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July - August 2020

Kids & COVID-19

- Hyperinflammatory condition
- Kawasaki disease
- Resilience

MERS vaccine

ChAdOx1 MERS shows promise in latest study

No symptoms

Whole-town study of COVID-19 transmission reveals importance of asymptomatic cases

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- Pioneering research reveals relationship between genes and gut bacteria
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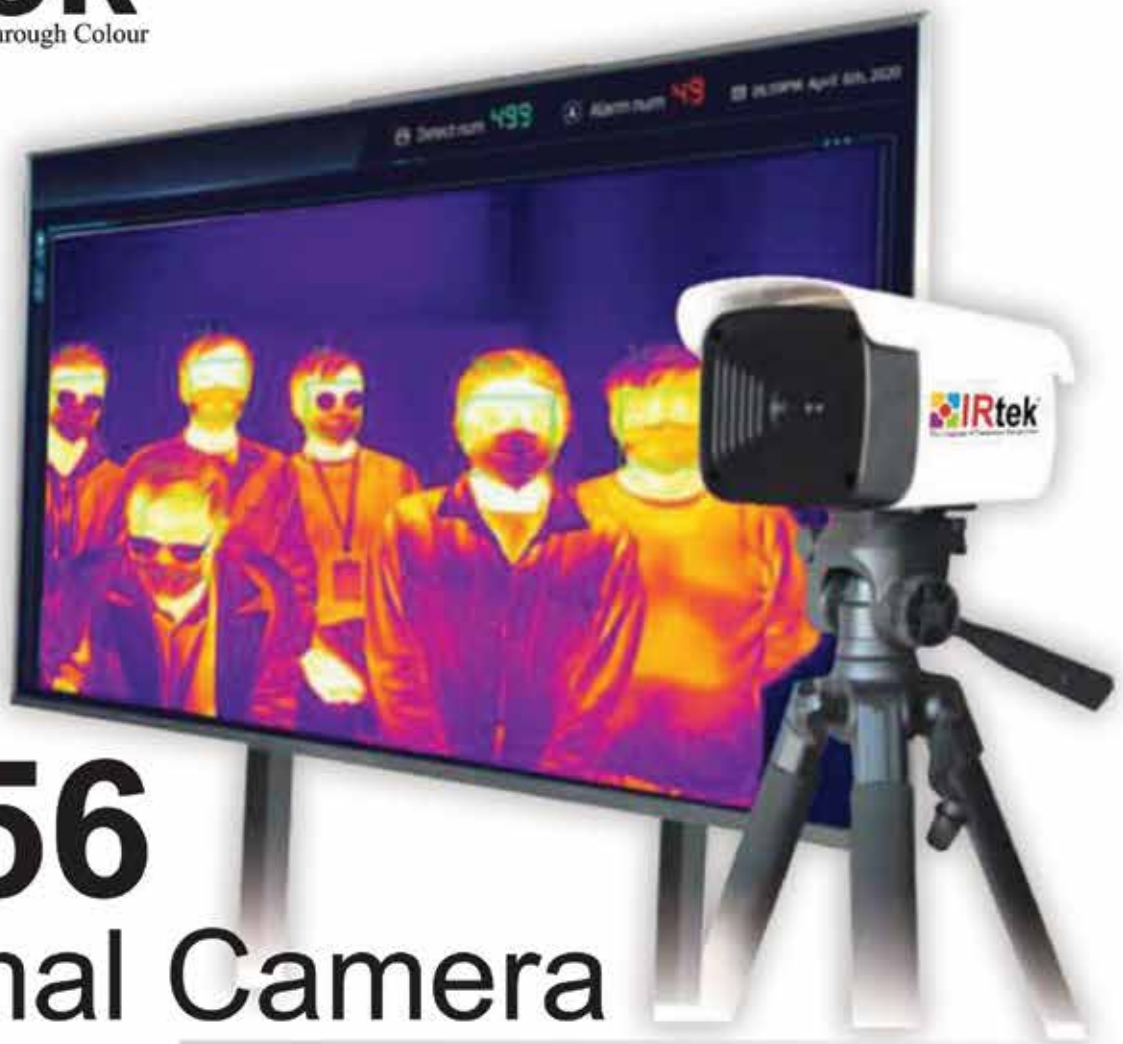

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Prognosis

Proceed with caution

In a defining sign of the times, the 73rd World Health Assembly was held virtually for the first time ever (it is expected to be reconvened later this year). Dr Tedros Adhanom Ghebreyesus, the WHO Director-General, opened the session with these wise words. "It's precisely because we want the fastest possible global recovery that we urge countries to proceed with caution," he said. "Countries that move too fast, without putting in place the public health architecture to detect and suppress transmission, run a real risk of handicapping their own recovery. The majority of the world's population remains susceptible to this virus. The risk remains high and we have a long road to travel." You can read an excerpt of his opening remarks in this issue.

Most of the content in this issue revolves around COVID-19. It is front and centre of healthcare, news media and peoples lives around the world. Although children appear to show significant resilience against COVID-19 there have been a number of reported cases of kids presenting with Kawasaki-like symptoms post infection. Read our report on this issue which is raising concern among some paediatricians. Also, there have been several cases of COVID-19-infected children presenting with a multisystem hyperinflammatory condition known in the US as Multisystem Inflammatory Syndrome in Children. We report on a paper published in *Radiology* that discusses this issue with a view to raising awareness of this emerging pattern in radiological image findings.

Scientific research of SARS-COV-2 continues apace. One study of interest, which covered a whole town in Italy, highlights the significance of asymptomatic people in the transmission of the virus. As well as identifying the proportion of asymptomatic cases, the researchers also found that asymptomatic people had a 'viral load' similar to symptomatic patients. You can read more about this in our COVID-19 Update.

A viable MERS vaccine may be not too far off. Middle East Respiratory Syndrome coronavirus (MERS-CoV) has been responsible for a number of deaths in the Middle East, with most cases occurring in Saudi Arabia. The latest research of the investigational vaccine ChAdOx1 MERS showed that the vaccine prevents MERS in rhesus macaque monkeys, marking a significant step forward in the ongoing research. Read more about these developments in this issue.

Take care and wear your mask in public.

Callan Emery
Editor
Callan@MiddleEastHealthMag.com

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Publisher
Michael Hurst
michael@middleeasthealthmag.com

Editor
Callan Emery
Callan@MiddleEastHealthMag.com

Editorial Consultants
Dr Gamal Hammad, Dr Peter Moore, Harry Brewer

Middle East Editorial Office
PO Box 72280, Dubai, UAE
Telephone: (+9714) 391 4775
Callan@MiddleEastHealthMag.com

Marketing Manager
Foehn Sarkar
Telephone: (+9714) 391 4775 ▮ Fax: (+9714) 391 4888
marketing@middleeasthealthmag.com

Subscription & Admin Manager
Savita Kapoor
Telephone: (+9714) 391 4775 ▮ Fax: (+9714) 391 4888
savita@middleeasthealthmag.com

Advertising Sales
PO Box 72280, Dubai, UAE
marketing@middleeasthealthmag.com

Americas, France
Joy Sarkar
P O Box 72280, Building No.2
2nd Floor, Dubai Media City
Dubai, United Arab Emirates
Tel: +971 4 391 4775 Fax: +971 4 391 4888
joy@middleeasthealthmag.com

Japan
Mr Katsuhiro Ishii
Ace Media Service Inc
12-6, 4-chome, Adachi-ku, Tokyo 121-0824, Japan
Tel: +81-3-5691-3335 ▮ Fax:+81-3-5691-3336
Email: *amskatsu@dream.com*

China
Miss Li Ying
Medic Time Development Ltd,
Flat 1907, Tower A, Haisong Building, Tairan 9th Road,
Futian District, Shenzhen, China 518048
Tel: +86-755-239 812 21 ▮ Fax: +86-755-239 812 33
Email: *medic8@medictime.com*

Taiwan
Larry Wang
Olympia Global Co Ltd
7F, No.35, Sec 3, Shenyang Rd, Taichung
Taiwan 40651 ▮ P O Box: 46-283 Taichung Taiwan 40799
Tel: +886- (4)-22429845 ▮ Fax:+886- (4)-23587689
Email: *media.news@msa.hinet.net*

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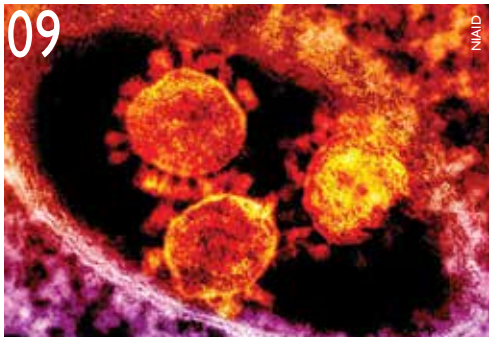

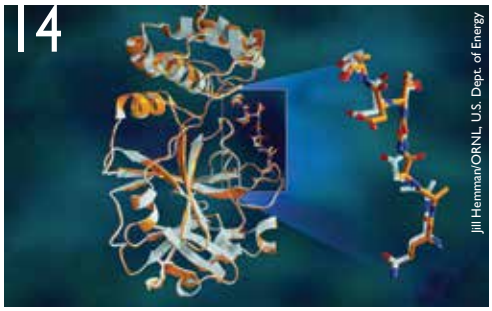

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Update from around the region

Spike in violence against healthcare amidst COVID-19 threatens millions in Afghanistan

The International Committee of the Red Cross (ICRC) has issued a call to protect medical facilities in Afghanistan following the recent rise in violence in the country combined with targeted attacks against healthcare facilities. The attacks threaten to reduce or prevent access to health services for millions of Afghans, which is now particularly crucial with the outbreak of COVID-19.

