war fighting, the IAF said in a statement.

Chief of the Air Staff Air Chief Marshal R K S Bhadauria reviewed the status and issues related to all the Air Commands and the branches of the Air Headquarters. (Source: Defence PRO/IAF/File)

Chief of the Air Staff Air Chief Marshal R K S Bhadauria reviewed the status and issues related to all the Air Commands and the branches of the Air Headquarters.

During the conference, a "series of discussions and reviews on operational preparedness and strategies for countering security threats envisaged across the entire spectrum" were taken up, and the IAF leadership "discussed the current situation and thereafter carried out a thorough review of the IAF's transformation roadmap for the next decade", the statement said.

In his concluding remarks, Bhadauria stated that "it was important to recognise the nature of emerging threats in a rapidly changing world" and emphasised on the "need for rapid capacity building, increase in serviceability of all assets and dedicated work towards effective integration of new technologies in the shortest timeframes", according to the statement.

The IAF chief "reiterated" that the "long-term goals for sustainable capability mandate the acquisition and employment of niche technologies and development of indigenous platforms and weapons". He also stated that "since human resource was the most valuable asset of the IAF,

recruitment, training and motivation strategies should keep pace with the changing times", the statement mentioned. Bhadauria laid down the Vision 2030 for the IAF, with milestones for transformation of IAF in the coming decade, the statement said.

https://indianexpress.com/article/india/air-force-commanders-meet-ends-iaf-chief-outlines-vision-2030-6522412/

दैनिक भास्कर

Sat, 25 July 2020

एयरफोर्स का 10 साल का रोडमैप:पश्चिमी और उत्तरी सीमा पर ताकत बढ़ाना, पूर्वी लद्दाख में जल्द से जल्द राफेल की तैनाती और नई तकनीक के इस्तेमाल पर फोकस

- ***दिल्ली में तीन दिन चली एयरफोर्स की कॉन्फ्रेंस में वायुसेना प्रमुख ने अपने कमांडरों के साथ मौजूदा चुनौतियों पर चर्चा की***
- ***चीन के साथ एलएसी पर जारी तनाव के बीच पूर्वी लद्दाख सेक्टर में रात के वक्त भी गश्त कर रहे वायुसेना के एयरक्राफ्ट***

तीन दिन तक चली वायुसेना की कॉन्फ्रेंस शुक्रवार को खत्म हो गई। एयर फोर्स के टॉप कमांडर ने इस कॉन्फ्रेंस के दौरान एयरफोर्स की ताकत बढ़ाने के लिए 10 साल के रोडमैप का खाका तैयार किया। इसके मुताबिक, वायुसेना का फोकस उत्तरी और पश्चिमी सीमा पर उभर रहे खतरों का जवाब देने के लिए ताकत बढ़ाने, जल्द से जल्द राफेल की पूर्वी लद्दाख में तैनाती और नई तकनीक के इस्तेमाल पर होगा।

पूर्वी लद्दाख में चीन के साथ जारी तनाव को लेकर एयर चीफ मार्शल आरकेएस भदौरिया, उनके सभी कमांडर इन चीफ में लंबी चर्चा हुई।

एयर चीफ मार्शल बोले- उभरते हुए खतरों को पहचानने की जरूरत

- कॉन्फ्रेंस के आखिरी दिन एयर चीफ मार्शल भदौरिया ने क्षमता बढ़ाने, मौजूदा संसाधनों के काम करने का वक्त बढ़ाने और नई तकनीक को कम से कम समय में अपनाए जाने पर जोर दिया। एयरफोर्स के प्रवक्ता के मुताबिक, वायुसेना प्रमुख ने विजन 2030 को लेकर बात की।
- आने वाले दशक में वायुसेना बदलाव की दिशा में एक मुकाम हासिल करेगी। उन्होंने कहा कि इस वक्त लगातार बदलते दौर में जरूरत उभरते हुए खतरों को पहचानने की है।
- वायुसेना को स्थाई क्षमता का विकास करना होगा और इसके लिए बड़े लक्ष्य रखने होंगे। इसके अलावा तकनीक और हथियारों के अपने ही देश में विकास के लिए मंच तैयार करना होगा।
- वायुसेना के लिए उसके पर्सनल सबसे जरूरी पूंजी हैं। ऐसे में इनके रिक्रूटमेंट, ट्रेनिंग और मोटिवेशन स्ट्रैटजी में बदलते वक्त के साथ बदलाव लाना होगा।

कॉन्फ्रेंस में राजनाथ ने वायुसेना की तारीफ की थी

वायुसेना प्रमुख ने अपने कमांडरों के साथ चुनौतियों से निपटने की रणनीति, तैयारियों का कई बार रिव्यू भी किया। मौजूदा हालात के बारे में लंबी बातचीत के बाद अगले दशक में वायुसेना में किए जाने वाले बदलावों का खाका खींचा। इस कॉन्फ्रेंस में रक्षा मंत्री राजनाथ सिंह ने वायुसेना की तारीफ की थी।

उन्होंने कहा था कि चीन से जारी तनाव के बीच वायुसेना ने बड़ी ही तेजी से फॉरवर्ड लोकेशन पर लड़ाकू विमानों की तैनाती की। हाल में वायुसेना के ऑपरेशनों और बालाकोट स्ट्राइक से विरोधियों को एक कड़ा संदेश गया।

कॉन्फ्रेंस में चीफ ऑफ डिफेंस स्टाफ जनरल बिपिन रावत, नौसेना प्रमुख एडमिरल करमबीर सिंह और सेनाध्यक्ष एमएम नरवणे ने भी कमांडरों से बातचीत की। इस दौरान सभी सेनाओं के मिलकर काम करने और इंटीग्रेटेड वार फाइटिंग पर चर्चा हुई।

पिछले कई हफ्तों से लद्दाख में रात के वक्त निगरानी कर रही वायुसेना

अधिकारियों ने बताया कि कमांडर चाहते हैं कि इसी महीने 29 जुलाई को मिलने वाले राफेल फाइटर जेट को अगले महीने तक जल्द से जल्द पूर्वी लद्दाख में तैनात कर दिया जाए। पिछले कई हफ्तों से वायुसेना इस इलाके में रात के समय निगरानी कर रही है। इससे चीन को यह संदेश गया है कि हम इस इलाके में की गई किसी भी हिमाकत का जवाब देने के लिए तैयार हैं।

वायुसेना ने सुखोई एमकेआई, जगुआर, मिराज 2000 जैसे फाइटर जेट्स पूर्वी लद्दाख के फ्रंट एयर बेस पर तैनात कर दिए हैं। इसके अलावा लाइन ऑफ एक्चुअल कंट्रोल (एलएसी) के पास फॉरवर्ड बेस पर इनकी तैनाती की गई है, क्योंकि चीन विवाद वाली कई जगहों से पीछे हटने को तैयार नहीं है।

कई फॉरवर्ड लोकेशन पर अपाचे, चिनूक जैसे हेलिकॉप्टर की तैनाती की गई है। इसके अलावा सी-17 ग्लोबमास्टर और सी-130जे सुपर हरक्यूलिस जैसे ट्रांसपोर्ट एयरक्राफ्ट पर भी एयरफोर्स का जोर है, ताकि भारी मिलिट्री इक्विपमेंट और हथियार फॉरवर्ड पोस्ट तक पहुंचाए जा सकें।

https://www.bhaskar.com/national/news/iaf-commanders-draw-10-year-roadmap-for-enhancing-countrys-aerial-prowess-127547118.html

Firstpost.

Sat, 25 July 2020

Ambala, Hasimara Rafale bases strategically selected to address Pakistan and China, optimise limited resources

It is important to keep in mind that these Rafale squadrons are only filling the gaps and not an addition to the sanctioned IAF strength

By Simantik Dowerah

The excitement over the touchdown of the first five Rafale jets on Indian soil later next week and their looming induction into the Indian Air Force (IAF) — an extremely significant chapter in India's military history — have been overshadowed by recent events.

No one could have envisioned this kind of "war-like"situation with China along the Line of Actual Control (LAC) in September 2016, when India inked a pact with France's Dassault Aviation to procure 36 Rafale fighter jets (two squadrons of 18 each) at a cost of Rs 59,000 crore.

Nor could anyone have anticipated this on 11 September, 2019, when No 17 Squadron was resurrected at the Ambala Air Force Station or when Defence Minister Rajnath Singh received the first Rafale combat jet at the production unit of Dassault Aviation at Merignac in the southwestern French town of Bordeaux last October.

"The first batch of five Indian Air Force (IAF) Rafale is likely to arrive in India by end July 2020. The aircraft will be inducted at Air Force Station Ambala on 29 July subject to weather. No media coverage is planned on arrival. The final induction ceremony will take place in second half

of August 20 wherein full media coverage would be planned," a formal IAF statement had said earlier.

But the death of 20 Indian soldiers and 76 wounded in Ladakh, along with an unknown number of casualties of China's People's Liberation Army, changed the military equation with Beijing.

That the brand new aircraft is expected to be in the thick of action as soon as possible is indicative of the seriousness of the situation.

For an air force 12 short of its sanctioned strength of 42 squadrons, the situation is already a logistical nightmare in terms of machines and human resources.

There is no doubt that the acquisition of Rafale fighter jets was made with an eye on China and Pakistan, but no one expected the relationship with Beijing to deteriorate as quickly as a sandcastle hit by waves.

Never has the old adage of peace through strength, with the Rafale jets being a critical addition to the air force, rang more true.

Add to that the operating mantra: if they dare, scare.

Home bases for Rafale squadrons

Rafale is India's attempt to prevent the worst (read war). Which necessitated the craft being strategically placed to make optimum use of limited resources by covering the maximum geographical area. Deterrence, in short.

India shares the 740-kilometre Line of Control (LoC) with Pakistan and the 3,448-kilometre Line of Actual Control with China. Which leaves the country protecting a massive geographical expanse.

The choice of home bases to station the two Rafale squadrons — Ambala in Haryana and Hasimara in West Bengal — was made keeping these conditions in mind. Located 200 kilometres north of Delhi, the Ambala Air Force Station comes under the operational command of the Western Air Command in Delhi.

During the airstrike on terror camps in Pakistan's Balakot in last February, the Mirage 2000s took off from this base. The Air Force Station in Ambala also played a critical role during the 1999 Kargil War with 234 operational sorties being carried out from the base.

The Ambala IAF base already houses two squadrons (No. 14 and No. 5) of Jaguar aircraft with the Rafale becoming the third addition. “Rafale gives us longer range than Jaguars. Ambala gives us adequate depth when the range required is more, both towards the north and west. We have adequate area for air to air refuelling which is not possible at forward bases,” former Vice-Chief of Air Staff Air Marshal PK Barbora (Retired) told *The Tribune*.

From the geographical and strategic point of view, Ambala is situated almost equidistant from the LoC and the LAC on its northwest and northeast respectively. Whether for offensive or defensive missions or to conduct combat air patrols at a short notice on either border, it won't take much time for the Rafale aircraft to be deployed.

In another piece in *The Tribune*, IAF officers felt that "Ambala was chosen for housing Rafales in the western sector due to several factors such as depth from the border, base infrastructure and technical facilities, airspace availability for local flying and training as well as allocation of IAF assets at other airbases in the region."

On the eastern front, the selection of Hasimara as the home base for the second squadron Rafale is also logistically significant. The IAF base in Hasimara is under the operational command of the Shillong-based Eastern Air Command, which shares the security concerns of the Line of Actual Control along with the Western Air Command and Prayagraj-based Central Air Command.

Hasimara Air Force Station is responsible for the protection of the tiny Chicken's Neck or the Siliguri Corridor in North Bengal, a narrow stretch of land about 22 kilometres wide that connects the country's mainland with the northeastern states.

This narrow stretch of land is surrounded by Nepal on the north and Bangladesh on the south. The base is also shouldering the responsibility of securing the Nathula Pass in Sikkim from the

Chinese. In the event of war, support from the Hasimara airbase to the three important army mountain divisions based in Gangtok, Binnaguri and Kalimpong respectively under the Sukna-based 33 Corps could have a decisive impact on the outcome.

The Doka La plateau, which lies between China's Chumbi Valley to the north, Bhutan's Ha Valley to the east and India's Nathang Valley to the west, saw a major stand-off between the Indian and Chinese armies in June 2017 when the Chinese attempted to forcibly build a road on Bhutanese territory.

During a military conflict with China, this area will also come under the purview of the Hasimara airbase and hence the planned stationing of the Rafale fighter jets assumes paramount significance. The air security in the North East is primarily handled by the IAF bases in Tezpur and Chabua (both in Assam) with the Russian-made Sukhoi-30 aircraft as the most potent weapon delivery machine.