"After the hope brought by a relative reduction in hostilities in February and March, we again see more violence in Afghanistan. Civilian casualties are on the rise while the country is battling against COVID-19," said Juan Pedro Schaerer, the head of the ICRC delegation in Afghanistan.

The fight against COVID-19 needs commitments from all parties to the conflict, the ICRC says.

"We battle a worldwide enemy and need a country-wide agreement on how to address COVID-19," Scharer said. "As a start, full respect of international humanitarian law by all parties, without exception, is needed to protect civilians in Afghanistan."

Afghanistan, like many war-torn countries, has an overstretched health system that is challenged by limited coverage in conflict-affected areas, poor specialized healthcare and now the outbreak of COVID-19. Attacks against health staff or health facilities, such as the deadly assault in May against the MSF-supported maternity hospital in Kabul, exacerbate the situation

"COVID-19 has challenged the world's most advanced nations. A country where gunmen attack a hospital stands no chance at providing quality care. We see it in health facilities in conflict-affected areas and in prisons, where people have already limited access to health care," Schaerer said.

In Afghanistan's largest hospital, Mirwais Regional Hospital in Kandahar, which the ICRC has supported for over 20 years, the staff continue to provide obstetric care and surgery for people wounded in war. Due to an increase in COVID cases, the hospital now operates at a reduced capacity despite the near-usual rates of patients wounded in fighting and child deliveries.

Mirwais Regional Hospital is the only regional hospital servicing the approximately six million people in southern Afghanistan. Many of the patients, especially in the surgical ward, come from areas where fighting between the Taliban and government forces continues.

Worryingly, a substantial number of COVID cases in Afghanistan are health personnel, which puts more strain on the entire system.

To help reduce the spread of COVID-19 outbreak in Afghanistan, the ICRC together with the Red Cross and Red Crescent movement partners:

- Support the Kabul District Hospital of the Afghanistan Red Crescent Society (ARCS) with training, infection control, hygiene and patient care protocols, material equipment and the long-term infrastructure upgrade of electricity, water and sanitation, and waste management facilities.
- Provided 12 field hospitals and first responders with Personal Protective Equipment (PPE) including masks, gloves, hand sanitizer and advised on surgical recommendations for the staff to operate safely in a COVID-19 environment.
- In detention places, donated Personal Protective Equipment (PPE), contact-free thermometers, medical items and hygiene items such as chlorine, soap and detergents, and installed hand washing basins besides rebuilding and rehabilitated isolation rooms, and works to improve ventilation.
- Distributed hygiene items in seven Physical Rehabilitation Centers in Afghanistan to reinforce preventive measures against COVID where thousands of people with disabilities are assisted.

UAE employee survey shows majority concerned over how personal health data is used

David Healy - CEO EMEA - Aetna International

The majority of employees in the United Arab Emirates think businesses should provide more physical and mental health support through technology, with apps, wearables and online services high on the list of demands, according to new research published by Aetna International. However, there is also clear concern around the use of personal health data by employers on an individual basis, according to the global survey involving over 4,000 employees in the US, UK, UAE and Singapore.

Whether it is via smart watches, fitness trackers or applications, the study found that 75% of UAE employees believe their employer can help them manage physical health better through technology while 66% say the same of their mental health. Additionally, 75% believe access to physical health services (provided by their employer) through their phone would help them manage physical health better, while 64% said the same for mental health services.

However, the findings also highlight employee concerns around personal health

data being used by employers or shared with third parties. Of UAE employees surveyed, 66% worry it could one day be used as criteria for promotion and 67% believe it could be used as a means of establishing salary grade. Most employees surveyed had concerns about their employer sharing their personal health data with third parties (61%) or government agencies or institutions (64%).

David Healy, CEO – EMEA, Aetna International, said: "Technology has not only revolutionised how we collaborate, communicate and work, but also how organisations help support and improve employee health and well-being. Particularly in the current climate, high-tech, high-touch corporate well-being strategies that include apps, devices, and virtual access to care services are high on the list of employee demands. Businesses have a significant opportunity to embrace technology and innovation and fundamentally change their values, culture and approach to employee health.

"Of course, with more digital innovation, comes more data, and a greater need to alleviate employees' concerns about the use of their health data. Interestingly, our research shows that when data is used responsibly, many people are open to sharing anonymised health data. This suggests employees understand the powerful role technology can play in enabling and informing a business's strategies."

Circumstances where employees indicated they would willingly share their health data include helping to improve health and wellness benefits offered across the business (87%) and helping their business to offer more personalised health benefits (80%). The same number (80%) also said they would share personal health data if it helped to improve company culture, while 82% would do so to help improve workplace policies.

"All employers are responsible for the privacy and protection of their employees' health data, ensuring that individuals retain ownership and control. If handled correctly, it presents an incredible opportunity for employers to foster trust, and for all parties to help shape the corporate culture and approach to workforce health and well-being," said Healy. MEH

Healthworkers from Cleveland Clinic in the US visit Abu Dhabi to share best practice in treating Covid-19

A team of 40 frontline medical staff from Cleveland Clinic in the US, including nurses, physicians, and allied health professionals, arrived in Abu Dhabi early June to spend six weeks with the multidisciplinary team at Cleveland Clinic Abu Dhabi to share expertise and best practice around treating COVID-19 patients, as part of a global knowledge exchange.

While providing care for the most seriously ill COVID-19 patients, the caregivers will also share some of the key learnings from managing the disease in the USA, as well as receiving updates on the progress in testing and treatment being made in the UAE.

"This international health crisis requires a collaborative effort to share best practice and find the most effective treatments for COVID-19 patients. We are proud to be working with experts in the Department of Health – Abu Dhabi, SEHA and Mubadala in treating the disease in the UAE and we are grateful to be able to share some key learnings with colleagues from the global Cleveland Clinic network," says Dr. Rakesh Suri, Chief Executive Officer at Cleveland Clinic Abu Dhabi

Cleveland Clinic Abu Dhabi has been designated as a tier three hospital by the Department of Health – Abu Dhabi, to care for patients with the most severe symptoms. MEH

State-of-the-art inhaler and nasal spray testing laboratory opens at Dubai Science Park

Pharmax Pharmaceuticals and Cipla Limited have established the UAE's first state-of-the-art inhaler and nasal spray

testing laboratory at Dubai Science Park to increase the availability of asthma medication in the local and regional markets.

The launch of the pMDI (pressurised metered-dose inhaler) centre is in line with the directives of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, to build a post-COVID-19 economy focused on sectors such as healthcare and pharmaceutical manufacturing.

The cutting-edge centre will carry out sophisticated testing, providing the UAE and the wider region with access to locally-produced, high-quality medical products for respiratory diseases from Dubai Science Park.

With respiratory diseases considered among the 'big four' health burdens in the UAE that have been exacerbated by the onset of COVID-19, the exclusive partnership is timely and relevant.

The UAE Ministry of Health and Prevention awarded the fully equipped pMDI laboratory the Good Manufacturing Practice approval that enables both companies to commence testing immediately.

Under the agreement, Cipla will transfer its expertise in the respiratory disease space to Pharmax Pharmaceuticals. The companies will jointly work to launch respules that can be used to treat asthma and other respiratory diseases. MEH

Patient video calling services introduced at Al Ain Hospital to boost well-being

Al Ain Hospital in in the UAE has introduced video-calling technology services for patients to enable them communicate with family members, boosting their morale during their hospital stay.

This announcement is aligned with the Department of Health – Abu Dhabi and Al Ain Hospital's mission to provide holistic support, enabling patients to improve their psychological wellbeing, which has a direct impact on their treatment journeys and physical condition.

Mohammed Salem Thaaloub Alderei, Chief Operating Officer, Al Ain Hospital, Al Ain Hospital, said: "With patient experience and comfort our top priority, we are committed to providing a unique model of care with a truly integrated approach that focuses on both medical and psychological wellbeing. From the moment a patient walks through our doors, we are committed to providing a holistic experience to ensure they are fully supported throughout their treatment journey."

Abdulla Gharib Al Darmaki, Patient Experience Director, Al Ain Hospital, said: "We have introduced a new unit that comprises of members from the Patient Affairs and clinical teams, who are responsible for ensuring ICU patients have access to an easy and consistent method of remotely communicating with their family members. Not only does this provide patients with a large morale boost, it also allows the patients' medical teams to focus solely on the patients' physical needs and wellbeing."

Prior to the COVID-19 pandemic, Al Ain hospital staff joined lectures and workshops aimed at developing their expertise in dealing with senior patients, particularly from a psychological wellbeing standpoint, the results of which are beneficial today, allowing the facility to ensure that all patients are provided with 360-degree care.

The launch of these new services further position Al Ain as a fully-integrated medical facility that adheres to best-practice in HealthTech and advanced treatment methods, providing the community in Al Ain City and its surrounding areas medical services that meet and exceed world-class standards and benchmarks. MEH

Mediclinic Middle East launches robotic surgery programme

Mediclinic Middle East has implemented a robotic surgery programme at Mediclinic City Hospital, Dubai, using the da Vinci Xi HD 4 arm robotic system, one of the most sophisticated laparoscopic surgical technologies available. This programme will complement and enhance its current comprehensive general surgery and laparoscopic surgery services, and will offer the service to patients from across the UAE and wider MENA region.

Da Vinci robotic surgery is a state-of-the-art surgical procedure in which the conventional laparoscopic technique is combined with high precision robotic technology using four robotic arms which are expertly commanded by the surgeon from the surgical console using a 3D high-definition view of the surgical area. Articulated instruments allow the same movement capacity as the human wrist and the tremor filter eliminates any small uncontrollable movement in the surgeon's hands. Minimally invasive surgery with da Vinci is widely used in urology and gynaecology procedures, as well as a number of other procedures.

Globally, Mediclinic already has extensive experience in robotic surgery using the da Vinci robotic system, with the technology in place since 2005 in Hirslanden, Mediclinic Middle East's sister division in Switzerland, where they have carried out over 1,000 da Vinci

robotic interventions. Robotic surgery has also been in use at Mediclinic Southern Africa since 2014.

Mediclinic City Hospital was selected as the hub for Mediclinic Middle East's robotic programme because it is already a market leader in the provision of advanced laparoscopic surgery across a number of specialities. The introduction of robotics is a logical fit with the existing clinical capabilities of the hospital, specifically in General Surgery, Gynaecology and Urology. As a leading tertiary care facility, it has an established programme infrastructure to support a surgical robot and has recruited a cohort of consultants, highly experience in performing robotic surgery.

Mediclinic City Hospital was also the first hospital in the UAE to offer robotic-assisted total/partial knee replacement surgery and has quickly built a strong reputation in this area, demonstrating the ability of the hospital to adopt new technologies and deliver measurable benefits.

The benefits of robotic surgery include less postoperative discomfort, smaller incisions with less damaged tissue, fewer scars and lower risk of bleeding and infections. The patient is able to return to their daily activities quickly and safely, with a shorter hospital stay and recovery time. MEH

ChAdOx1 MERS vaccine shows promising results

An investigational vaccine called ChAdOx1 MERS protected two groups of rhesus macaques from disease caused by Middle East respiratory syndrome coronavirus (MERS-CoV). This latest research of the MERS vaccine offers hope that we may be close to having a viable vaccine against MERS which has caused numerous deaths in the Middle East.

MERS-CoV is a relative of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19).

US National Institutes of Health scientists and colleagues are pursuing similar studies with ChAdOx1 SARS2, a vaccine candidate against SARS-CoV-2.

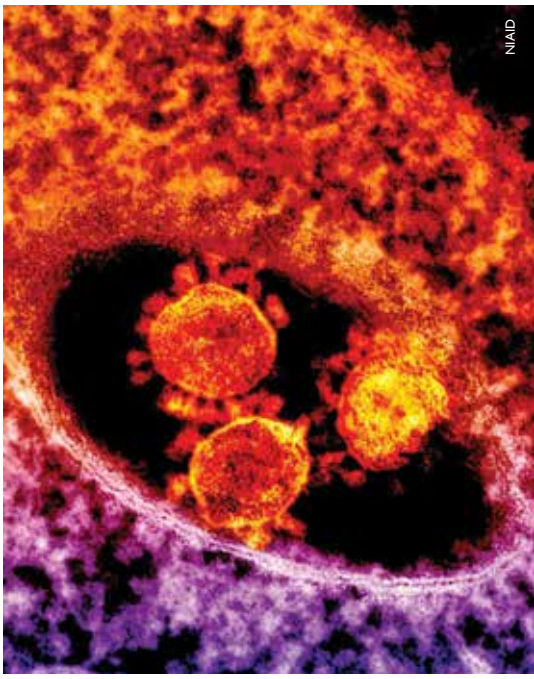
The researchers note that ChAdOx1 vaccines can be produced rapidly, have been shown to be safe in human patients. They suggest that the ChAdOx1 platform is ideal for the development of vaccines against novel emerging coronaviruses, such as SARS-CoV-2.

The findings of the ChAdOx1 MERS are published 10 June 2020 in the journal *Science Advances* – **doi:** 10.1126/sciadv.aba8399.

The researchers note that the clinical spectrum of MERS-CoV infection in humans varies from asymptomatic to severe respiratory disease and death. Patients present with influenza-like symptoms such as a fever and shortness of breath. Thereafter, they may develop pneumonia, which can require mechanical ventilation and support in an intensive care unit. Human-to-human transmission of MERS-CoV is relatively limited and occurs mainly in nosocomial settings but has been reported in local communities as well.

Human cases of MERS-CoV were first reported in Saudi Arabia in 2012; dromedary camels are also infected with the virus and likely transmit it to people. Through January 2020, the World Health Organization had received reports of 2,519 MERS-CoV cases and 866 deaths in 27 countries. It is mainly prevalent in the Arabian Peninsula, with the majority of cases (84%) occurring in Saudi Arabia.

ChAdOx1 MERS, which uses a replication-deficient chimpanzee adenovirus to deliver a MERS-CoV protein in recipients, also worked against six different strains of MERS-CoV when tested in mice as a single vaccination. Scientists from NIH's National Institute of Allergy and Infectious Diseases (NIAID) led the project. Collaborators work at the University of Oxford in the United Kingdom; researchers at the University of Oxford Jenner Institute developed the ChAdOx1 vaccine technology.


NIAID

Colourised transmission electron micrograph showing particles of the Middle East Respiratory Syndrome Coronavirus that emerged in 2012.

Macaque study

In the macaque study, one group of animals was vaccinated 28 days prior to infection; the other group received two vaccinations – a prime-boost strategy – 56 and 28 days prior to infection. A third group of monkeys served as controls. The researchers report that none of the animals in the two treatment groups developed signs of MERS-CoV disease. The prime-boost group clearly had less virus in lung tissue compared to the control group and no evidence of replicating virus, while the prime-only group showed much less virus in tissue than the control group. Both treatment groups showed no lung damage and were protected from disease, unlike the control animals.

The scientists' MERS-CoV macaque study follows earlier studies of the experimental vaccine in mice. They also have successfully tested the vaccine platform against Nipah virus in hamsters and against Lassa virus in guinea pigs; they next plan to expedite testing a vaccine candidate against SARS-CoV-2.

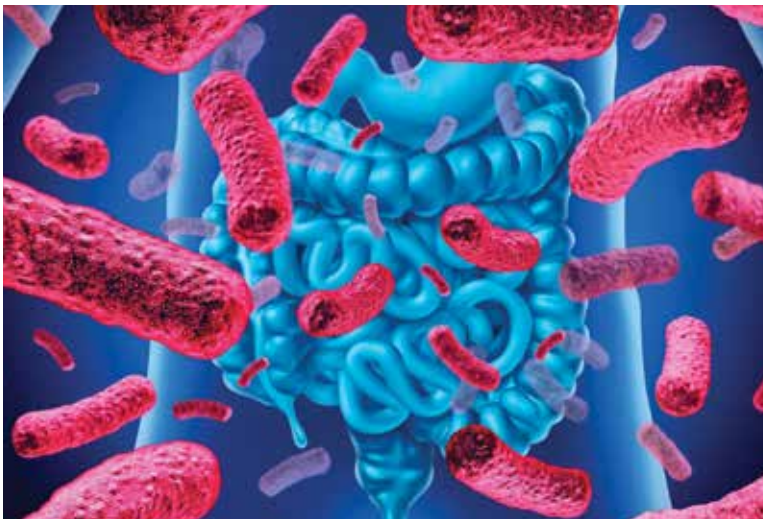
The MERS vaccine is being studied in Phase 1 human clinical trials in the United Kingdom and Saudi Arabia. The same chimpanzee adenovirus vaccine platform also is being assessed for malaria, HIV, influenza, hepatitis C, tuberculosis and Ebola.

The researchers write: We recently demonstrated that vaccination of mice with a replication-deficient simian adenovirus vaccine vector (ChAdOx1) encoding full-length MERS-CoV S protein (ChAdOx1 MERS) elicited high-titer MERS-CoV-neutralizing antibodies and a robust CD8+ T cell response against the S protein. In addition, ChAdOx1 MERS vaccination resulted in full protection of human dipeptidyl peptidase 4 (hDPP4) transgenic mice against a lethal challenge with MERS-CoV. ChAdOx1 MERS vaccination of dromedary camels was immunogenic and reduced MERS-CoV shedding after challenge in a highly stringent natural transmission model with multiday exposure to infectious MERS-CoV. ChAd-vectored vaccines against malaria, HIV, influenza, hepatitis C, tuberculosis , Ebola, and others show an excellent immunogenicity and safety profile in humans. In the current manuscript, we show that a single dose of ChAdOx1 MERS vaccine protects rhesus macaque model against a mucosal challenge with HCoV-EMC/2012. Serum obtained from vaccinated rhesus macaques was able to neutralize six diverse MERS-CoV strains. Furthermore, a single dose of ChAdOx1 MERS vaccine protects hDPP4 transgenic mice against all evaluated MERS-CoV strains.

- **doi:** 10.1126/sciadv.aba8399

the laboratory

Medical research news from around the world



Pioneering research reveals relationship between genes and gut bacteria

The role genetics and gut bacteria play in human health has long been a fruitful source of scientific enquiry, but new research marks a significant step forward in unravelling this complex relationship. Its findings could transform our understanding and treatment of all manner of common diseases, including obesity, irritable bowel syndrome, and Alzheimer's disease.

The international study, led by the University of Bristol and published 22 June in *Nature Microbiology*, found specific changes in DNA affected both the existence and amount of particular bacteria in the gut.