The IAF base in Jorhat, Assam, also houses one of the two AH-64E (I) Apache helicopter squadrons. The other squadron is in Pathankot. All airbases in the North East are under the command of the Eastern Air Command and completely focussed on activities along the Line of Actual Control in their respective area of operations.

“The second base for Rafale is planned at Hashimara (West Bengal). Pakistan is not the real enemy as far air power is concerned, but our eastern neighbour China is. When we didn’t have Rafale, we had moved three squadrons of Sukhoi in the east. With Rafale, we will have adequate number of airborne fighters and fighter bombers to look after the China threat,” former Vice-Chief of Air Staff Air Marshal Barbora told *The Tribune*.

The recent violent clash between the two armies in the Galwan Valley only proved the decision to base the Rafale squadrons in Ambala and Hasimara to be strategically correct given the mercurial nature of China and its conflict-happy ally Pakistan.

What makes Rafale fighter jet special

The twin-engine Medium Multi-Role Combat Aircraft, Rafale is the first and, so far, only European aircraft with an electronic scanning radar. With Rafale fighter jet's 'omnirole' capabilities, the IAF will be able to carry out a wide range of missions such as air defence, air superiority, close air support, dynamic targeting, air-to-ground precision strike, anti-ship attacks, nuclear deterrence, etc.

Apart from Israeli helmet-mounted display, the weapon systems include the new-age beyond visual range missile Meteor, which is capable of hitting the enemy aircraft and its missiles from more than 100-km.

According to its manufacturer Dassault Aviation, the Rafale has three variants "the Air Force single-seat Rafale C, the Air Force two-seat Rafale B, and the Navy single-seat Rafale M feature maximum airframe and equipment commonality, and very similar mission capabilities."

"In the defence sector, the Indian Air Force (IAF) is our longest standing export customer and has been flying Dassault aircraft since 1953. The acquisition contract for 36 Rafale — signed in 2016 — and the modernisation of the Mirage 2000 I/TI are a continuation of this historic partnership," Dassault Aviation had said in a statement.

The Rafale entered service with the French Navy in 2004 and with the French Air Force in 2006 and is said to have proven its worth in combat in war zones such as Afghanistan, Libya, Mali, Iraq and Syria.

The Rafale jets customised for the IAF have certain bespoke modifications for the force that have been awaited as a crucial enhancement to India's Medium Multi-role Combat Aircraft fleet. The first Rafale jet comes with tail number RB 001, with RB denoting the initials of Air Chief Marshal Rakesh Bhadauria who played a key role in striking the deal for the jets in his previous role as IAF deputy chief.

Meteor and Scalp: Weapon systems to reckon with

Besides the agility of the aircraft, it is the weapon systems that make the difference. Armed with Meteor and Scalp missile systems, it is one of the most combat-proven 4.5 generation fighters. The Meteor is a Beyond Visual Range Air-to-Air Missile (BVRAAM).

MBDA, which makes the Meteor, says the missile is "guided by an advanced active radar seeker, Meteor provides all weather capability to engage a wide variety of targets from agile fast jets to small Unmanned Aerial Vehicles and cruise missiles. It is designed to meet the most stringent of requirements and is capable of operating in the most severe of clutter and countermeasure environments."

Moreover, the Meteor is also equipped with data link communication, which allows its use in a network-centric environment. The weapon can be operated by using third party data giving the pilot an opportunity to have the most flexible weapon system.

According to a report in *The Economic Times*, "The beyond-visual-range air-to-air missile is considered to be the best in its class and can take out enemy aircraft at a range of much beyond 100 km, outranging the American origin AMRAAM being used by Pakistan."

It may be said that Pakistani jets reportedly used AMRAAMs during the response a day after India's bombing of a Jaish-e-Mohammed facility in Balakot on 26 February, 2019. Another weapon that is also from the MBDA stable and arms the Rafale is the Storm Shadow or the SCALP air-launched long-range, conventionally armed, deep strike weapon, which is designed to meet the requirements of pre-planned attacks against high value fixed or stationary targets.

The Rafale manufacturers describe SCALP as "able to be operated in extreme conditions, the weapon offers operators a highly flexible, deep-strike capability based around a sophisticated mission planning system."

It also says: "Storm Shadow / SCALP has been put into operations with the Royal Air Force and the French Air Force in 2003 and was used in the Gulf, Iraq and Libya. The weapon is now in service with three other nations giving unrivalled deep strike capability. Storm Shadow / SCALP is operated from Tornado, Rafale, Mirage 2000 and in the future from Eurofighter Typhoon."

Apart from the Meteor and SCALP missile systems, the Rafale jets will be armed with the MICA air-to-air BVR interception, combat and self-defence missiles. The MICA can be also be used for within visual range (WVR) delivery. Then the Rafale fighter jet also has the HAMMER (Highly Agile and Manoeuvrable Munition Extended Range), which is a modular, rocket-boosted air-to-ground precision-guided weapon series.

The Rafale is also capable to be armed with AM39 EXOCET anti-ship missile, Laser-guided bombs with different warheads from 500lbs to 2,000 lbs, classic bombs non guided and the 2,500 rounds/min NEXTER 30M791 30 mm internal cannon, according to Dassault Aviation.

Better defence, sharper offence

Given the a high probability of Pakistan resorting to a full-scale offensive against India in case war breaks out with China, New Delhi has little choice but to view the two rival air forces as one big unit rather than two separate entities.

China's large number of indigenously manufactured fighter jets such as the Xian H-6, Xian JH-7, Chengdu J-7, Shenyang J-16, Chengdu J-20, Shenyang J-11, Chengdu J-10, Shenyang J-16, Shenyang J-8 apart from the Russian-made Sukhoi Su-30 and Sukhoi Su-35, combined with India's crippling shortage of fighter squadrons could be a recipe for disaster.

The fact that most of these Chinese craft have not been battle-tested offers little solace. There is every possibility that they might exceed expectations during real action. Besides, China always has the numbers advantage, be it men or machinery, compared to India.

Pakistan may not overwhelm with its relatively fewer fighter squadrons of Mirage 5, Mirage III, JF-17 Thunder and F-16 Fighting Falcon but could upset India's balance in concert with China.

The induction of Rafale will certainly increase India's air power, be it offensive, defensive or reconnaissance missions, but it is equally important to keep in mind that these squadrons are only plugging the gaps and not an addition to sanctioned strength.

After taking over as the IAF chief, Air Chief Marshal RS Bhadauria unveiled his plans to beef up the squadron strength but even then this "will only raise numbers to 37 squadrons by 2025, before falling again to 33 squadrons by 2032", as per a *Business Standard* piece.

Dassault Aviation describes Rafale as a fully versatile aircraft "able to carry out all combat aviation missions: air superiority and air defence, close air support, in-depth strikes, reconnaissance, anti-ship strikes and nuclear deterrence".

In terms of its capability, Rafale can indeed be a game-changer for India, but for that to happen the country must also address strategically non-negotiable shortcomings.

India can't afford a Charlie Foxtrot.

https://www.firstpost.com/india/rafale-bases-in-ambala-hasimara-strategically-selected-but-dwindling-iaf-fighter-squadrons-threaten-to-wean-off-edge-8621941.html

TIMESNOWNEWS.COM

Sat, 25 July 2020

IAF HAMMERS home the point: The lethal missiles Rafales are armed with give Indian Air Force an edge

The Highly Agile Modular Munition Extended Range (HAMMER) missile is an air-to-ground weapon which was originally designed for the French military

Key Highlights

- ***HAMMER missiles will give the IAF the ability to destroy hardened shelters such as bunkers in all types of terrain including the one along the Line of Actual Control in eastern Ladakh***
- ***HAMMER systems work in all-weather day and night conditions, and have vertical strike capabilities***
- ***The order for the missiles, which can destroy targets 60-70 km away, is reportedly being processed under emergency acquisition powers given to the Indian military by the Indian government***

As the Indian government awaits the delivery of the Rafales from France amid a border dispute with China that shows no signs of ending, reports say that the advanced fighter jets will be armed with HAMMER missiles.

The order for the missiles, which can destroy targets 60-70 km away, is reportedly being processed under emergency acquisition powers given to the Indian military by the Indian government.

News agency *ANI* quoted Indian government sources as saying that French authorities had agreed to supply the HAMMER missiles at a short notice for the Rafale planes.

Given the urgency, France will reportedly deliver the missiles from the stock originally reserved for another buyer.

The first five Rafales are expected to start arriving in India in the last week of July.

On their way from France to India, the aircraft will be refuelled in the air by an Air Force tanker aircraft of France somewhere between southern Europe and the Middle East, following which they will make a halt in the region.

India and France signed a Rs 60,000 crore-plus deal in September 2016 for the sale of 36 Rafales.

The Rafales are meant to replace the Mirage 2000s in the long run, and they come with some pretty cool technological innovations like the Advanced Terrain Following System and the Remotely Operated Video Enhanced Receiver, which helps them quickly zero in on new targets by using real-time intelligence data.

What is the HAMMER missile?

The Highly Agile Modular Munition Extended Range (HAMMER) missile is an air-to-ground weapon originally designed for the French military.

It will give the Indian Air Force (IAF) the ability to destroy hardened shelters such as bunkers in all types of terrain including the one along the Line of Actual Control in eastern Ladakh, the site of the current stand-off between the Indian and Chinese armies.

The HAMMER missile, which is part of the AASM family, comprises a guidance kit along with a range extension kit. These are fitted with Mk82 warheads such as Smart Bomb Unit (SBU)-38 and SBU-54.

The bomb bodies are of varying sizes – from 125 kg to 1000 kg.

The guidance systems range from INS/GPS to the more advanced INS/GPS/Infrared/Laser guidance.

The infrared guidance tech reduces errors of target coordinates, while laser guidance helps take out moving targets, making it a lethal missile system.

HAMMER systems work in all-weather day and night conditions, and have vertical strike capabilities. They can also be used in anti-ship missions and support deep strikes.

https://www.timesnownews.com/india/article/iaf-hammers-home-the-point-the-lethal-missiles-rafales-are-armed-with-give-indian-air-force-an-edge/626609

INDIA TV

Sat, 25 July 2020

Check out the patches specially designed for IAF warriors in Rafale fighter jets

Rafale fighter jets will soon be inducted in Indian Air Force dramatically increasing its capabilities and firepower. The advanced fighter jet will increase India's strategic and tactical depth in South Asian region. First Rafale fighter jets will land in India on July 29

By Manish Prasad

New Delhi: Rafale fighter jets will soon be inducted in Indian Air Force dramatically increasing its capabilities and firepower. The advanced fighter jet will increase India's strategic and tactical depth in South Asian region. First Rafale fighter jets will land in India on July 29.

Rafale fighter jets will form the new 17th squadron of Indian Air Force named Golden Arrow. The Golden Arrow Squadron, which was previously disbanded is being resurrected and Rafale fighter jets will soon be part of it.

Since Rafale fighter jets will form the tip-of-the-spear of Indian Air Force's offensive power, it's fitting that our air warriors be given new patches that they will proudly wear on their uniforms. Symbolism holds a great place in Indian armed forces which have a proud tradition and rich history.

The new patches that have been designed will be worn by Rafale pilots on the shoulder and chest.

The design of the patches has retained the old school essence of the historical Golden Arrow Squadron. There are two patches, one is circular and another is a silhouette of Rafale fighter jet.

Both the designs have the logo of the Golden Arrow unit along with 'Himalayan Eagle' in the middle. Colours of the Indian flag have been used in the patches as well.

This brand new Golden Arrow patch was worn by Defence Minister Rajnath Singh when he did a sortie in Rafale fighter jet last year. Group Captain Harkirat Singh, who is the commanding officer of the 17th squadron, also wore the patch.

These Rafale patches were designed last year during the resurrection of 17 Squadron "Golden Arrows". The task of making these patches for the squadron was given to Saurav Chordia.

"Though I have been into designing for a long time, this assignment was something special for me as it was about the first IAF Rafale Squadron, and it is also one of my favourite aircrafts," says Chordia.

Around 120 pilots, technical staff and other crewmen have been trained in France to be part of the glorious 17th squadron that is being resurrected.

History of 17th squadron 'Golden Arrow':

- The 17th squadron was organised in the year 1951.
- When Mig-21 fighter jets were introduced in the air force, the 17th squadron consisted of these fighter jets that were new to our air force.
- 17th squadron was part of the IAF even during the Kargil. Air Chief Marshal BS Dhanoa was commander of the squadron at that time. This was before he took charge as Air Chief Marshal.
- 17th squadron was disbanded in the year 2016.

https://www.indiatvnews.com/news/india/rafale-fighter-jets-iaf-warriors-patches-indian-air-force-636887

The EurAsian Times

Sat, 25 July 2020

India-China war: US study explains why Indian Air Force could outgun China in a border conflict

A full-scale or limited war between India and China, despite several rounds of intense negotiations, cannot be ruled out yet. Experts have consistently compared the Indian Army against the Chinese PLA troops

EurAsian Times gets you a comprehensive analysis from Belfer Center for Science and International Affairs which make a comparison between Indian and Chinese troops.