Lead author Dr David Hughes, Senior Research Associate in Applied Genetic Epidemiology, said: "Our findings represent a significant breakthrough in understanding how genetic variation affects gut bacteria. Moreover, it marks major progress in our ability to know whether changes in our gut bacteria actually cause, or are a consequence of, human disease."

The human body comprises various unique ecosystems, each of which is populated by a vast and diverse array of microorganisms. They include millions of bacteria in the gut, known as the microbiome, that help digest food and produce molecules essential for life, which we cannot produce ourselves. This has prompted researchers to question if gut bacteria may also directly influence human health and disease.

Previous research has identified numerous genetic changes apparently related to bacterial composition in the gut, but only one such association has been observed consistently. This example involves a well-known single mutation that changes whether someone can digest the sugar (lactose) in fresh milk. The same genetic variation also predicts the prevalence of bacteria, Bifidobacterium, that uses or digests lactose as an energy source.

This study, the biggest of its kind, identified 13 DNA changes related to changes in the presence or quantity of gut bacteria. Researchers at Bristol worked with Katholieke Universiteit Leuven and Christian-Albrecht University of Kiel to analyse data from 3,890 individuals from three different population studies: one in Belgium (the Flemish Gut Flora Project) and two in Germany (Food Chain Plus and PopGen). In each individual, the researchers measured millions of known DNA changes and, by sampling their faeces, also registered the presence and abundance of hundreds of gut bacteria.

Dr Hughes said: "It was exciting to identify new and robust signals across the three study populations, which makes the correlation of genetic variation and gut bacteria much more striking and compelling. Now comes the great challenge of confirming our observations with other studies and dissecting how exactly these DNA changes might impact bacterial composition."

Such investigations could hold the key to unlocking the intricate biological mechanisms behind some of the biggest health challenges of our time.

Study co-author Dr Kaitlin Wade, Lecturer in Epidemiology at the University of Bristol, said: "A strength here is that these findings provide a groundwork for causal analyses to determine, for instance, whether the presence of specific bacteria increases the risk of a disease or is a manifestation of it."

"The implications for our understanding of human health and our approach to medicine are far-reaching and potentially game changing."

- **doi:** *https://doi.org/10.1038/s41564-020-0743-8*

New treatment offers hope for cure for thalassemia

The medication luspatercept-aamt (generic name) will reduce the need for blood transfusions in thalassemia patients, and significantly improve bone-marrow transplant outcomes, meaning there is a cure for almost any patient, according to an expert from top US hospital Cleveland Clinic.

Thalassemia is a debilitating and potentially fatal genetic disease where the body makes an abnormal form or inadequate amount of haemoglobin – the protein in red blood cells that carries oxygen – and patients need frequent blood transfusions. It is the most common inherited single-gene disorder in the world and occurs most frequently in people from the Middle East, Mediterranean countries, North Africa, India, Central Asia, and Southeast Asia.

Rabi Hanna M.D., Director of Pediatric Blood & Marrow Transplants at Cleveland Clinic Children's, says: "We are excited about the new drug, which was approved by the FDA towards the end of last year, as it is the first medication to treat thalas-

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semia directly. It can help reduce the need for blood transfusions and improve patients' symptoms. Consequently, it reduces the risk of blood transfusion reactions, as well as the risk of iron overload, which can damage organs such as the heart and liver in the long term."

The new drug is a first-in-class medication that enhances erythroid (red blood cell) maturation and reduces the blood transfusion burden, and is given in the form of an injection every three weeks. According to Dr. Hanna, a clinical trial called BELIEVE has shown that it can reduce the need for blood transfusions by up to 50% in some patients.

He adds that while the drug is not in itself a cure, it can enhance outcomes in curative bone marrow transplantations, which have also become more widely accessible in recent years thanks to a new transplant approach. Dr. Hanna was among the pioneers of the haplo-identical bone marrow transplant that allows for non-identical-HLA (human leukocyte antigen) donors, and which he performed successfully on a young Emirati patient in 2016.

He explains that the reduction in blood transfusions means the patient has better health prior to the procedure, and also has fewer antibodies that could potentially attack transplanted bone marrow.

"Between the improved overall pre-transplant health from taking the medication, and the new approach we take to bone-marrow transplants, almost any patient can be cured," he says.

Whereas previously only 25% of thalassemia patients could find a match for bone marrow donation, with the newer method, the donated cells only need to match half of the recipient's important genes. This has broadened the scope of possible donors tremendously so that almost every child or young adult will have a suitable donor, such as a parent, half-sibling or other relative.

In addition, the approach uses a reduced-intensity conditioning and post-operative protocol. Patients receive low doses of chemotherapy and immuno-suppressant medication before and after the transplant, and the risks and side effects of the operation are minimal.

Among the first patients to receive the newer type of transplant was Dubai-based Emirati Hussein Alblooshi, with the assistance of the UAE Government and Cleveland Clinic's Global Patient Services team. Around 8.5% of Emiratis are believed to be carriers of thalassemia genes.

The operation was performed by Dr. Hanna and his team at Cleveland Clinic in the United States, with bone marrow donated by Ablooshi's brother, Suhail.

The transplant successfully cured Ablooshi's thalassemia and he no longer takes medication and does not need any blood transfusions. Now 18 and a student at a Dubai college, he is keen to spread awareness about the cure, having visited a thalassemia centre in Dubai earlier this year to talk to patients about the procedure and what it entails.

"I want to spread the message of hope that there is a cure to all of those going through what I went through – constant tiredness, painful blood transfusions, waking up at night to take medication, and all the other disruptive effects. I live a completely normal life now, and want to let others know they can too," he says.

Dr. Hanna adds: "It has been wonderful to keep in touch with Hussein and his family and hear about his progress and his advocacy. He had the procedure a few years ago, before the new medication was approved by the FDA, so the treatment journey is even better for patients now."

Scientists decode how our brains perceive odours

In experiments in mice, NYU Grossman School of Medicine researchers have for the first time created an electrical signature that is perceived as an odour in the brain's smell-processing centre, the olfactory bulb, even though the odour does not exist.

Because the odour-simulating signal was manmade, researchers could manipulate the timing and order of related nerve signalling and identify which changes were most important to the ability of mice to accurately identify the synthetic smell.

"Decoding how the brain tells apart odours is complicated, in part, because unlike with other senses such as vision, we do not yet know the most important aspects of individual smells," says study lead investigator Edmund Chong, MS, a doctoral student at NYU Langone Health. "In facial recognition, for example, the brain can recognize people based on visual cues, such as the eyes, even without seeing someone's nose and ears," says Chong. "But these distinguishing features, as recorded by the brain, have yet to be found for each smell."

The current study results, published online in the journal *Science* on June 18, centre on the olfactory bulb, which is behind the nose in animals and humans. Past studies have shown that airborne molecules linked to scents trigger receptor cells lining the nose to send electric signals to nerve-ending bundles in the bulb called glomeruli, and then to brain cells (neurons).

The timing and order of glomeruli activation is known to be unique to each smell, researchers say, with signals then transmitted to the brain's cortex, which controls how an animal perceives, reacts to, and remembers a smell. But because scents can vary over time and mingle with others, scientists have until now struggled to precisely track a single smell signature across several types of neurons.

For the new study, the researchers designed experiments based on the availability of mice genetically engineered by another lab so that their brain cells could be activated by shining light on them – a technique called optogenetics. Next they trained the mice to recognize a signal generated by light activation of six glomeruli – known to resemble a pattern evoked by an odour – by giving them a water reward only when they perceived the correct "odour" and pushed a lever.

If mice pushed the lever after activation of a different set of glomeruli (simulation

of a different odour), they received no water. Using this model, the researchers changed the timing and mix of activated glomeruli, noting how each change impacted a mouse's perception as reflected in a behaviour: the accuracy with which it acted on the synthetic odour signal to get the reward.

Specifically, researchers found that changing which of the glomeruli within each odour-defining set were activated first led to as much as a 30 percent drop in the ability of a mouse to correctly sense an odour signal and obtain water. Changes in the last glomeruli in each set came with as little as a 5 percent decrease in accurate odour sensing.

The timing of the glomeruli activations worked together "like the notes in a melody," say the researchers, with delays or interruptions in the early "notes" degrading accuracy. Tight control in their model over when, how many, and which receptors and glomeruli were activated in the mice enabled the team to sift through many variables and identify which odour features stood out.

"Now that we have a model for breaking down the timing and order of glomeruli activation, we can examine the minimum number and kind of receptors needed by the olfactory bulb to identify a particular smell," says study senior investigator and neurobiologist Dmitry Rinberg, PhD.

Dr. Rinberg, an associate professor in NYU Langone's Department of Neuroscience and Physiology and member of its Neuroscience Institute, says the human nose is known to have some 350 different kinds of odour receptors, while mice, whose sense of smell is far more specialized, have more than 1,200.

"Our results identify for the first time a code for how the brain converts sensory information into perception of something, in this case an odour," adds Dr. Rinberg. "This puts us closer to answering the longstanding question in our field of how the brain extracts sensory information to evoke behaviour."

In addition to Chong and Dr. Rinberg, other NYU Langone researchers involved in this study are Christopher Wilson, PhD, and Shy Shoham, PhD. Other study co-investigators are Monica Moroni, PhD, and Stefano Panzeri, PhD, at the Istituto Italiano di Tecnologia in Rovereto, Italy.

- doi: 10.1126/science.aba2357

Major international study discovers three potential new targets for treating epilepsy

A major international study has uncovered three molecules that have the potential to be developed into new drugs to treat epilepsy.

The findings are an important step towards discovering new drugs for people with epilepsy whose seizures cannot be controlled with current treatments.

The study was led by researchers at FutureNeuro, the SFI Research Centre for Chronic and Rare Neurological Diseases and RCSI University of Medicine and Health Sciences. It is the result of seven years of research, involving contributions from 35 scientists, based in eight different European countries, across the fields of neuroscience, genetics, computer science and synthetic chemistry. The research was published 24 June 2020 in *Proceedings of the National Academy of Sciences* (PNAS) USA.

In one of the largest sequencing projects of its kind, researchers identified and measured levels of over a billion strands of microRNAs – small molecules that control gene activity in the brain – to investigate if they were changed in epilepsy. They discovered a small set of microRNAs which were always elevated in epilepsy and designed drug-like molecules, synthesized by chemists from the group, to target these. Three of the synthetic molecules were found to stop seizures in preclinical tests.

Computer simulations demonstrated how the potential treatments influenced molecule networks inside brain cells by changing the inflammatory response, part of the brain's immune system which is thought to contribute to seizures.

"Our approach to drug discovery has led us to new types of molecules that can be targeted to prevent seizures with hopefully fewer side effects," said Dr Cristina Reschke, FutureNeuro Research Fellow and Honorary Lecturer at RCSI, and Co-Lead Author. "Currently, most drugs used to treat epilepsy work by blocking the signals brain cells use to communicate. This results in many of the side effects experienced by people with epilepsy."

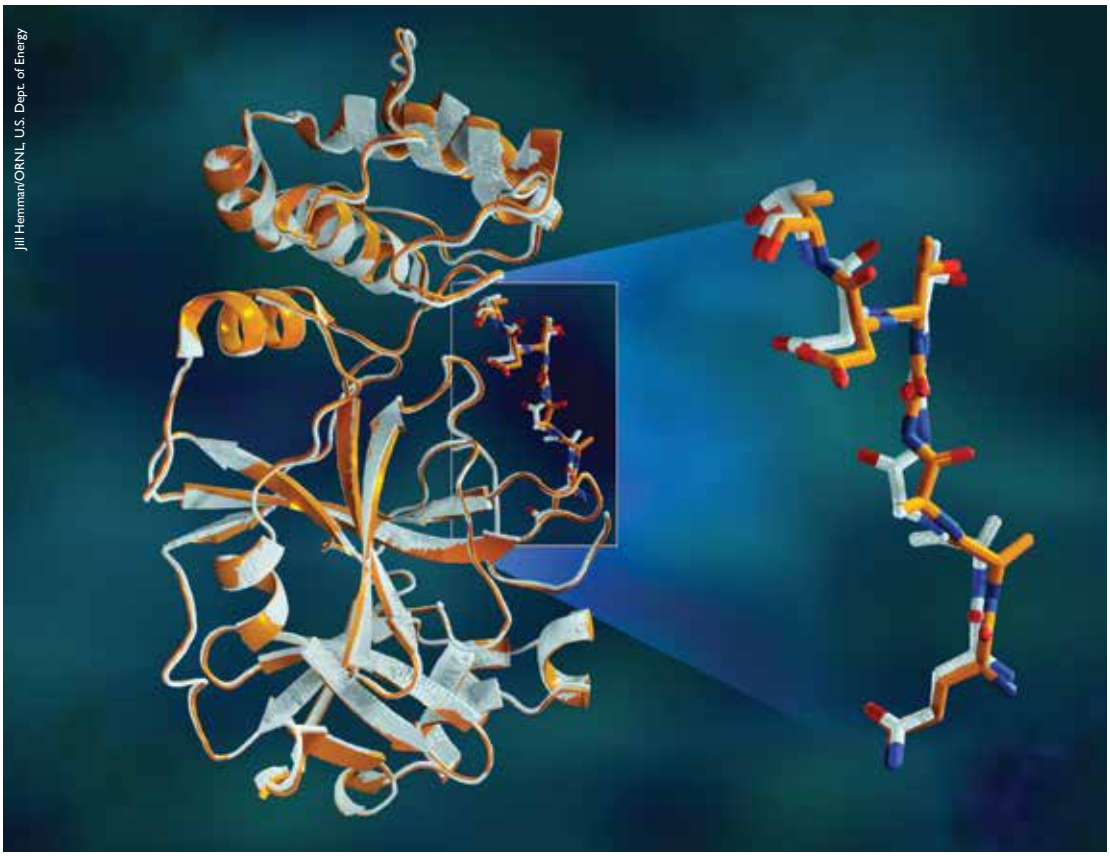
Epilepsy is one of the most-common chronic brain diseases, affecting some 65 million people worldwide. People with epilepsy are prone to repeated seizures, but for the majority of people, these can be well controlled. There are more than 20 medicines available to prevent seizures in people with epilepsy, but progress has slowed in recent years and new treatments offer little benefit over those that have been around for decades.

"By characterising and targeting an entire new class of molecules in epilepsy, we hope to develop novel and innovative treatment strategies for temporal lobe epilepsy," said Dr Gareth Morris, Marie Sklodowska-Curie Actions Fellow at FutureNeuro and Co-Lead Author of the paper. "This is an important step closer to fulfilling the urgent and unmet clinical needs for the one-third of people whose seizures are resistant to currently available drugs."

Senior author on the study, Professor David Henshall, Director of FutureNeuro and Professor of Molecular Physiology and Neuroscience at RCSI, said: "The project is a great example of team science, where groups with different areas of expertise combine to create innovative solutions that keep people with epilepsy as the central focus. The discoveries here may be just the tip of the iceberg for new strategies in the treatment of epilepsy. I'm optimistic this can be translated to the clinic."

The work began under EpimiRNA, an RCSI-led pan-European project, funded through the EU Seventh Framework Programme and concluded in FutureNeuro which is funded by Science Foundation Ireland.

- doi: *https://doi.org/10.1073/pnas.1919313117*



Overlapping X-ray data of the SARS-CoV-2 main protease shows structural differences between the protein at room temperature (orange) and the cryogenically frozen structure (white).

X-rays size up protein structure at the 'heart' of COVID-19 virus

A team of researchers at the Department of Energy's Oak Ridge and Argonne national laboratories has performed the first room-temperature X-ray measurements on the SARS-CoV-2 main protease – the enzyme that enables the virus to reproduce.

The X-ray measurements mark an important first step in the researchers' ultimate goal of building a comprehensive 3D model of the enzymatic protein. The model will be used to advance supercomputing simulations aimed at finding drug inhibitors to block the virus's replication mechanism and help end the COVID-19 pandemic. Their research results are publicly available <*https://www.rcsb.org/structure/6WQF*> and have been published in the journal *Nature Communications*.

SARS-CoV-2 is the virus that causes the disease COVID-19. The virus reproduces by expressing long chains of proteins that must be cut into smaller lengths by the protease enzyme.

"The protease is indispensable for the virus life-cycle. The protein is shaped like a valentine's heart, but it really is the heart of the virus that allows it to replicate and spread. If you inhibit the protease and stop the heart, the virus cannot produce the proteins that are essential for its replication. That's why the protease is considered such an important drug target," said ORNL's Andrey Kovalevsky, corresponding author. While the structure is known from cryogenically preserved crystals, "This is the first time the structure of this enzyme has been measured at room temperature, which is significant because it's near the physiological temperature where the cells operate."

Complete model

Building a complete model of the protein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structure requires identifying each element within the structure and how they are arranged. X-rays are ideal for detecting heavy elements such as carbon, nitrogen and oxygen atoms. Because of the intensity of the X-ray beams at most large-scale synchrotron facilities, biological samples typically must be cryogenically frozen to around 100 K, or approximately minus 280 degrees Fahrenheit, to withstand the radiation long enough for data to be collected.

To extend the lifetime of the crystallized protein samples and measure them at room temperature, ORNL researchers grew crystals larger than required for synchrotron cryo-studies and used an in-house X-ray machine that features a less intense beam.

"Growing protein crystals and collecting data is a tedious and time-consuming process. In the time it typically takes to prepare and ship the sample to a synchrotron, we were able to grow the crystals, take the measurements and begin analyzing the data," said ORNL's Daniel Kneller, the study's first author. "And, when there's a pandemic with many scientists mobilizing to study this problem, there's not a day to spare."

The protease enzyme consists of chains of amino acids with a repeating pattern of nitrogen-carbon-carbon atoms that form the backbone of the protein. Side groups of the amino acid building blocks, or "residues", extend from each of the central backbone carbon atoms. The enzyme is folded into a specific 3D shape, creating special pockets where a drug molecule would attach.

The study revealed significant structural disparities between the orientations of the backbone and some of the residues in the room-temperature and cryogenic samples. The research suggests that freezing the crystals may introduce structural artifacts that could result in a less accurate understanding of the protease structure.

The team's results are being shared with researchers, led by ORNL-University of Tennessee Governor's Chair Jeremy Smith, who are conducting drug docking simulations using Summit at ORNL – the US's fastest supercomputer.

"What researchers are doing on Summit is taking known drug compounds and trying to computationally bind them to the main protease for drug repurposing, as well as looking for new leads into other potential drug candidates," said ORNL corresponding author Leighton Coates. "Our room temperature data is being used to build a more accurate model for those simulations and improve drug design activities."