The Indian Army divides its ground and air strike forces facing China into Northern, Central and Eastern Commands. The Air Force is organized into Western, Central and Eastern Air Commands. The total available Army strike forces near China's border areas are assessed to be around 225,000 personnel according to BCSIA reports.

This incorporates the roughly 3,000 personnel attached to a T-72 tank brigade stationed in Ladakh and the estimated 1,000 personnel attached to a Brahmos cruise missile regiment in Arunachal Pradesh. For the Army, this total near China's border areas is divided into about 34,000 troops in the Northern Command; 15,500 troops in the Central Command; and 175,500 troops in the Eastern Command.

In comparison, the Belfer Center for Science and International Affairs (BCSIA) estimates a total of 200,00-230,000 Chinese ground forces are under the Western Theater Command, and Tibet and Xinjiang Military Districts.

However, this apparent numerical near-equivalence with that of Indian regional ground forces is misleading.

Even in a war with India, a significant proportion of these forces will be unavailable, reserved either protecting the Russian border or for countering rebellion in Xinjiang and Tibet, says the report.

The majority of the PLA troops are located far away from the Indian border, posing a striking contrast with the majority of forward-deployed Indian forces with a single China defence mission.

The new joint Western Theater Command of China is estimated to hold around 90,000-120,000 troops, principally divided into the 76th and 77th Group Armies. Because of ongoing unrest in Tibet and Xinjiang, the Western Theater Command's ground operational authority does not extend to these regions.

Instead, a special PLA Army-directed Military District (MD) has been created for each of these regions. In Tibet, the region closest to Indian border areas, the PLA presence is judged to number just 40,000 troops. The highest concentration of PLA forces are located in the Xinjiang region, totalling around 70,000.

This means that China is regularly operating with a permanent Indian conventional force advantage along with its border areas. In the event of a major standoff or conflict with India, it would have to rely upon mobilization primarily from Xinjiang and secondarily from the Western Theater Command forces deeper in China's interior. By contrast, Indian forces are already in position.

Indian Air Force vs People's Liberation Army Air Force

The research by the Belfer Center for Science and International Affairs also compares the IAF and the PLAAF. Aerial combat is likely to decide the fate in case of a potential war between India and China since much of the battlefront is located high in the Himalayas, an area with limited ground accessibility.

IAF has an estimated 270 fighters and 68 ground attack aircraft across its three China-facing commands. It is also expanding its network of Advanced Landing Grounds (ALGs), which constitute small air bases in forward locations to provide staging grounds and logistics hubs for aircraft strike missions.

In the Western Air Command, the IAF possesses around 75 fighters and 34 ground attack aircraft, besides 5 ALGs close to Chinese Tibetan areas. The Central Air Command features around 94 fighters, 34 ground attack aircraft, and one ALG.

The Eastern Air Command hosts around 101 fighters and 9 ALGs. Most importantly, the Indian Army and the IAF are stationed very close to China's border, thus shortening their mobilization time and limiting the prospects of a successful Chinese cross-border advance.

The Chinese PLAAF, on the other hand, suffers from a numerical disparity to the IAF in the border region. Unlike the tripartite organizational division of Chinese ground forces facing India, the Western Theater Command has assumed control of all regional strike aircraft. In total, this amounts to around 157 fighters and a varied drone armoury.

This includes an estimated 20 GJ-1/WD-1K precision strike UAVs, 12 WD-1 ground attack and reconnaissance UAVs, 12 WD-1 precision strike UAVs, and 8 EA-03 reconnaissance and electronic warfare UAVs.

A proportion of these are reserved for Russia-centric missions. By comparison, as noted earlier, the Indian Eastern Air Command can field around 101 fighters against China alone. China also uses eight airbases and airfields relevant to India strike missions, although a majority are civilian airports that can be commandeered in wartime.

Other comparative weaknesses permeate the PLAAF's posture against India. On a strict comparison of available 4th generation fighters, authoritative assessments hold that China's J-10 fighter is technically comparable to India's Mirage-2000 and that the Indian Su-30MKI is superior to all theatre Chinese fighters, including the additional J-11 and Su-27 models.

China hosts a total of around 101 4th-generation fighters in the theatre, of which a proportion must be retained for Russian defence, while India has around 122 of its comparable models, solely directed at China.

The high altitude of Chinese air bases in Tibet and Xinjiang, plus the generally difficult geographic and weather conditions of the region, means that Chinese fighters are limited to carrying around half their design payload and fuel. In-flight refuelling would be required for PLAAF forces to maximize their strike capacity.

China had only inducted 15 such tanker aircraft nationally as of 2017, meaning only a handful of its forces will benefit from this solution. Against these underpowered fighters, IAF forces will launch from bases and airfields unaffected by these geographic conditions, with maximum payload and fuel capabilities.

The most significant PLAAF forward air bases and airfields near Indian border areas are located at Hotan, Lhasa/Gonggar, Ngari-Gunsa, and Xigaze and are vulnerable to a dedicated Indian offensive.

Ngari-Gunsa and Xigaze reportedly have no hardened shelters or blast pens for their aircraft, which sit in the open. Lhasa/Gonggar has recently developed hardened shelters able to protect up to 36 aircraft, while Hotan reportedly hosts “two aircraft shelters” of unknown capacity.

An Indian early initiative to incapacitate these four bases—and achieve air superiority over them—would compel China to rely more upon aircraft from its rear-area bases, exacerbating its limited fuel and payload problems.

Moreover, China lacks the redundancy and related force survivability compared to India in their comparative numbers of regional airbases. In sum, India has a stronger regional air position, with “a large number of airfields in the east and west, so even if some airfields are down, operations can continue from other locations.

PLAAF training and experience shortcomings that are not shared by the IAF amplify China’s air disadvantage. Recent PLAAF exercises with unscripted scenarios have found that pilots are excessively reliant upon ground control for tactical direction.

In unanticipated combat scenarios, this dependence on explicit control tower guidance becomes extreme, while “ground commands” are simultaneously often unable “to keep up with the complex and changeable air situation. This suggests that PLAAF combat proficiency may be significantly weaker than often estimated.

Via: Belfer Center for Science and International Affairs

Authors: Frank O’Donnell, Alexander K. Bollfrass

March 2020 Report

https://eurasiantimes.com/india-china-war-us-reports-explains-why-india-needs-to-use-its-air-force-to-incapacitate-china/

THE WEEK

Sat, 25 July 2020

In the sky, on the waves

India's Air Force and Navy came into their own during the war

By Squadron Leader (Retd) Rana Chhina

UNLIKE WORLD WAR I, which was primarily an army affair as far as India was concerned, World War II saw the active participation of all three Indian fighting services.

Both the Indian Air Force (IAF) and the Indian Navy were fledgling services when the war broke out. The IAF came into existence on October 8, 1932. The Royal Indian Navy (RIN) evolved from the Indian Marine founded in 1612, undergoing a series of transitions till it was reconstituted as a combat service on September 8, 1934.

"India played a pivotal role in the Allied war effort in the Middle East and southeast Asia. India's defence was no longer confined to its national borders; its frontiers were seen to lie in Singapore and Egypt."

The outbreak of the war gave a great fillip to the growth of the Indian armed forces. The IAF and the RIN both came into their own as a result of the wartime expansion. Both services used a system of 'volunteer reserves', akin to the present Territorial Army, as the nucleus of their expansion. The IAF Volunteer Reserve (IAFVR) in particular formed the basis of the IAF Coastal Defence Flights (CDFs), which grew into regular IAF squadrons as the war progressed.

While officer commissions into the RIN were open to both Indians and Europeans alike, the IAF was the first truly 'Indian' service. Only Indian nationals were commissioned into it as officers or recruited as airmen, although in the early years a number of Royal Air Force personnel served in it on attachment. The ratings (sailors) of the RIN were recruited from all over India, but predominantly from Punjab and Konkan, while a large number of Bengali lascars served on board merchant marine ships.

A Hurricane IIC of the Royal Indian Air Force is readied for a sortie in Burma in 1943 | USI of India

In the IAF, the ground crew were initially recruited on an all-India basis as 'Hawai Sepoys'. But soon after the war began, the RAF rank structure was adopted by the IAF as well. The senior-most Hawai Sepoy, Harjinder Singh, was one of the early proponents of the 'Make in India' policy. He rose to be the first AOC-in-C (air officer commanding in chief) of the IAF's Maintenance Command after independence.

India's commanding geostrategic location ensured that it played a pivotal role in the Allied war effort in the Middle East and southeast Asia. India's defence was no longer confined to its national borders; its frontiers were seen to lie in Singapore and Egypt. Apart from defending the country's 5,000 miles of coastline, the RIN had to protect all sea routes in the Indian Ocean.

In the early stages of the war, it was deployed to keep the Red Sea safe for the passage of troopships and supply vessels between India and the Middle East. It succeeded in this task despite sporadic Italian attacks. The RIN later took part in the operations against Italian East Africa and in a brief campaign in Iran. After the entry of Japan into the war, the RIN was increasingly built up. By 1944, it was 20 times larger in terms of ships and men than in September 1939.

In November 1942, one of its ships, the HMIS Bengal, a Bathurst-class minesweeper, fought an epic battle against two Japanese raiders on its maiden voyage in the Bay of Bengal. Its operational

duties in the war against Japan included convoy escorts, anti-submarine patrols, constant minesweeping and collaborating with other services operating on the Burma seaboard.

The IAF began the war with a single squadron equipped with antediluvian Westland Wapiti biplanes. It initially took over 'watch and ward' duties from the RAF on India's rugged mountainous North-West Frontier. Simultaneously, five IAFVR-CDFs were formed in major coastal cities.

IAF pilots won 22 Distinguished Flying Crosses (DFCs) during the war. One of them, the indomitable K.K. "Jumbo" Majumdar later became the only Indian pilot to earn a bar to his DFC while flying reconnaissance missions over Normandy prior to the 'D-Day' landings.

IAF personnel saw service as far afield as Occupied Europe and Australia, but by far its most important theatre of operations was Burma, where it flew more than 16,000 sorties involving more than 24,000 operational flying hours. In recognition of its contribution towards victory, the service was bestowed with the prefix 'Royal' in March 1945, becoming the Royal Indian Air Force.

(The author is secretary and editor, USI Centre for Armed Forces Historical Research.)

https://www.theweek.in/theweek/cover/2020/07/23/in-the-sky-on-the-waves.html

THE TIMES OF INDIA

Sat, 25 July 2020

Greater need to guard India's waters, must stop reliance on defence imports: Shripad

Panaji: Union minister of state for defence Shripad Naik said on Friday that in the current hostile geopolitical situation, there is a greater need to guard India's coastline and territorial waters. Addressing senior naval officers, and shipyard and MSME representatives, Naik stressed on the need to reduce India's reliance on defence imports.

He said that manufacturing for defence forces is a massive opportunity for local suppliers, as the Indian Navy itself has orders worth around $60 billion till 2020-30.

"We need to be on our guard due to the current geopolitical scenario, as we remain surrounded by a hostile neighbourhood," said Naik at the virtual meet organised by the Confederation of Indian Industry in collaboration with Goa Shipyard Limited.

"To counter the threats, India needs to keep its coastline and surrounding waters under constant surveillance. Proactive and preventive capabilities are essential," the minister said.

Naik said that modernisation of the armed forces and indigenisation has emerged as a focus area in recent months, but that the efforts would pay off only with industrial support from the private sector.

"There is a need to consolidate the Indian maritime defence industry in the best possible way for the growth of the Indian maritime sector," Naik said.

"We should aspire to be a quality shipbuilding nation like Japan or Korea, which can be possible when Indian industry is equipped with in-house, state of the art technology at par with global benchmarks."

The Indian Navy's assistant chief of material (modernisation) Rear Admiral S N Alamanda, shed light on the navy's modernisation plans and future acquisitions, and urged private players to conduct research and develop equipment that is currently being procured from foreign companies.

Alamanda said that as India's shipbuilding industry matures, the country could become a hub for defence shipbuilding and exports to foreign countries.

CII organised the buyer-seller virtual meet with a focus on original equipment manufacturers and vendors from the sectors dealing with component, turn-key contracts and sub-contract works, with an aim to create a strong supplier base to strengthen indigenous manufacturing.

"We should focus more on R&D to develop AI, enable processes to cut costs and enable material savings. The segment is receiving a much-needed push," said Naik.

https://timesofindia.indiatimes.com/city/goa/greater-need-to-guard-indias-waters-must-stop-reliance-on-defence-imports-shripad/articleshow/77160159.cms

INDIA TODAY

Sat, 25 July 2020

40 days after bloodshed, Indian Army fighting vehicles pull back from Galwan flashpoint

It is this rollback of the Indian Army vehicles that will mark the grueling completion of the first pullback phase agreed upon by both sides in this area

By Shiv Aroor

In a clear sign, both of distrust as well as logistical problems caused by melting snow swelling the Galwan river, the Indian Army will shortly pull back the last of its infantry fighting vehicles from near Patrol Point 14. It was here, 40 days ago, that Indian and Chinese troops faced off in an extended and violent clash that left 20 Indian Army men and at least 16 Chinese Army personnel dead.

(Photo: @detresfa_/buffer zone; Annotation: Shiv Aroor)

It is this rollback of the Indian Army vehicles that will mark the grueling completion of the first pullback phase agreed upon by both sides in this area.

In the days that followed the bloodshed, Indian infantry fighting vehicles and other military vehicles had rumbled towards the flashpoint from posts near the Shyok-Galwan confluence.

In the first week of July, with both sides agreeing to form a buffer zone of 1.5 km on each side, troops had pulled back, though several Indian Army vehicles had remained in the buffer zone. The Chinese side had fully cleared the buffer zone of its positions by this time.

Following an agreement at the fourth round of Corps Commander-level talks between the two armies at Chushul, the Indian Army pulled back most of the vehicles by July 20. India Today TV learns the last of the Indian vehicles will be pulled back by this weekend across a set of new bridges constructed on the river.

The rollback of the Indian Army vehicles has been a difficult process owing to the swollen river breaking its banks. Chinese positions near the buffer zone have similarly been marooned by swelling bends in the river, through areas earlier identified have also since cleared.

The necessarily slow rollback at Galwan has amplified the huge terrain and logistical challenges faced by both sides in the narrow river valley. The pullback of the vehicles will, however, complete the first phase of the pullback agreed upon by both sides.

But things could change dramatically in the Galwan Valley, with developments across two other friction points -- the Gogra Post at Patrol Point 17A and the Fingers complex at Pangong Tso -- validating India's distrust of Chinese commitments to troop disengagement.

As India has reported consistently since the standoff began, the Pangong sector has proven to be the trickiest flashpoint to disengage from, and now the tentative pullback of token troops stands fully paralysed at Finger 5.

Serious differences over status and claims have brought the de-escalation process to a complete halt for over 10 days now, with both sides now clear that another Corps Commander-level meeting -- it'll be the fifth -- will be necessary. India Today TV learns this could happen next week.

More ominous than the Chinese refusal to pull back further is the overriding Indian perception that the Chinese could actually re-occupy positions. Indian Army surveillance resources are currently fixed on the 'mob of disengaged Chinese troops', since infrastructure on the Chinese side provides them with the flexibility to bounce back at short notice.

This is true across the friction points, and especially true at the Hot Springs sector. Here, the Chinese have pulled back more than at any of the other flashpoints. But smoother infrastructure allows them to rush back if necessary.

While the Indian Army had always known that the disengagement process would be tedious, it is not taking any Chinese movements at face value. Monitoring of depth areas has gained enormous primacy, since this is where the Chinese could easily redeploy from -- and in even bigger numbers.

All of Ladakh's rivers in spate has only heightened the difficult verification process. The Army is also keeping a close watch on China's training areas along the western highway and the PLA's capacity development in the area, because these are the area that will be activated should 'intent' change at any time.

As India Today has reported, China's deployments and mobilisation in the area confirm that the Ladakh standoff was no spontaneous flare-up, but part of a wider strategic effort by the People's Liberation Army under Xi Jinping.

What is clear is that the Chinese are in no mood to pull back any more or any further, forcing India to reinforce positions and plan logistically for what will be its largest winter deployment at those heights in decades. The Indian Army is also seriously looking to end the concept of a 'road close period' as soon as possible, with the current crisis hugely underscoring the need for 365 day connectivity across sectors. The determined infrastructure effort across four highways and multiple bridges in Ladakh is towards that end.

https://www.indiatoday.in/india/story/40-days-after-bloodshed-indian-army-fighting-vehicles-pull-back-from-galwan-flashpoint-1704103-2020-07-24

THE FINANCIAL EXPRESS

Sat, 25 July 2020

India-China standoff: Indian Army battles not just the enemy but high altitude, highly difficult Himalayan terrain

Comparing the cost of transporting the essential supplies on a truck with that on the aircraft, Major General Singh said that one round trip between Srinagar and Leh on a transport truck which carries 10 tons costs about Rs 1 lakh while one f light of C-17 Globemaster military aircraft costs a whopping Rs 24 lakh

With three divisions of the army moving up near the Line of Actual Control (LAC) in Ladakh to keep a watch on the Chinese, the Indian army has started preparations to ensure that the troops, who are going to brave the whole winter season at the high altitude posts, are given all necessary provisions for their upkeep. While the Army officially does not share the specifics of the provisions and logistical arrangements such troop movements entail, the Indian Express talked to some veteran army personnel who served in the region to understand the challenges faced by the troops on the higher altitude and arrangements made thereof.

Average cost incurred for the upkeep of a soldier

Major General A P Singh, who was the head of logistical operations of XIV Corps at the LAC between 2011 and 2013 told the Indian Express that on the high terrain the soldier is fighting against not one but three elements at the same time- the enemy, the weather and his physical health. To the question of an estimated cost incurred by the Army to keep a soldier at such a high altitude, Major General Singh said that on an average Rs 10 lakh a year is spent to keep a soldier at this height. The provisions include food, fuel for warming the shelter of soldiers, clothing, equipment among others. In addition to this, additional costs are incurred for some sensitive untold needs which are not disclosed by the Army because of their sensitive nature.

In addition to this, additional costs are incurred for some sensitive untold needs which are not disclosed by the Army because of their sensitive nature.

How are the supplies carried to the forward posts?

Transportation of the supplies to the higher altitude posts poses one of the biggest challenges to the Indian Army as the road routes remain closed from the start of November to March-April due to excessive snow. Both the land routes to Ladakh from Srinagar and Himchal – Rohtang Pass and Zoji La remain shut throughout the winter season. However, the army is placing its bet on the Rohtang tunnel which might get open by the end of the year.

Comparing the cost of transporting the essential supplies on a truck with that on the aircraft, Major General Singh said that one round trip between Srinagar and Leh on a transport truck which carries 10 tons costs about Rs 1 lakh while one flight of C-17 Globemaster military aircraft costs a whopping Rs 24 lakh. The capacity of the aircraft is five times that of the truck but the cost is about 24 times higher which poses huge financial constraints in transporting the supplies on the aircraft.

Mindful of the astronomical cost of sending the supplies to the posts on the aircrafts, the Army begins the process of Advance Winter Stocking from the month of April-May with the help of trucks so that it does not have to resort to the aircrafts except for emergency purposes. Major General Singh said during normal circumstances, the XIV Corps stock a reserve of about 2 lakh tonnes of supplies including food, equipment etcetera which could easily last for the 6-7 winter months. However, with the positioning of additional troops on the LAC, the post would need about

3 lakh tonnes of supply this time, he added. With the winters approaching close, the Army might need to resort to the use of the aircraft to stock the additional provisions.

Sending the supplies to Leh is not the end of the tunnel as more than 70 per cent of the supplies are to be climbed up further on higher posts like Kargil and Siachen. Before the arrival of the winter months, the Army ensures that all the supplies have been stocked up at the forward posts with the help of local people and mules as terrain becomes dangerous for the trucks higher up. The locals along with their mules walk upto 20 kilometre on a round trip to ensure that the posts are stocked with the essential supplies.

What special equipment do Army personnel need?

Special equipment which could keep the body of personnel warm are procured by the Indian Army for such high altitude regions. Major General Singh said that most of the additional troops positioned at the LAC would spend their first winter on the post and might face hardships in adapting to the climate and requiring to be battle ready at the same time. The Special Clothing and Mountaineering Equipment (SCME) procured by the Army includes ropes, special helmets, snow boots, jackets among others. Each soldier is issued two pairs of each of the equipment which roughly costs about Rs 4 lakh, Major General Singh said.

What other major challenges are before the Army?

With few months left before the onset of winters, the Army has got an uphill task of transporting the additional provisions and supplies for the additional troops in time. In addition to the supplies for the soldiers, the Army also has to stock enough material for the infrastructure work going on at the forward areas including the Durbuk-Shyok-Daulat Beg Oldie road.

With the number of soldiers doubling at the LAC, the heat proof shelters will also need to be built for the additional soldiers. Major General Singh said that soldiers will at least need shelters which can withstand the weather at -20 degree celsius and lots of stuff will need to be sent to the posts as early as by the end of August because the cement does not set after the month of September.

https://www.financialexpress.com/defence/india-china-standoff-indian-army-battles-not-just-the-enemy-but-high-altitude-highly-difficult-himalayan-terrain/2033791/

livemint

Sat, 25 July 2020

China entered covert deal with Pakistan military for bio-warfare capabilities against India, Western countries: Report

- ***The secret project was 'detached from supervision of civilian universities or government health departments' in Pakistan***
- ***The Wuhan Lab has provided Pakistan with reagents for Bacillus Thuringiensis***

Beijing : As part of a broader offensive against India and Western rivals, Pakistan and China have entered a secret three-year agreement to expand potential bio-warfare capabilities, including several research projects related to the deadly agent anthrax, the Klaxon reported citing multiple intelligence sources.

China has been criticised for handling of coronavirus pandemic with speculations that disease could have emerged from Wuhan Institute of Virology, though most experts have discounted the theory.

According to the report authored by Anthony Klan, the same lab has signed the covert deal with Pakistan military's Defense Science and Technology Organization (DESTO), to collaborate

research in "emerging infectious diseases" and advance studies on the biological control of transmitted diseases.

As per the intelligence sources cited by The Klaxon, they have serious concerns about the covert project which involves China testing biological agents outside its borders to minimize the "risk of drawing condemnation from the international community".

China has been accused over its opaqueness in the handling of coronavirus as crucial information of the lethal virus was not revealed in the early days of the outbreak which could have helped the pandemic to be tackled more effectively.

The infamous Wuhan Lab had "lent all financial, material and scientific support for the project". The program being entirely funded by China is formally titled "Collaboration for Emerging Infectious Diseases and Studies on Biological Control of Vector Transmitting Diseases", according to the report.

One senior intelligence source was quoted as saying that DESTO has been engaged in various dual-use research projects related to anthrax under a covert biological weapons program.

The Klaxon report said the "covert China-Pakistan project has conducted "successful soil sampling tests" to isolate Bacillus Thuringiensis (BT), which has a "striking similarity" to Bacillus Anthracis - or anthrax."

"Considering the striking similarity between BT and Bacillus Anthracis, a classified bio-warfare agent, (Pakistan's) improved know-how in handling the bacteria could enrich a potential offensive biological program," a source was quoted as saying.

The Wuhan Lab has provided Pakistan with reagents for Bacillus Thuringiensis. It was also providing "extensive training on the manipulation of pathogens and bio-informatics" to Pakistani scientists "to help Pakistan develop its own virus collection database", said the report.

According to an intelligence source cited by the outlet, this could help Pakistan "enhance its capability of genetic identification of viruses, access to dangerous microorganisms, and use of genomic tools for research and infectious diseases."

The secret project was "detached from supervision of civilian universities or government health departments in Pakistan" and was structured so as to allow unspecified operations, the report said.

A source was quoted as saying that the agreement "clearly outlines that the cooperation is not necessarily limited to stated objectives" and "new thematic research to monitor potential new diseases can be added by either party".

China's involvement in the project is being viewed by India and key western intelligence agencies as being "driven chiefly by its agenda to engage Pakistan against India," a security expert told The Klaxon on condition of anonymity.

"China's keen interest in the project is driven chiefly by its agenda to engage Pakistan against India and to conduct potentially dangerous experiments on foreign soil, without subjecting its own land and people to risk," the expert said.

The plan, according to the report, was a part of a move by Beijing to "designate Pakistan a destination for hazardous bio chemical research" while "evading use of its own territory for such activities", which "stand the risk of drawing criticism and condemnation from the international community".

Sources told The Klaxon that the China-Pakistan biological project had already undertaken experiments on the Crimean-Congo Hemorrhagic Fever Virus (CCHFV), a rapid-onset fever virus that causes death in about 25% of cases and is similar to the Ebola virus.

Pakistan is allegedly carrying out tests on CCHFV in laboratories which are not equipped to handle Bio-Safety Level-4 diseases, the report stated.