The researchers' next step in completing the 3D model of the SARS-CoV-2 main protease is to use neutron scattering at ORNL's High Flux Isotope Reactor and the Spallation Neutron Source. Neutrons are essential in locating the hydrogen atoms, which play a critical role in many of the catalytic functions and drug design efforts. MEH

• doi: https://doi.org/10.1038/s41467-020-16954-7

Countries with early adoption of face masks showed modest COVID-19 infection rates

Regions with an early interest in face masks had milder COVID-19 epidemics, according to a new letter-to-the-editor published in the *American Journal of Respiratory and Critical Care Medicine*.

In "COVID-19 and Public Interest in Face Mask Use," <https://www.atsjournals.org/doi/pdf/10.1164/rccm.202004-1188LE> researchers from the Chinese University of Hong Kong shared findings from their analysis of how public interest in face masks may have affected the severity of COVID-19 epidemics and potentially contained the outbreak in 42 countries in 6 continents.

The authors noted that "In many Asian countries like China and Japan, the use of face masks in this pandemic is ubiquitous and is considered as a hygiene etiquette, whereas in many western countries, its use in the public is less common."

There was a clear negative correlation between the awareness or general acceptance of wearing a face mask and its infection rates. "One classic example is seen in Hong Kong," said Sunny Wong, MD, associate professor, Department of Medicine and Therapeutics, The Chinese University of Hong Kong.

"Despite [Hong Kong's] proximity to mainland China, its infection rate of COVID-19 is generally modest with only 1,110 cases to-date. This correlates with an almost ubiquitous use of face masks in the city (up to 98.8 percent by respondents in a survey). Similar patterns are seen in other Asian areas, such as Taiwan, Thailand and Malaysia. To date, there are more than two million cases in the U.S. and more than one million cases in Brazil.

While, the authors acknowledge that face masks are seen as important in slowing the rise of COVID-19 infections, it is difficult to assess whether it is more effective than handwashing or social distancing alone.

As cities in the U.S. and elsewhere put re-opening plans into effect, Dr. Wong said the use of face masks should be encouraged: "Face masks can help slow the spread of COVID-19, and have a relatively low cost compared to the health resources and death toll associated with the pandemic".

He added: "We believe that face mask use, handwashing and social distancing are all important components of the non-pharmaceutical measures against COVID-19." MEH

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Identification of genetic basis of Covid-19 susceptibility will aid treatment and prevention

The clinical presentation of Covid-19 varies from patient to patient and understanding individual genetic susceptibility to the disease is therefore vital to prognosis, prevention, and the development of new treatments. For the first time, Italian scientists have been able to identify the genetic and molecular basis of this susceptibility to infection as well as to the possibility of contracting a more severe form of the disease. The research was presented at the 53rd annual conference of the European Society of Human Genetics, held online early June.

Professor Alessandra Renieri, Director of the Medical Genetics Unit at the University Hospital of Siena, Italy, described her team's GEN-COVID project to collect genomic samples from Covid patients across the whole of Italy in order to try to identify the genetic basis of the high level of clinical variability they showed. Using whole exome sequencing (WES) to study the first data from 130 Covid patients from Siena and other Tuscan institutions, they were able to uncover a number of common susceptibility genes that were linked to a favourable or unfavourable outcome of infection.

"We believe that variations in these genes may determine disease progression," says Prof Renieri. "To our knowledge, this is the first report on the results of WES in Covid-19."

Searching for common genes in affected patients against a control group did not give statistically significant results with the exception of a few genes. So the researchers decided to treat each patient as an independent case, following the example of autism spectrum disorder. "In this way we were able to identify for each patient an average of three pathogenic mutations involved in susceptibility to Covid infection," says Prof Renieri. "This result was not unexpected, since we already knew from studies of twins that Covid-19 has a strong genetic basis."

Although presentation of Covid is different in each individual, this does not rule out the possibility of the same treatment being effective in many cases. "The model we are proposing includes common genes and our results point to some of them. For example, ACE2 remains one of the major targets. All our Covid patients have an intact ACE2 protein, and the biological pathway involving this gene remains a major focus for drug development," says Prof Renieri. ACE2 is an enzyme attached to the outer surface of several organs, including the lungs, that lowers blood pressure. It serves as an entry point for some coronaviruses, including SARS-COV-2.

These results will have significant implications for health and healthcare policy. Understanding the genetic profile of patients may allow the repurposing of existing medicines for specific therapeutic approaches against Covid-19 as well as speeding the development of new antiviral drugs. Being able to identify patients susceptible to severe pneumonia and their responsiveness to specific drugs will allow rapid public health treatment interventions. Future research will be aided, too, by the development of a Covid Biobank accessible to academic and industry partners.

The researchers plan to analyse a further 2000 samples from other Italian regions, specifically from 35 Italian hospitals belonging to the GEN-COVID project.

"Our data, although preliminary, are promising, and now we plan to validate them in a wider population," says Prof Renieri. "Going beyond our specific results, the outcome of our study underlines the need for a new method to fully assess the basis of one of the more complex genetic traits, with an environmental causation (the virus), but a high rate of heritability. We need to develop new mathematical models using artificial intelligence in order to be able to understand the complexity of this trait, which is derived from a combination of common and rare genetic factors.

> We were able to identify for each patient an average of three pathogenic mutations involved in susceptibility to Covid infection.

"We have developed this approach in collaboration with the Siena Artificial Intelligence Lab, and now intend to compare it with classical genome-wide association studies in the context of the Covid-19 Host Genetics Initiative, which brings together the human genetics community to generate, share, and analyse data to learn the genetic determinants of COVID-19 susceptibility, severity, and outcomes. As a research community, we need to do everything we can to help public health interventions move forward at this time."

on the WEB GEN-COVID project
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Professor Stefano Merigliano testing a child.

Whole-town study of COVID-19 transmission reveals importance of asymptomatic cases

The authors of the new research, from the University of Padova and at Imperial College London, published 30 June in Nature, suggest asymptomatic or pre-symptomatic people are an important factor in the transmission of COVID-19. They also argue that widespread testing, isolating infected people, and a community lockdown effectively stopped the outbreak in its tracks.

The town of Vò, with a population of nearly 3,200 people, experienced Italy's first COVID-19 death on 21 February 2020. The town was put into immediate quarantine for 14 days. During this time, researchers tested most of the population for infection of SARS-CoV-2, the virus that causes COVID-19, both at the start of the lockdown (86 percent tested) and after two weeks (72 percent tested).

The testing revealed that at the start of the lockdown, 2.6 percent of the population (73 people) were positive for SARS-CoV-2, while after a couple of weeks only 1.2 percent (29 people) were positive. At both times, around 40 percent of the positive cases showed no symptoms (asymptomatic). The results also show it took on average 9.3 days (range of 8-14 days) for the virus to be cleared from someone's body.

None of the children under 10 years old in the study tested positive for COVID-19, despite several living with infected family members. This is in contrast to adults living with infected people, who were very likely to test positive.

As a result of the mass testing any positive cases, symptomatic or not, were quarantined, slowing the spread of the disease and effectively suppressing it in only a few short weeks.

Suppressing transmission

Co-lead researcher Professor Andrea Crisanti, from the Department of Molecular Medicine of the University of Padua and the Department of Life Sciences at Imperial, said: "Our research shows that testing of all citizens, whether or not they have symptoms, provides a way to manage the spread of disease and prevent outbreaks getting out of hand. Despite 'silent' and widespread transmission, the disease can be controlled."

The results of the mass testing programme in Vò informed policy in the wider Veneto Region, where all contacts of positive cases were offered testing. "This testing and tracing approach has had a tremendous impact on the course of the epidemic in Veneto compared to other Italian regions, and serves as a model for suppressing transmission and limiting the virus' substantial public health, economic and societal burden," added Professor Crisanti.

As well as identifying the proportion of asymptomatic cases, the team also found that asymptomatic people had a similar 'viral load' as symptomatic patients.

Viral load also appeared to decrease in people who had no symptoms to begin with but later developed symptoms, suggesting that asymptomatic and pre-symptomatic transmission could contribute significantly to the spread of disease, making testing and isolating even more important in controlling outbreaks.

Identification and isolation

Co-lead researcher Dr Ilaria Dorigatti, from the MRC Centre for Global Infectious Disease Analysis, Jameel Institute (J-IDEA), at Imperial College London, said: "The Vò study demonstrates that the early identification of infection clusters and the timely isolation of symptomatic as well as asymptomatic infections can suppress transmission and curb an epidemic in its early phase. This is particularly relevant today, given the current risk of new infection clusters and of a second wave of transmission.

"There are still many open questions about the transmission of the SARS-CoV-2virus, such as the role of children and the contribution of asymptomatic carriers to transmission. Finding answers to these questions is crucial to identifying targeted and sustainable control strategies to combat the spread of SARS-CoV-2 in Italy and around the world."

Professor Enrico Lavezzo, from the Department of Molecular Medicine at the University of Padua, said: "The result concerning asymptomatic carriers is key. We took a picture of the Vò population and found that about half of the population testing positive had no symptoms at the time of testing and some of them developed symptoms in the following days. This

tells us that if we find a certain number of symptomatic people testing positive, we expect the same number of asymptomatic carriers that are much more difficult to identify and isolate.

"The fact that the viral load is comparable between symptomatic and asymptomatic carriers means even asymptomatic infections have the potential to contribute to transmission, as some of the reconstructed chain of transmission obtained from the detailed contact tracing conducted in ;Vò confirmed.

"On the one hand, it is likely that a symptomatic infection transmits large quantities of virus, for example via coughing, but it is also reasonable to think that symptoms may induce a person with a symptomatic infection to stay at home, limiting the number of contacts and hence the transmission potential. On the other hand, someone with an asymptomatic infection is entirely unconscious of carrying the virus and, according to their lifestyle and occupation, could meet a large number of people without modifying their behaviour."