The threat of biological warfare has grown considerably in recent years with experts warning that China is heavily involved in DNA research that could potentially enable a biological weapon to target, or be ineffective against, people of specific races.

Intelligence sources cited by The Klaxon said there were concerns the Wuhan Institute of Virology had also established the Institute of Medical Biology in Kunming, in China's southern Yunnan province.

There were concerns the Kunming facility, which is controlled by the Chinese Academy of Medical Sciences, was also handling class-4 diseases without proper protections, the report said.

According to latest data from the Johns Hopkins University, there has been 15,439,456 cases of coronavirus worldwide, while the fatalities related to the virus has risen to 631,926.

https://www.livemint.com/news/world/china-entered-covert-deal-with-pakistan-military-for-bio-warfare-capabilities-against-india-western-countries-report-11595568891788.html

THE HINDU

Sat, 25 July 2020

Arms and the women: On gender barrier in Indian Army

After a long battle, women officers overcome the gender barrier in the Indian Army

A glass ceiling was shattered on Thursday when the Ministry of Defence issued a formal letter granting permanent commission to women officers in the Indian Army. The uphill battle to break a gender stereotype and provide equal opportunities for women in the Army had to be fought right up to the highest level, in the Supreme Court. Even so, the MoD's Government Sanction Letter specifying the grant of permanent commission to Short Service Commission (SSC) women officers in all the 10 streams in which they presently serve is a cause for celebration. It will go a long way in ending a prejudice associated with the Army. True, the fight was far from easy. It was long and protracted, as the government initially glossed over a Delhi High Court ruling in the litigants' favour 10 years ago. Then in the Supreme Court, just what the litigants were up against became clear from the views of the government. A written note to the Court pointed at "physiological limitations" of women officers, saying that these were great challenges for women officers to meet the exigencies of service. In February, the Supreme Court read the government the riot act, asking it to abide by its own policy on granting permanent commission to women in the SSC and giving them command postings in all services other than combat.

The misogyny was called out in a 54-page judgment. The Supreme Court noted that women officers of the Indian Army had brought laurels to the force. "The time has come for a realisation that women officers in the Army are not adjuncts to a male dominated establishment whose presence must be 'tolerated' within narrow confines," it said. The Army is often seen as the preserve of men, but enough women have fought heroic battles to bust that myth, from Rani of Jhansi in the past to Squadron Leader Minty Agarwal of the Indian Air Force, who last year "was part of the team that guided Wing Commander Abhinandan Varthaman during the Balakot airstrike carried out by the IAF". The irony is that of the 40,825 officers serving in the Army, a mere 1,653 are women, as the top court noted. The overall percentage of women at all levels of the armed forces needs to be increased. To usher in a change in a regressive mindset, which mirrors society, a lot more must be done on gender sensitisation. Elsewhere in the world, in countries such as the United States and Israel, women are allowed in active combat. Here, the Supreme Court had to forcefully nudge the government to make women's role in the Army more inclusive. A gender barrier may have fallen, but the war against inequity is far from over.

https://www.thehindu.com/opinion/editorial/arms-and-the-women-on-gender-barrier-in-indian-army/article32186249.ece

TECHNOLOGY NETWORKS
Exploring the Science That Matters to You

Sat, 25 July 2020

Genome mapping reveals how cryptic colors help insect "stick out"

Traits that form an organism's appearance, including color, are determined by many different genes and the creature's environment.

"Humans and domestic animals, for example, have varied skin, fur and hair, as well as a range of heights – an example of continuous variation," says Utah State University genetic ecologist Zach Gompert. "In the wild, however, types of genetic mutations affecting adaptation and thus, appearance, are only beginning to be understood. Some traits show more discontinuous or discrete variation."

In a paper published July 23, 2020 in *Science*, Gompert and colleagues from the University of Sheffield, United Kingdom; France's Paul Valéry University of Montpellier; the University of Bern and the Swiss Federal Institute for Aquatic Science and Technology, Switzerland; México's Campus Juriquilla of the Autonomous University of Querétaro, University of Notre Dame and the University of Nevada-Reno, discuss findings from an investigation of seven species of North American stick insects (Timema).

"Most research on the genetic basis of traits and adaptation has focused on individual genes and small mutations," says Gompert, associate professor in USU's Department of Biology and the USU Ecology Center. "But in this paper, we uncover a greater role for large mutations and structural rearrangements of the genome that effectively 'lock up' suites of genes in groups."

The stick insects used in the study are flightless and plant-feeding. Most Timema species have green and brown-color "morphs," a local variety of a species, which are cryptic, meaning they visually blend into their surroundings. Cryptic coloration enables the insects to avoid predation by birds, as they blend in on the leaves and stems or bark of the plants they eat. However, one species, *Timema chumash*, exhibits a range of morph colors, including greens and browns, but also yellow, orange, red and shades of blue.

"Using genome-mapping methods, we show that a large, million base pair, adaptive deletion – a supermutation – converts a continuum of color variation seen in *T. chumash* into discrete color morphs in the other stick insect species," Gompert says. "This finding is important, as it helps reconcile large evolutionary shifts or gaps with the continuous process of evolution. It also provides insights into how continuous variation is packaged into semi-discrete units of biological diversity, such as morphs, sexes and species."

Large, segregating blocks of genes, he says, have most frequently been associated with hybridization, the process of an organism breeding with another species or variety. In an earlier paper published in the May 1, 2020 issue of *Nature Communications*, Gompert and colleagues reported a study of Lycaeides butterflies shows that hybridization and natural selection can result in repeated patterns of evolution at a chromosome scale.

"However, the Timema case is different," he says. "Here the supermutation has persisted as a polymorphism within a species, mainlining green and brown forms, for millions of years without hybridization. Instead, natural selection appears to maintain both forms in a balance."

Reference: Villoutreix et al. (2020). Large-scale mutation in the evolution of a gene complex for cryptic coloration. *Science.* DOI: 10.1126/science.aaz4351.

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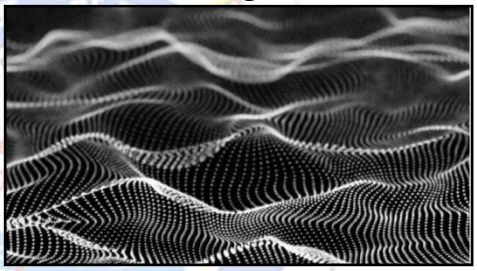
https://www.technologynetworks.com/tn/news/genome-mapping-reveals-cryptic-colors-help-insect-stick-out-from-the-rest-337856

Sat, 25 July 2020

Scientists iron out the physics of wrinkling

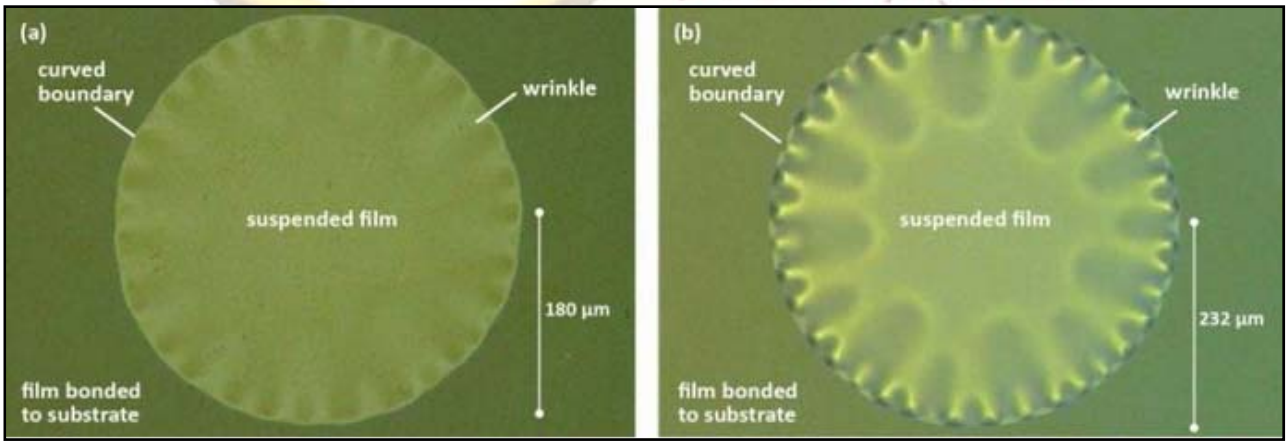
Researchers combine experiments and theory to determine how curved edges affect the wrinkling of ultra-thin materials

When we think of wrinkles, we usually envision the lines etched into our skin, for some an unwelcome reality and for others a proud sign of a life well-lived. In material science, wrinkles can also be either wanted or unwanted. But the physical factors that cause wrinkling to occur are not yet fully understood.



Now, in a paper recently published in *Applied Physics Letters*, researchers from the Mathematics, Mechanics, and Materials (MMM) Unit at the Okinawa Institute of Science and Technology Graduate University (OIST) have shown how wrinkles can be increased or reduced by altering the curvature at the edge of a material.

"Historically, scientists and engineers have focused on preventing wrinkling, which can adversely affect the performance of pressure sensors, aircraft panels, and lightweight spacecraft structures including deployable space booms and telescopes," said Professor Eliot Fried, who leads the MMM unit. "But recent research has also shown that wrinkling can give materials useful properties. For example, it can be used to make a material super hydrophobic or to make coatings that reflect light in unique ways."

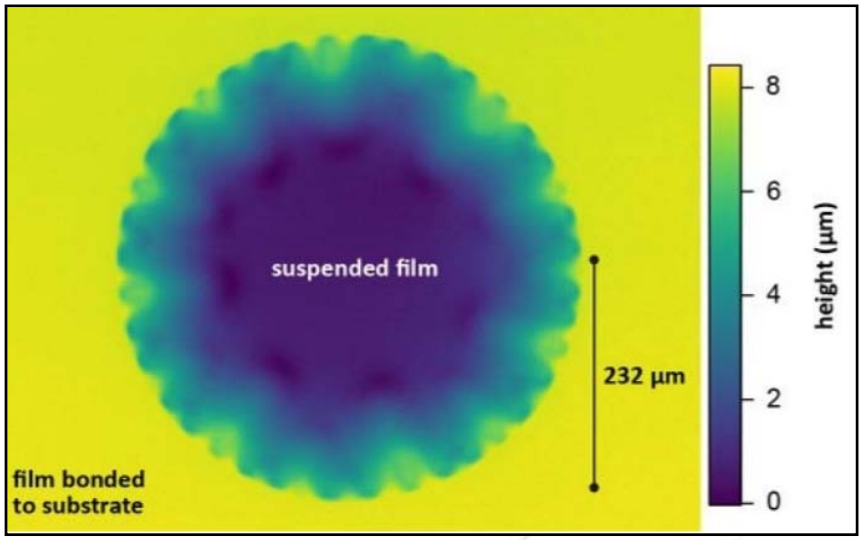


Wrinkling in the diamond window is caused by stress in the layers of diamond and glass. The diamond window in image a, which is smaller than the diamond window in image b, has a higher density of wrinkles. Credit: OIST

Diamond windows of opportunity

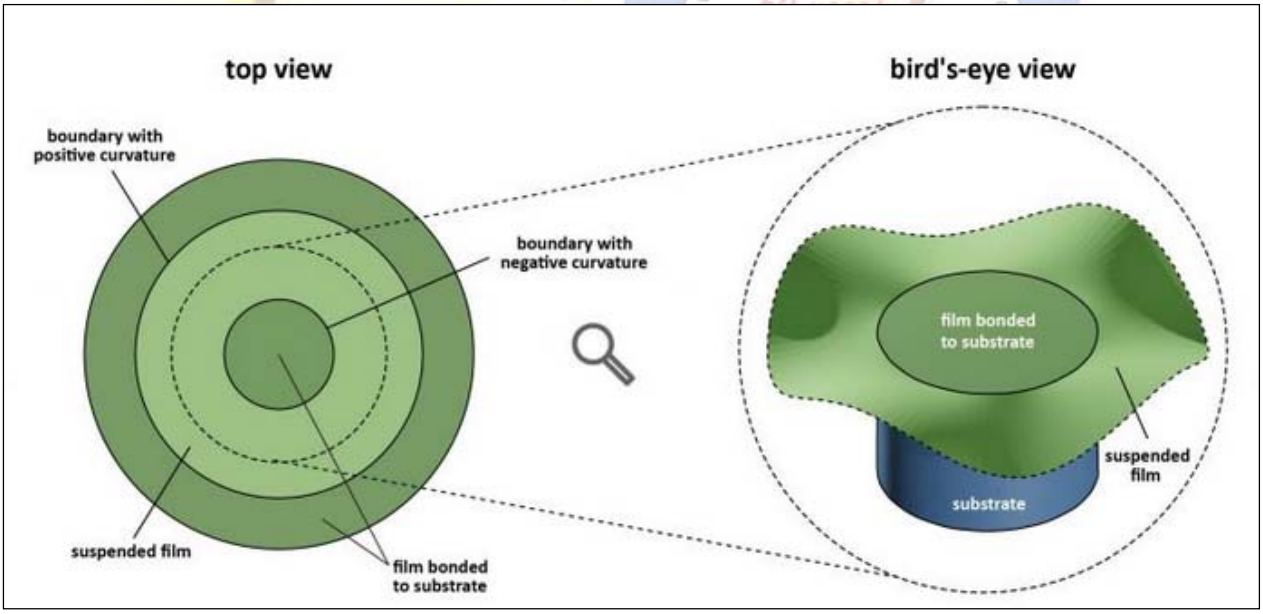
The unit first encountered the phenomenon of wrinkling while working with ultra-thin nanocrystalline diamond films, grown on a sheet of glass.