Co-first author Dr Elisa Franchin, from the Department of Molecular Medicine of the University of Padua, said: "This work highlights the efficacy of the containment strategies implemented since the finding of the first positive patient in the town of Vò. From a technical perspective, this work has been possible thanks to the most advanced diagnostic technologies that we had available and to the work of a large number of people with different skills: from nurses to clerks, technicians, biologists and medical doctors. The en mass participation of the Vo' population to this study has given us the opportunity to better understand the transmission of this virus and how to avoid future infections."

This research was funded by the Veneto Region, Wellcome Trust, Royal Society, the European Union's Horizon 2020 research and innovation programme, the UK Medical Research Council (MRC) and the UK Department for International Development (DFID) under the MRC/DFID Concordat agreement, the EDCTP2 programme supported by the European Union and the Abdul Latif Jameel Foundation.

- doi: *https://doi.org/10.1038/s41586-020-2488-1*

> Our research shows that testing of all citizens, whether or not they have symptoms, provides a way to manage the spread of disease and prevent outbreaks getting out of hand.

Cleveland Clinic study confirms no association between medications for chronic cardiac diseases and COVID-19

Despite recent controversy suggesting that popular medications prescribed to lower blood pressure may increase the risk of infection by the novel coronavirus and lead to more severe outcomes in COVID-19, a retrospective study by Cleveland Clinic, Ohio, US, has supported the view that there is no foundation to these claims, although the researchers called for larger studies as the pandemic develops.

The medications in question are Angiotensin-converting enzyme (ACE) inhibitors and Angiotensin II receptor blockers (ARBs), both of which dilate blood vessels to increase the amount of blood pumped by the heart. The result is lowered blood pressure and increased blood flow, which helps to lower the heart's workload and reduce the risk of heart failure. The medications are commonly prescribed in cases of coronary artery disease, heart failure, diabetes and hypertension (high blood pressure).

"Our analysis found no association between ACEI or ARB use and COVID-19 test positivity," says Cleveland Clinic cardiologist Ankur Kalra, MD, the study's corresponding author.

"These medications are important tools in the management of coronary artery disease, heart failure, diabetes and hypertension. As there may be a risk to withdrawing these agents, our findings support current professional society guidelines to not discontinue ACEI or ARB therapy in the context of the COVID-19 pandemic," he added.

The Cleveland Clinic study looked at 18,472 individuals tested for COVID-19 at its locations in Florida and Ohio, with a mean age of 49 (± 21 years), and who were predominantly female (60%) and white (69%). Testing for COVID-19 was positive in 1,735 patients, or 9.4% of the total sample.

First study author Neil Mehta, MD of the Department of Medicine at the Cleveland Clinic Lerner College of Medicine, says: "Our findings with regard to clinical outcomes and measures of COVID-19 severity while on ACEI or ARB therapy give some reassurance. However, they must be interpreted with caution, due to the small sample size and the limitations of observational studies. They require replication and reanalysis in larger patient samples later in the course of the ongoing COVID-19 pandemic."

A secondary analysis among COVID-19-positive patients showed no association between use of these medications and risk for mechanical ventilation. MEH

Potent human antibodies protect against COVID-19 in animal tests

A team led by Scripps Research has discovered antibodies in the blood of recovered COVID-19 patients that provide powerful protection against SARS-CoV-2, the coronavirus that causes the disease, when tested in animals and human cell cultures.

The research, published June 15, 2020 in *Science*, offers a paradigm of swift reaction to an emergent and deadly viral pandemic, and sets the stage for clinical trials and additional tests of the antibodies, which are now being produced as potential treatments and preventives for COVID-19.

"The discovery of these very potent antibodies represents an extremely rapid response to a totally new pathogen," says study co-senior author Dennis Burton, PhD, the James and Jessie Minor Chair in Immunology in the Department of Immunology & Microbiology at Scripps Research.

If further safety tests in animals and clinical trials in people go well, then conceivably the antibodies could be used in clinical settings as early as next January, the researchers say.

In principle, injections of such antibodies could be given to patients in the early stage of COVID-19 to reduce the level of virus and protect against severe disease. The antibodies also may be used to provide temporary, vaccine-like protection against SARS-CoV-2 infection for healthcare workers, elderly people and others who respond poorly to traditional vaccines or are suspected of a recent exposure to the coronavirus.

The project was led by groups at Scripps Research; IAVI, a nonprofit scientific research organization dedicated to addressing urgent, unmet global health challenges; and University of California San Diego School of Medicine.

"It has been a tremendous collaborative effort, and we're now focused on making large quantities of these promising antibodies for clinical trials," says co-lead author Thomas Rogers, MD, PhD, an adjunct assistant professor in the Department of Immunology & Microbiology at Scripps Research, and assistant professor of Medicine at UC San Diego.

Developing a treatment or vaccine for severe COVID-19 is currently the world's top public health priority as the daily toll of new infections continues to rise.

One approach to new viral threats is to identify, in the blood of recovering patients, antibodies that neutralize the virus's ability to infect cells.

These antibodies can then be mass-produced, using biotech methods, as a treatment that blocks severe disease and as a vaccine-like preventive that circulates in the blood for several weeks to protect against infection. This approach already has been demonstrated successfully against Ebola virus and the pneumonia-causing respiratory syncytial virus, commonly known as RSV.

For the new project, Rogers and his UC San Diego colleagues took blood samples from patients who had recovered from mild-to-severe COVID-19. In parallel, scientists at Scripps Research and IAVI developed test cells that express ACE2, the receptor that SARS-CoV-2 uses to get into human cells. In a set of initial experiments, the team tested whether antibody-containing blood from the patients could bind to the virus and strongly block it from infecting the test cells.

The scientists were able to isolate more than 1,000 distinct antibody-producing immune cells, called B cells, each of which produced a distinct anti-SARS-CoV-2 antibody. The team obtained the antibody gene sequences from these B cells so that they could produce the antibodies in the laboratory. By screening these antibodies individually, the team identified several that, even in tiny quantities, could block the virus in test cells, and one that could also protect hamsters against heavy viral exposure.

> The discovery of these very potent antibodies represents an extremely rapid response to a totally new pathogen.

In the course of their attempts to isolate anti-SARS-CoV-2 antibodies from the COVID-19 patients, the researchers found one that can also neutralize SARS-CoV, the related coronavirus that caused the 2002-2004 outbreak of severe acute respiratory syndrome (SARS) in Asia.

"That discovery gives us hope that we will eventually find broadly neutralizing antibodies that provide at least partial protection against all or most SARS coronaviruses, which should be useful if another one jumps to humans," Burton says.

"Rapid isolation of potent SARS-CoV-2 neutralizing antibodies and protection in a small animal model" was co-authored by 30 scientists including lead authors Thomas Rogers, Fangzhu Zhao, Deli Huang, and Nathan Beutler, all of Scripps Research. The corresponding authors were Devin Sok and Joseph Jardine of IAVI, and Dennis Burton of Scripps Research.

Funding was provided by the National Institutes of Health, the IAVI Neutralizing Antibody Center, the Bill and Melinda Gates Foundation, the John and Mary Tu Foundation, and the Pendleton Foundation.

- **doi:** 10.1126/science.abc7520

UAE's first Covid-fighting robot is here

Sanitizexperts, the Dubai-based professionals in home, office and industrial air sanitization has introduced an Automated UVC Robot, the latest intelligence in the UAE in the fight against Covid-19. Forget harmful chemicals, sprays, smells and residue, the Robot uses ultraviolet to provide 360-degree disinfection of the air in public spaces.

Extensive testing by the International Ultraviolet Association (IUVA) has shown that UV disinfection technologies provide a multiple barrier approach to reducing the transmission of the Covid-19 virus.

The ultraviolet and sterilization Robot uses intelligent pulse disinfection and nature navigation AI technology to automatically plan its path and judge the disinfection time required within the environment. Its radar vision and ultrasonic obstacle avoidance allows it to move freely around the space without colliding into objects in it

The Robot's UV-C lamps, which can work up to 8000 hours, disinfect and kill bacteria effectively and safely. The Robot's infrared system can recognize when a human is within range and automatically shuts the lamp down.

The Robot can disinfect an 800 square metre floor area within 150 minutes, which is around 10 times the efficiency of manual disinfection.

The Robot is operated through WiFi and can be managed with the click of a button either on a PC or through a smartphone App. The software will assist you in mapping the area you need to sanitize and even have multiple automated UVC robot working simultaneously. When the battery level energy is low, the Robot it will automatically go back to its station and charge.

Omar Chappuis, CEO of Sanitizexperts, said: "The Automated UVC Robot is an exciting development against Covid-19, which we're very excited to introduce to the UAE. Whether in a hospital, airport, mall, home or the office, the robot will ensure that bacteria are eliminated, allowing for clean, safe living."

- The Automated UVC Robot is available for rental and purchase exclusively from Sanitizexperts.

For more information, visit *www.sanitizexperts.ae* MEH

Strategies to stay safe whilst staying connected

Many hospitals have had to take extreme measures to manage patient surges during the COVID-19 crisis. Extra capacity has been created through pop-up bed locations by re-appropriating existing hospital space like operating theatres and meeting rooms, or by extending facilities beyond the hospital to convention centres, arenas and hotels.