"I was removing the layer of glass underneath small areas of the nanocrystalline diamond film to create diamond windows," said Dr. Stoffel Janssens, first author of the study and postdoctoral researcher in the MMM unit. "Diamond windows are extremely difficult to make but they have really exciting potential applications, including being used as a transparent structure upon which a cell culture can be grown and easily visualized."



The scientists used a laser microscope to determine the height across the surface of the diamond window in order to calculate the level of strain. For this diamond window, the suspended nanocrystalline diamond film buckles downwards below the glass surfa

The scientists found that wrinkling was an unavoidable part of fabricating diamond windows. The process of growing the nanocrystalline diamond film on top of the glass sheet involves heating and cooling the substrate, which causes the two layers to expand and contract by different amounts, generating stress in the layers, Dr. Janssens explained. Then, when a hole in the glass substrate is made by lasers and acids to form a diamond window, the residual stress causes the now suspended portion of nanocrystalline diamond film, which is no longer bonded to the sheet of glass, to deform and wrinkle around the edge.



The scientists hope to fabricate ring-shaped diamond windows, which have boundaries with both positive and negative curvature. Credit: OIST

"We realized that diamond windows provided a great opportunity to understand some of the physical factors that affect wrinkling," said Prof. Fried. "Using circular diamond windows, we experimentally demonstrated the effect of diameter and boundary curvature on wrinkling, and then we also developed a simple theoretical model to explain what we observed."

Bridging experiment and theory

In the study, the researchers created different sized diamond windows, and then measured the wavelength and number of wrinkles that formed in the suspended film around the curved edge of each diamond window.

They found that as the size of the diamond windows increased, reducing the curvature at the boundary between the bonded and suspended nanocrystalline diamond film, the density of wrinkles decreased, and the wavelength of each wrinkle was longer.

The researchers also measured the level of strain – the amount of deformation caused by the stress in the layers – across the diamond windows.

“Measuring strain across a 2D material in a conventional way is very complicated and expensive, but we were able to devise a technique where we instead determined the surface profile of the diamond window — how high each point is — and then developed algorithms to retrieve the strain values,” said Dr. Janssens.

The scientists used a laser microscope to determine the height across the surface of the diamond window in order to calculate the level of strain. For this diamond window, the suspended nanocrystalline diamond film buckles downwards below the glass surface. Credit: OIST

The team then used the experimental results to develop a theoretical model, which they believe could be used to design devices with functional wrinkles or reduced wrinkling.

The model also expanded on the experiments, suggesting that devices containing a negative curvature would see further reductions in wrinkling.

Going forward, the unit are interested in creating diamond windows in the shape of rings, rather than circles. While more challenging to fabricate, these structures have two boundaries between the suspended and attached portions of nanocrystalline diamond films – one with positive curvature and one with negative curvature – allowing the scientists to use experiments to further explore the validity of their model.

“Overall, this study integrates theory, computation, experimentation, and analysis,” said Prof. Fried. “The interdisciplinary environment fostered at OIST made this work possible and has ultimately allowed all the researchers of our unit to collaborate and expand their expertise.”

Reference:

“Boundary curvature effect on the wrinkling of thin suspended films featured” by Stoffel D. Janssens, Burhannudin Sutisna, Alessandro Giussani, James A. Kwiecinski, David Vázquez-Cortés and Eliot Fried, 11 May 2020, *Applied Physics Letters*.

DOI: 10.1063/5.0006164

https://scitechdaily.com/scientists-iron-out-the-physics-of-wrinkling/

livemint

Sat, 25 July 2020

India's first COVID-19 vaccine trial at AIIMS Delhi: 30-year-old gets shot, no side effects so far. Key points

By Anulekha Ray

- ***AIIMS-Delhi is is among the 12 sites selected by ICMR for phase I and II trial of Covaxin***
- ***A Delhi resident took the first dose of India's COVID-19 vaccine candidate at AIIMS today***

Covaxin, India's first COVID-19 vaccine candidates today has started its human trial at All India Institutes of Medical Sciences (AIIMS), Delhi. Over 2,000 volunteers have enrolled for the first phase of human clinical trial of Covaxin. India's COVID-19 vaccine has started the human trial on July 15. The vaccine has been developed by the Hyderabad-based pharmaceutical company Bharat Biotech in collaboration with National Institute of Virology (NIV) and Indian Council of Medical Research (ICMR). AIIMS-Delhi is is among the 12 sites selected by the Indian Council for Medical Research (ICMR) for conducting phase I and II trial.

1) A Delhi resident took the first dose of India's COVID-19 vaccine at AIIMS. "The first dose of 0.5 ml intramuscular injection was given to him around 1.30 pm. No immediate side-effects have been observed so far. He was under observation for two hours and will be monitored for the next seven days," Dr Sanjay Rai, Professor at the Centre for Community Medicine at AIIMS said.

The first volunteer was screened two days ago, according to reports by the news agency *PTI*.

2) In phase I, the vaccine will be tested on 375 volunteers. The second phase of trial will be conducted on 750 volunteers. For phase I trial, healthy people who are between 18-55 years old and do not have any co-morbid conditions will be selected. For phase II trial, people aged between 12-65 will be enrolled.

3) "In the first phase we see the safety of the vaccine which is of primary importance and the dose range is also calculated," said AIIMS Director Dr Randeep Guleria.

2) Covaxin has been derived from a strain of the novel coronavirus isolated by the National Institute of Virology in Pune. Bharat Biotech developed an “inactivated" vaccine at its high-containment facility at Genome Valley in Hyderabad.

4) There are three formulations of the COVID-19 vaccine candidate. Each subject will be given any one of the formulation in two doses two weeks apart. The first 50 will get the lowest strength dose of the vaccine. If it is found to be safe in them, then it will be given to another 50 patients in high doses, Dr Rai told *PTI*.

5) The human trials of coronavirus vaccine have initiate at Goa's Redkar Hospital this week, confirmed state chief minister Pramod Sawant. "Human trials of Covaxin, an indigenously developed vaccine for COVID-19, has begun at Redkar Hospital in Goa. This is a testimony of India's immense potential in healthcare innovation. My best wishes to the entire team working on Covaxin," Sawant earlier tweeted.

6) The trial has also started at Nizams Institute of Medical Sciences, Hyderbad; Post-Graduate Institute (PGI) of Medical Sciences in Rohtak; AIIMS Patna; Institute of Medical Sciences and SUM (IMS & SUM) Hospital in Bhubaneswar among others.

7) The Drug Controller General of India (DCGI) earlier approved two vaccines — one developed by the Bharat Biotech and another one by ZydusCadila to go in for the first and second phase of human clinical trials.

8) At least seven Indian pharmaceutical companies are working on the coronavirus vaccine India. These firms are Bharat Biotech, Serum Institute, Zydus Cadila, Panacea Biotec, Indian Immunologicals, Mynvax and Biological E.

9) On how Covaxin works, Bharat Biotech said, “Once the vaccine is injected into a human, it has no potential to infect or replicate, since it is a killed virus. It just serves to the immune system as a dead virus and mounts an antibody response towards the virus."

10) India has a fantastic "vaccine capability" and it would play a crucial role in the partnerships the UK is building on COVID-19 vaccine development and manufacturing, the new British High Commissioner earlier said.

https://www.livemint.com/news/india/india-s-first-covid-19-vaccine-covaxin-trial-starts-at-aiims-delhi-10-updates-11595589341415.html

livemint

Sat, 25 July 2020

COVID-19 vaccine: Three candidates are at final trials and show 'good results'. Details here

By Anulekha Ray

- ***At present, there are three COVID-19 vaccine candidates that are at the final stage of trial***
- ***There are more than 150 vaccine candidates to combat the coronavirus in the different stages of trial across the world***

The deadly novel coronavirus has infected over 1.5 crore people across the world. There has not been been any vaccine yet, to protect against COVID-19 virus. The medical researchers are working day and night to develop a vaccine for the world. There are more than 150 vaccine candidates to combat the coronavirus in the different stages of trial across the world, according to the World Health Organisation.

AstraZeneca has joined Serum Institute of India (SII) to produce the potential vaccine in India (AFP

At present, there are three COVID-19 vaccine candidates that are at the final stage of trial. The most promising of them is the COVID-19 vaccine developed by the University of Oxford along with pharmaceutical company AstraZeneca. Another vaccine made by Chinese pharmaceutical firm Sinovac Biotech has entered the final stage of testing this week. Moderna Inc's COVID-19 vaccine has also reached final trial.

Oxford University's COVID-19 vaccine

Officially dubbed as AZD1222, the COVID-19 vaccine has been developed by the Jenner Institute, a part of the Nuffield Department of Medicine at the University of Oxford. The formulation is backed by by AstraZeneca PLC, a British-Swedish pharmaceutical company. The vaccine has shown positive results in the initial trial. The vaccine candidate is safe and prompts protective immune response, according to a report in The Lancet.

AstraZeneca has joined Serum Institute of India (SII), the world's largest vaccine manufacturers by number of doses produced and sold, to produce the potential vaccine in India. The large-scale phase III human trials of Oxford COVID-19 vaccine has already started in Brazil.

Moderna's COVID-19 vaccine:

Moderna Inc.'s Covid-19 vaccine produced antibodies to the coronavirus in, all patients tested in an initial safety trial, federal researchers said. However, researchers noticed some side effects during the human trial of Moderna's vaccine candidate.

Tony Moody, a doctor and researcher at the Duke Human Vaccine Institute, said that the antibody levels produced were "really encouraging." Although stimulating production of neutralizing antibodies doesn't prove a vaccine will be effective, it's considered an important early step in testing.

Sinovac Biotech's CoronaVac:

A vaccine made by private Chinese pharmaceutical firm Sinovac Biotech became the third in the world to enter Phase III clinical trials. Known as CoronaVac, the vaccine candidate has been made by Chinese pharmaceutical firm Sinovac Biotech. The firm has joined a the Butantan Institute, a Brazilian public health research center for the trial. Around 9,000 health workers across six Brazilian states will receive the vaccine in two doses over the next three months under the study. Sao Paulo Governor Joao Doria said initial results were expected within 90 days.

COVID-19 vaccine by Pfizer and BioNTech

The Pfizer and BioNTech candidate, which had initial data from a German study in 60 healthy volunteers, was shown to prompt an immune response and was well-tolerated. That vaccine uses a different novel platform — ribonucleic acid (RNA) — the chemical messenger containing instructions for cells to produce proteins.

Researchers are making "good progress" in developing vaccines against COVID-19, with a handful in late-stage trials, but their first use cannot be expected until early 2021, a World Health Organization (WHO) expert earlier said.

https://www.livemint.com/news/india/coronavirus-update-when-will-we-have-a-covid-19-vaccine-11595585331811.html

Sat, 25 July 2020

Researchers design new version of protein to develop COVID-19 vaccine

By James Ives

Responding to a need to quickly develop billions of doses of lifesaving COVID-19 vaccines, a scientific team at The University of Texas at Austin has successfully redesigned a key protein from the coronavirus, and the modification could enable much faster and more stable production of vaccines worldwide.

The new findings are described in the journal *Science*.

Most coronavirus vaccine candidates train the human immune system to recognize a key protein on the surface of the SARS-CoV-2 virus called the spike protein in order to fight infection. Researchers designed a new version of this protein that, when expressed in cells, produces up to 10 times more protein than that of an earlier synthetic spike protein already in use in multiple COVID-19 vaccines.

Along with colleagues at the National Institutes of Health, several members of the UT research team also designed the earlier version of the spike protein found in at least two COVID-19 vaccine candidates currently in U.S. clinical trials.

Depending on the type of vaccine, this improved version of the protein could reduce the size of each dose or speed up vaccine production. Either way, it could mean more patients have access to vaccines faster."

Jason McLellan, Study Senior Author and Associate Professor, Department of Molecular Biosciences, University of Texas at Austin

Dubbed HexaPro, the new protein is also more stable than the team's earlier version of the spike protein, which should make it easier to store and transport. It also keeps its shape even under heat stress, during storage at room temperature and through multiple freeze-thaws. Such qualities are desirable in a robust vaccine.

The Bill & Melinda Gates Foundation have contributed to the development of the technology through a grant in the interest of making vaccines accessible to people in lower-income countries.

Vaccine companies with different platform technologies will have the ability to test and further develop COVID vaccines that use HexaPro. McLellan has also indicated there is interest from partners in extending access to the technology to people in the developing world.

"Four billion people living in developing countries will need access to a vaccine, as all of us will," McLellan said.

HexaPro also could be used in COVID-19 antibody tests where it would act as a probe to identify the presence of antibodies in a patient's blood, indicating whether a person has previously been infected with the virus.

The paper's first author is Ching-Lin Hsieh, a postdoctoral researcher in McLellan's lab. Corresponding authors are McLellan; Ilya Finkelstein, an associate professor in the Department of Molecular Biosciences; and Jennifer Maynard, a professor in the Cockrell School of Engineering.

The team's original version of the spike protein forms the basis of vaccine candidates currently in human clinical trials, including Moderna's mRNA-1273 and Novavax's NVX-CoV2373.

For nucleic acid-based vaccines that use the patient's own cells to create the viral proteins that trigger an immune response, such as mRNA-1273, this improved spike protein might enable next-generation versions that require a much smaller dose to elicit the same immune response from a patient.

For subunit vaccines that contain a version of the actual viral protein as an antigen, such as NVX-CoV2373, many more vaccine doses could be produced in the same time frame. Either way, from a production standpoint, this could mean accelerating access to lifesaving vaccines.

Drawing on their experience creating stabilized proteins as vaccines against MERS-CoV, the coronavirus that causes Middle East respiratory syndrome, and other viruses, the researchers identified 100 different modifications to the spike protein that they believed might lead to a more stable, more highly expressed version.

Next, they created 100 different versions of the protein by inserting the genetic blueprints for each version into a different culture of human cells. Of those 100 versions of the spike protein, 26 were more stable or had higher expression.

The researchers then took four of those beneficial modifications, plus two from their original stabilized spike protein, and combined them to create HexaPro. When they inserted the genetic blueprints for this version of the spike protein into a human cell culture, the cells produced 10 times as much protein than that of their original protein.

Source:

University of Texas at Austin

Journal reference:

Hsieh, C-L., *et al*. (2020) Structure-based design of prefusion-stabilized SARS-CoV-2 spikes. *Science*. doi.org/10.1126/science.abd0826.

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ScienceDaily

Sat, 25 July 2020

Study identifies 21 existing drugs that could treat COVID-19

Multiple drugs improve the activity of remdesivir, a current standard-of-care treatment for COVID-19

Summary:

A new study has identified 21 existing drugs that stop the replication of SARS-CoV-2, the virus that causes COVID-19.

A *Nature* study authored by a global team of scientists and led by Sumit Chanda, Ph.D., professor at Sanford Burnham Prebys Medical Discovery Institute, has identified 21 existing drugs that stop the replication of SARS-CoV-2, the virus that causes COVID-19.

The scientists analyzed one of the world's largest collections of known drugs for their ability to block the replication of SARS-CoV-2, and reported 100 molecules with confirmed antiviral activity in laboratory tests. Of these, 21 drugs were determined to be effective at concentrations that could be safely achieved in patients. Notably, four of these compounds were found to work synergistically with remdesivir, a current standard-of-care treatment for COVID-19.

"Remdesivir has proven successful at shortening the recovery time for patients in the hospital, but the drug doesn't work for everyone who receives it. That's not good enough," says Chanda, director of the Immunity and Pathogenesis Program at Sanford Burnham Prebys and senior author of the study. "As infection rates continue to rise in America and around the world, the urgency remains to find affordable, effective, and readily available drugs that can complement the use of remdesivir, as well as drugs that could be given prophylactically or at the first sign of infection on an outpatient basis."

Extensive testing conducted

In the study, the research team performed extensive testing and validation studies, including evaluating the drugs on human lung biopsies that were infected with the virus, evaluating the drugs for synergies with remdesivir, and establishing dose-response relationships between the drugs and antiviral activity.

Of the 21 drugs that were effective at blocking viral replication, the scientists found:

- 13 have previously entered clinical trials for other indications and are effective at concentrations, or doses, that could potentially be safely achieved in COVID-19 patients.
- Two are already FDA approved: astemizole (allergies), clofazamine (leprosy), and remdesivir has received Emergency Use Authorization from the agency (COVID-19).
- Four worked synergistically with remdesivir, including the chloroquine derivative hanfangchin A (tetrandrine), an antimalarial drug that has reached Phase 3 clinical trials.

"This study significantly expands the possible therapeutic options for COVID-19 patients, especially since many of the molecules already have clinical safety data in humans," says Chanda. "This report provides the scientific community with a larger arsenal of potential weapons that may help bring the ongoing global pandemic to heel."

The researchers are currently testing all 21 compounds in small animal models and "mini lungs," or lung organoids, that mimic human tissue. If these studies are favorable, the team will approach the U.S. Food and Drug Administration (FDA) to discuss a clinical trial(s) evaluating the drugs as treatments for COVID-19.

"Based on our current analysis, clofazimine, hanfangchin A, apilimod and ONO 5334 represent the best near-term options for an effective COVID-19 treatment," says Chanda. "While some of these drugs are currently in clinical trials for COVID-19, we believe it's important to pursue

additional drug candidates so we have multiple therapeutic options if SARS-CoV-2 becomes drug resistant."

Screening one of the world's largest drug libraries

The drugs were first identified by high-throughput screening of more than 12,000 drugs from the ReFRAME drug repurposing collection -- the most comprehensive drug repurposing collection of compounds that have been approved by the FDA for other diseases or that have been tested extensively for human safety.

Arnab Chatterjee, Ph.D., vice president of medicinal chemistry at Calibr and co-author on the paper, says ReFRAME was established to tackle areas of urgent unmet medical need, especially neglected tropical diseases. "We realized early in the COVID-19 pandemic that ReFRAME would be an invaluable resource for screening for drugs to repurpose against the novel coronavirus," says Chatterjee.

The drug screen was completed as rapidly as possible due to Chanda's partnership with the scientist who discovered the first SARS virus, Kwok-Yung Yuen, M.D., chair of Infectious Diseases at the University of Hong Kong; and Shuofeng Yuan, Ph.D., assistant research professor in the Department of Microbiology at the University of Hong Kong, who had access to the SARS-CoV-2 virus in February 2020.

About the ReFrame library

ReFRAME was created by Calibr, the drug discovery division of Scripps Research, under the leadership of President Peter Shultz, Ph.D., with support from the Bill & Melinda Gates Foundation. It has been distributed broadly to nonprofit collaborators and used to identify repurposing opportunities for a range of disease, including tuberculosis, a parasite called Cryptosporidium and fibrosis.

A global team

The first authors of the study are Laura Riva, Ph.D., a postdoctoral research fellow in the Chanda lab at Sanford Burnham Prebys; and Shuofeng Yuan at the University of Hong Kong, who contributed equally to the study. Additional study authors include Xin Yin, Laura Martin-Sancho, Naoko Matsunaga, Lars Pache, Paul De Jesus, Kristina Herbert, Peter Teriete, Yuan Pu, Courtney Nguyen and Andrey Rubanov of Sanford Burnham Prebys; Jasper Fuk-Woo Chan, Jianli Cao, Vincent Poon, Ko-Yung Sit and Kwok-Yung Yuen of the University of Hong Kong; Sebastian Burgstaller-Muehlbacher, Andrew Su, Mitchell V. Hull, Tu-Trinh Nguyen, Peter G. Schultz and Arnab K. Chatterjee of Scripps Research; Max Chang and Christopher Benner of UC San Diego School of Medicine; Luis Martinez-Sobrido, Wen-Chun Liu, Lisa Miorin, Kris M. White, Jeffrey R. Johnson, Randy Albrecht, Angela Choi, Raveen Rathnasinghe, Michael Schotsaert, Marion Dejosez, Thomas P. Zwaka and Adolfo Garcia-Sastre of the Icahn School of Medicine at Mount Sinai; Ren Sun of UCLA; Kuoyuan Cheng of the National Cancer Institute and the University of Maryland; Eytan Ruppin of the National Cancer Institute; Mackenzie E. Chapman, Emma K. Lendy and Andrew D. Mesecar of Purdue University; and Richard J. Glynne of Inception Therapeutics.

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Journal Reference:

1. Laura Riva, Shuofeng Yuan, Xin Yin, Laura Martin-Sancho, Naoko Matsunaga, Lars Pache, Sebastian Burgstaller-Muehlbacher, Paul D. De Jesus, Peter Teriete, Mitchell V. Hull, Max W. Chang, Jasper Fuk-Woo Chan, Jianli Cao, Vincent Kwok-Man Poon, Kristina M. Herbert, Kuoyuan Cheng, Tu-Trinh H. Nguyen, Andrey Rubanov, Yuan Pu, Courtney Nguyen, Angela Choi, Raveen Rathnasinghe, Michael Schotsaert, Lisa Miorin, Marion Dejosez, Thomas P. Zwaka, Ko-Yung Sit, Luis Martinez-Sobrido, Wen-Chun Liu, Kris M. White, Mackenzie E. Chapman, Emma K. Lendy, Richard J. Glynne, Randy Albrecht, Eytan Ruppin, Andrew D. Mesecar, Jeffrey R. Johnson, Christopher Benner, Ren Sun, Peter G. Schultz, Andrew I. Su, Adolfo García-Sastre, Arnab K. Chatterjee, Kwok-Yung Yuen, Sumit K. Chanda. **Discovery of SARS-CoV-2 antiviral drugs through large-scale compound repurposing**. *Nature*, 2020; DOI: 10.1038/s41586-020-2577-1

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In cell studies, seaweed extract outperforms remdesivir in blocking COVID-19 virus

Heparin, a common anitcoagulent, could also form basis of a viral trap for SARS-CoV-2

Summary:

In a test of antiviral effectiveness against the virus that causes COVID-19, an extract from edible seaweeds substantially outperformed remdesivir, the current standard antiviral used to combat the disease.

In a test of antiviral effectiveness against the virus that causes COVID-19, an extract from edible seaweeds substantially outperformed remdesivir, the current standard antiviral used to combat the disease. Heparin, a common blood thinner, and a heparin variant stripped of its anticoagulant properties, performed on par with remdesivir in inhibiting SARS-CoV-2 infection in mammalian cells.

Published online today in *Cell Discovery*, the research is the latest example of a decoy strategy researchers from the Center for Biotechnology and Interdisciplinary Studies (CBIS) at Rensselear Polytechnic Institute are developing against viruses like the novel coronavirus that spawned the current global health crisis.

The spike protein on the surface of SARS-CoV-2 latches onto the ACE-2 receptor, a molecule on the surface of human cells. Once secured, the virus inserts its own genetic material into the cell, hijacking the cellular machinery to produce replica viruses. But the virus could just as easily be persuaded to lock onto a decoy molecule that offers a similar fit. The neutralized virus would be trapped and eventually degrade naturally.

Previous research has shown this decoy technique works in trapping other viruses, including dengue, Zika, and influenza A.

"We're learning how to block viral infection, and that is knowledge we are going to need if we want to rapidly confront pandemics," said Jonathan Dordick, the lead researcher and a professor of chemical and biological engineering at Rensselaer Polytechnic Institute. "The reality is that we don't have great antivirals. To protect ourselves against future pandemics, we are going to need an arsenal of approaches that we can quickly adapt to emerging viruses."

The *Cell Discovery* paper tests antiviral activity in three variants of heparin (heparin, trisulfated heparin, and a non-anticoagulant low molecular weight heparin) and two fucoidans (RPI-27 and

RPI-28) extracted from seaweed. All five compounds are long chains of sugar molecules known as sulfated polysaccharides, a structural conformation that the results of a binding study published earlier this month in Antiviral Research suggested as an effective decoy.

The researchers performed a dose response study known as an EC50 -- shorthand for the effective concentration of the compound that inhibits 50% of viral infectivity -- with each of the five compounds on mammalian cells. For the results of an EC50, which are given in a molar concentration, a lower value signals a more potent compound.

RPI-27 yielded an EC50 value of approximately 83 nanomolar, while a similar previously published and independent in vitro test of remdesivir on the same mammalian cells yielded an EC50 of 770 nanomolar. Heparin yielded an EC50 of 2.1 micromolar, or about one-third as active as remdesivir, and a non-anticoagulant analog of heparin yielded an EC50 of 5.0 micromolar, about one-fifth as active as remdesivir.

A separate test found no cellular toxicity in any of the compounds, even at the highest concentrations tested.

"What interests us is a new way of getting at infection," said Robert Linhardt, a Rensselaer professor of chemistry and chemical biology who is collaborating with Dordick to develop the decoy strategy. "The current thinking is that the COVID-19 infection starts in the nose, and either of these substances could be the basis for a nasal spray. If you could simply treat the infection early, or even treat before you have the infection, you would have a way of blocking it before it enters the body."

Dordick added that compounds from seaweed "could serve as a basis for an oral delivery approach to address potential gastrointestinal infection."

In studying SARS-CoV-2 sequencing data, Dordick and Linhardt recognized several motifs on the structure of the spike protein that promised a fit compatible with heparin, a result borne out in the binding study. The spike protein is heavily encrusted in glycans, an adaptation that protects it from human enzymes which could degrade it, and prepares it to bind with a specific receptor on the cell surface.

"It's a very complicated mechanism that we quite frankly don't know all the details about, but we're getting more information," said Dordick. "One thing that's become clear with this study is that the larger the molecule, the better the fit. The more successful compounds are the larger sulfated polysaccharides that offer a greater number of sites on the molecules to trap the virus."

Molecular modeling based on the binding study revealed sites on the spike protein where the heparin was able to interact, raising the prospects for similar sulfated polysaccharides.

"This exciting research by Professors Dordick and Linhardt is among several ongoing research efforts at CBIS, as well as elsewhere at Rensselaer, to tackle the challenges of the COVID-19 pandemic through novel therapeutic approaches and the repurposing of existing drugs," said CBIS Director Deepak Vashishth.

"Sulfated polysaccharides effectively inhibit SARS-CoV-2 in vitro" was published in *Cell Discovery* with the support of the National Research Foundation of Korea. At Rensselaer, Dordick and Linhardt were joined in the research by Paul S. Kwon, Seok-Joon Kwon, Weihua Jin, Fuming Zhang, and Keith Fraser, and by researchers at the Korea Research Institute of Bioscience and Biotechnology in Cheongju, Republic of Korea, and Zhejiang University of Technology in Hangzhou, China.

Story Source:

Materials provided by **Rensselaer Polytechnic Institute**. Original written by Mary L. Martialay. *Note: Content may be edited for style and length.*

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ScienceDaily

Sat, 25 July 2020

Coronavirus makes changes that cause cells not to recognize it

Discovery lays groundwork for designing novel antiviral drugs

Summary:

The novel coronavirus changes the appearance of its messenger RNA cap to trick the host cell into not recognizing it is foreign, according to a new study.

With an alarm code, we can enter a building without bells going off. It turns out that the SARS coronavirus 2 (SARS-CoV-2) has the same advantage entering cells. It possesses the code to waltz right in.

On July 24 in *Nature Communications*, researchers at The University of Texas Health Science Center at San Antonio (UT Health San Antonio) reported how the coronavirus achieves this.

The scientists resolved the structure of an enzyme called nsp16, which the virus produces and then uses to modify its messenger RNA cap, said Yogesh Gupta, PhD, the study lead author from the Joe R. and Teresa Lozano Long School of Medicine at UT Health San Antonio.

"It's a camouflage," Dr. Gupta said. "Because of the modifications, which fool the cell, the resulting viral messenger RNA is now considered as part of the cell's own code and not foreign."

Deciphering the 3D structure of nsp16 paves the way for rational design of antiviral drugs for COVID-19 and other emerging coronavirus infections, Dr. Gupta said. The drugs, new small molecules, would inhibit nsp16 from making the modifications. The immune system would then pounce on the invading virus, recognizing it as foreign.

"Yogesh's work discovered the 3D structure of a key enzyme of the COVID-19 virus required for its replication and found a pocket in it that can be targeted to inhibit that enzyme. This is a fundamental advance in our understanding of the virus," said study coauthor Robert Hromas, MD, professor and dean of the Long School of Medicine.

Dr. Gupta is an assistant professor in the Department of Biochemistry and Structural Biology at UT Health San Antonio and is a member of the university's Greehey Children's Cancer Research Institute.

In lay terms, messenger RNA can be described as a deliverer of genetic code to worksites that produce proteins.

The laboratory of the lead author, Yogesh Gupta, PhD, is supported through funds from the Max and Minnie Tomerlin Voelcker Foundation, the San Antonio Area Foundation, The University of Texas System, UT Health San Antonio, the Greehey Children's Cancer Research Institute of UT Health San Antonio, and the Cancer Prevention and Research Institute of Texas (CPRIT).

Story Source:

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Rapid COVID-19 test developed to detect neutralizing antibodies with high specificity and sensitivity

Summary:
A unique and rapid SARS-CoV-2 surrogate virus neutralisation test (sVNT) may be the much needed boost to current COVID-19 investigations to determine infection rate, herd immunity, predicted humoral protection, and vaccine efficacy during clinical trials.

As the current COVID-19 pandemic continues to adversely impact communities and economies across the world, efficiency in testing for the infection and antibodies is vital. A unique and rapid SARS-CoV-2 surrogate virus neutralisation test (sVNT), developed in Singapore, may be the much needed boost to current COVID-19 investigations to determine infection rate, herd immunity, predicted humoral protection, and vaccine efficacy during clinical trials.

According to a study published in *Nature Biotechnology*, the sVNT is capable of detecting the functional neutralising antibodies (NAbs) that can block the binding of the coronavirus spike protein to the angiotensin-converting enzyme 2 (ACE2) host receptor, which mimics the virus-host interaction.

The sVNT was developed by scientists from Duke-NUS Medical School, in close collaboration with National Centre for Infectious Diseases (NCID), Agency for Science, Technology and Research (A*STAR)'s Institute of Molecular and Cell Biology (IMCB) Singapore, and GenScript Biotech. The scientists in Singapore and China validated the test across two patient cohorts, with a sample size of 250 from China and 375 from Singapore, achieving 99-100 per cent specificity and 95-100 per cent sensitivity.

"The sVNT kit can detect functional NAbs in an hour and differentiate them with binding antibodies (BAbs), without the need for live virus or a biocontainment facility. It also has the ability to detect total receptor binding domain (RBD)-targeting neutralising antibodies in patient samples, in contrast to most SARS-CoV-2 antibody tests published or marketed, which are isotype-specific. This makes the sVNT accessible to the broader community for both research and clinical applications," said Professor Wang Linfa, Director of Duke-NUS' Emerging Infectious Diseases programme. Prof Wang is considered among the most recognised international experts on emerging zoonotic viruses and is currently serving on multiple WHO committees on COVID-19.

Infection or immunity to the virus is diagnosed by the presence of NAbs in a patient's blood sample, which would block the RBD-ACE2 interaction. At this critical moment of the international response to the COVID-19 outbreak, there is an urgent need for a robust serological test that detects NAbs, for accurate assessment of infection prevalence and protective immunity at the individual and population level. Antibody tests, such as the conventional virus neutralization test (cVNT) and the pseudovirus-based virus neutralization test (pVNT), remain the only platforms for detecting NAbs. However, both require live viruses and cells, highly skilled operators, and days to obtain results. Other assays, such as the enzyme-linked immunosorbent assay (ELISA) detect Babs but are unable to differentiate between BAbs and NAbs.

The sVNT can also measure NAbs from different animals in a species-independent manner. It can therefore be a powerful tool to investigate the role of animals in the transmission of COVID-19 from natural reservoirs to intermediate hosts.

"It is an increasingly critical clinical question about what proportion of patients with COVID-19 develop antibodies to COVID-19, how long it lasts, and whether antibodies protect patients from reinfection. Neutralising antibody is the gold-standard serological platform to determine this. Unfortunately, the conventional virus neutralisation assay is laborious, time-consuming and

requires Biosafety Level 3 for COVID-19. The sVNT developed by Prof Wang, in collaboration with the national COVID-19 PROTECT study, makes it accessible to all hospital laboratories, and is a great advance in COVID-19 serological assays," said Associate Professor David Lye, Director, Infectious Disease Research and Training Office (IDRTO), and Senior Consultant, NCID.

Dr Sidney Yee, CEO of A*STAR's Diagnostics Development Hub, said, "Due to the SARS outbreak in 2003, researchers in Singapore have gained important insights into that virus, which shares some similarities with SARS-Cov-2. A*STAR supported the clinical tests in this collaboration with Duke-NUS by sharing data drawn from our research experience in SARS. We are happy to have contributed to the validation of this innovative test, which will be instrumental in our fight against the global pandemic."

"We are very pleased that Prof Wang's work has come to fruition," said Mr David Martz, Vice President of New Product Management, Life Sciences Group, at GenScript. "This is great news for scientists researching herd immunity and vaccine efficacy as they will now have access to this innovative research tool to accurately determine the level of neutralising antibodies in a population. We believe the test will shed new light on the current plaguing mysteries of COVID-19."

The sVNT kit is commercialised by GenScript and offered worldwide under the brand cPass™ for research use only. GenScript has also filed for Emergency Use Authorisation with the US Food and Drug Administration and this filing is currently under review.

Story Source:

Materials provided by **Duke-NUS Medical School**. *Note: Content may be edited for style and length.*

Journal Reference:

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ETIMES
ENTERTAINMENT TIMES

Fri, 24 July 2020

COVID19: Research on turmeric shows strong antiviral properties

01/4 Antiviral properties in Turmeric may eliminate virus attacks

As the world has laid down its arms in the battle against the deadly Coronavirus, researchers around the world are trying their best to find a cure and at the same time develop an antidote for future virus attacks.

In a recent study, it was found that turmeric has potent antiviral properties. However, a lot of research is still needed to prove the effectiveness of this potent antiviral spice in curing Coronavirus, but the fact that turmeric has antiviral properties shows that in future it can be a potential cure.

02/4 Turmeric used as a medicine?

In India turmeric has been a quintessential part of Indian households. Right from its use in religious rituals to using it for medicinal purposes to using it as a spice for cooking, turmeric has been an inseparable part of our life.

Since ages this spice has been used extensively as an immunity booster and for its health enriching properties. With the deadly Corona virus attack, this miraculous spice is being used more-than-ever to prepare medicines, health tonics and what not!

Amidst all this, a recent research found that the presence of the natural component Curcumin in turmeric may help in eliminating certain viruses.

03/4 What study says?

According to the study published in the Journal of General Virology showed that curcumin can prevent Transmissible gastroenteritis virus (TGEV) - an alpha-group coronavirus that infects pigs - from infecting cells. At higher doses, the compound was also found to kill virus particles.

Infection with TGEV causes a disease called transmissible gastroenteritis in piglets, which is characterised by diarrhoea, severe dehydration and death. TGEV is highly infectious and is invariably fatal in piglets younger than two weeks, thus posing a major threat to the global swine industry. There are currently no approved treatments for alpha-coronaviruses and although there is a vaccine for TGEV, it is not effective in preventing the spread of the virus.

To determine the potential antiviral properties of curcumin, the research team treated experimental cells with various concentrations of the compound, before attempting to infect them with TGEV. They found that higher concentrations of curcumin reduced the number of virus particles in the cell culture.

The research suggests that curcumin affects TGEV in a number of ways: by directly killing the virus before it is able to infect the cell, by integrating with the viral envelope to 'inactivate' the virus, and by altering the metabolism of cells to prevent viral entry. "Curcumin has a significant inhibitory effect on TGEV adsorption step and a certain direct inactivation effect, suggesting that curcumin has great potential in the prevention of TGEV infection," said Dr Lilan Xie, lead author of the study and researcher at the Wuhan Institute of Bioengineering.

04/4 How Curcumin can combat various virus attacks

As per the study, Curcumin has been shown to inhibit the replication of some types of virus, including dengue virus, hepatitis B and Zika virus. The compound has also been found to have a number of significant biological effects, including antitumor, anti-inflammatory and antibacterial activities. Curcumin was chosen for this research due to having low side effects according to Dr Xie. They said: "There are great difficulties in the prevention and control of viral diseases, especially when there are no effective vaccines. Traditional Chinese medicine and its active ingredients, are ideal screening libraries for antiviral drugs because of their advantages, such as convenient acquisition and low side effects."

The researchers now hope to continue their research in vivo, using an animal model to assess whether the inhibiting properties of curcumin would be seen in a more complex system. "Further studies will be required, to evaluate the inhibitory effect in vivo and explore the potential mechanisms of curcumin against TGEV, which will lay a foundation for the comprehensive understanding of the antiviral mechanisms and application of curcumin," said Dr Xie.

(Inputs from ANI)

https://timesofindia.indiatimes.com/life-style/food-news/celebrate-hariyali-teej-with-these-homemade-immunity-boosting-ladoos/photostory/77108756.cms