Communication is the foundation of patient triage and care. Without effective communication, patients cannot be moved quickly and safely through a hospital. Yet, with an infectious virus like COVID-19, the simple act of communicating using conventional tools can put care providers and patients at risk whilst potentially creating bottlenecks.

Communication

Care team members can reduce their risk of contamination by using the hands-free, voice-controlled Vocera® Badge or Vocera Smartbadge. These wearable devices provide clear, secure communication underneath even the most restrictive PPE.

For hospital leaders, the challenge of drastic change has been compounded by the speed and scale at which it is happening. Designing new communication workflows takes people and additional resources, all of which are extremely stretched as hospitals cope with patient surges, potential second waves and restarting elective procedures.

We want you to know that you're not alone in tackling these issues. At Vocera, our teams of clinical executives, informaticists and technology service experts can help relieve you of the burden of ensuring staff can communicate with each other and with patients easily and safely.

COVID-19 response tactics

Here are 6 simple and powerful Vocera COVID-19 response tactics that could help you make communication more efficient and potentially more effective during the pandemic:

1. **Enable instant communication with the entire incident-response or infection-control team**. Set up COVID-19 response groups that can be activated with simple voice commands or group texts via mobile devices.
2. **Allow caregivers to be notified immediately of a patient's COVID-19 test result or when risk factors are present.** With the right communication system, critical lab values and patient vitals indicating COVID-19 can be sent from the EHR to clinicians.
3. **Mobilize your COVID-19 leadership team.** Configure message templates to quickly communicate urgent information to your leadership group. Examples include an urgent request to join a conference call, or updates on triage area backlog.
4. **Make it easy for care teams to reach people in the community outside the hospital.** Add external numbers to your Global Address Book so staff don't waste valuable time searching for phone numbers.
5. **Allow care team members working outside the hospital to reach people *inside* or *outside* the hospital.** In a time when more people may be working outside the hospital, configure your communication solution so users can directly reach people inside and outside the hospital with a simple voice command. This saves precious time and eliminates the need to ask an operator or unit secretary to find a person manually.
6. **Enable nurses to communicate with patients in pop-up bed locations lacking nurse call.** The Vocera Badge and Smartbadge can be used to help restore the human connection between care teams and patients whilst helping reduce the need to don and doff PPE in pop-up bed locations.

Our clinical team can perform gap assessments remotely, with respect for your limited time and without disrupting your work. We can develop and remotely execute a customised plan and offer guidance for urgent group communication, such as mobilising infection control and COVID-19 response teams.

Strategies and resources

- Discover more strategies and resources to overcome the challenges of communicating in a pandemic on our COVID-19 hub: *www.vocera.com/covid* .
- To speak with one of our experts about Vocera solutions or to request a demo, email: *salesweb@vocera.com* or call us on 0800 652 8773. MEH

A strong partner worldwide

Stiegelmeyer beds support the fight against the pandemic

The Stiegelmeyer-Group equips hospitals and nursing homes with high-quality beds and furniture. The Burmeier subsidiary supports people in homecare with modern, homelike beds. Lifestyle beds for private customers combine a high quality of life and appealing design. The technical know-how and extensive experience of the family-run company have proved particularly valuable during the Corona pandemic.

In the fight against the coronavirus, treatment centres and auxiliary hospitals with a high demand for hospital beds were established worldwide. Stiegelmeyer was able to meet the needs of its international partners and customers in several countries from Denmark to South Africa through foresighted pre-production and clever production control. The high quality of the supplied beds also ensures their sustainable use after the end of the pandemic.

The hospital bed Evario and slim-line bedside cabinet Quado make a great pair for every patient room.

The Evario is available as a machine washable version that increases the bed's great hygiene characteristics.

Evario hospital bed

The current highlights of Stiegelmeyer's Hospital division are the Evario hospital bed and the new Quado bedside cabinet. Together, the two products make an attractive pair for many hospital rooms. Thanks to its intelligent modular system, the Evario hospital bed is suitable for all types of wards. Various control options, safety side systems, castors, headboards and footboards, external dimensions and optional scales create a flexible bed, suitable for general wards as well as premium rooms and ICUs. The bed reduces the workload of nursing staff with its effortless operation and its large height adjustment range from 35 to 91 cm, which allows ergonomic back-friendly working.

The new, slim-line Quado bedside cabinet from Stiegelmeyer is perfect for use in narrower hospital or care rooms. At the same time, it has such a flexible design that users still have plenty of space for storing and placing personal belongings. During development of the Quado, the greatest effort was put into making optimum use of the available space. Two compartments and a drawer can be accessed from both sides and can hold two 1½ litre drink bottles, for example. The optional lockable drawer is also suitable for larger wallets and purses. The compact miracle Quado also makes a big impression with its second major advantage: It is very mobile. If a bed is moved to another room or ward, the lightweight Quado can simply be hooked onto the head or footboard of most Stiegelmeyer hospital beds, such as Evario, and transported along with the bed.

Both, the Evario hospital bed and the Quado bedside cabinet are easy to clean and thus support hospitals in their fight against multi-resistant pathogens and viruses. Made from large-format plastic elements, the Quado can be cleaned easily and thoroughly – both by automatic reprocessing and by hand. The compartments have large radii and the entire design comprises flat surfaces with few niches. The clear design and optional machine-washable version of the Evario add to its excellent hygiene properties. These two modern products reduce the strain on personnel, promote the recovery of patients and, thanks to a high level of comfort and an elegant appearance, improve the external perception of the hospital.

Fine Hygienic Holding supports region's fight against COVID-19 with dedicated disinfection solutions

James Michael Lafferty, CEO, Fine Hygienic Holding

The COVID-19 pandemic has affected all facets of daily life, changing behaviour and attitude towards public health standards, as well as hygiene and safety around the world. As governments across the globe look to reopen economies, businesses and individuals are making a cautious return to work and navigating the boundaries and realities of our 'new normal'.

To help create a healthy environment that enables public and private sectors to reboot and promote consumer confidence across the MENA region, Fine Hygienic Holding (FHH), a world leader in Wellness and hygienic paper products, has launched Fine Disinfection Solutions, through its away-from-home division Fine Solutions – a dedicated disinfection service for companies and business navigating the COVID-19 pandemic in the UAE, Saudi Arabia, Jordan and Egypt.

Fine Disinfection Solutions is a state-of-the-art service that protects lives and brand reputation, offering reliability and reassurance to operators and consumers alike.

The bespoke service disinfects premises and contact surfaces, including floors, walls, countertops and more, to ensure a germ-protected environment, delivering an effective cleaning performance against bacteria, fungi, algae and viruses including Coronavirus.

By utilizing spraying and fogging techniques to ensure reach and efficiency of disinfection in small and otherwise unreachable spots, the service maintains the highest safety standards for brands, properties and spaces in the public and private sectors.

Fine Disinfection Solutions, which employs EPA-approved products, has already attracted numerous international brands looking to disinfect restaurants, hotels, schools, offices, factories, labour camps, and public spaces to protect customers and employees.

James Michael Lafferty, the CEO of FHH, said: "As a leading player in the global hygiene industry, we are fully aware of our strategic role in combatting the COVID-19 pandemic. In addition to the broad range of retail products that help regional families and businesses safeguard against Coronavirus, we are optimising our expertise in sterilized solutions and products to up the disinfection ante with Fine Disinfection Solutions.

"Our world-class solutions help disinfect and stop the spread of germs, providing streamlined disinfection of high-traffic touchpoints and surfaces. With much of the region currently working remotely, companies are rightly concerned about the safety of their public spaces and working environments when employees return to work; disinfected premises are essential to protect lives and businesses."

> Our world-class solutions help disinfect and stop the spread of germs, providing streamlined disinfection of high-traffic touchpoints and surfaces.

In addition to this service, Fine Hygienic Holding has been working on multiple fronts to serve the public in the countries it operates in during the COVID-19 crisis.

As the MENA region's leading producer of hygienic products, FHH has dramatically increased in-market production of its reusable Fine Guard face mask. FHH is also set to introduce reusable Fine Guard gloves into the MENA market as well as a new hygienic product which will help to combat Covid-19, Fine Guard wipes.

FHH has also created a regional relief fund, which has now funnelled US$2 million in products and cash donations to regional governments and communities in the countries it operates in. MEH

Scientific testing confirms Fine Guard face masks eliminate Human Coronavirus 229e on contact

Fine Hygienic Holding (FHH), one of the world's leading wellness groups and manufacturer of hygienic paper products, has released the results of scientific testing conducted by the University of Arizona which confirms Livinguard technology incorporated in its Fine Guard face masks effectively neutralizes pathogens of all kinds upon contact, including Human Coronavirus 229e.

The scientific tests, conducted by the Tucson university's Department of Environmental Studies under the supervision of Charles Gerba PhD, showed that the textile technology, made in partnership with Swiss microbiology and material sciences company Livinguard, effectively eliminates pathogens of all types, including Human Coronavirus 229e.

The tests affirm that textiles treated with the breakthrough technology, such as the Fine Guard face masks, is 99.99% effective in killing the Human Coronavirus 229e.

Dr. Gerba, Professor of Microbiology, Virology, and Immunology, said: "Livinguard textile technology holds promise in the fight against COVID 19."

The anti-viral, anti-bacterial Fine Guard face masks are available in the MENA markets including UAE, Saudi Arabia, and Jordan. Livinguard is currently working with the US FDA on the results of the testing, with the aim to introduce masks treated with the Livinguard technology into the US market.

Regarding the findings of the study, FHH CEO James Michael Lafferty said: "As a leader in the wellness and hygiene industry, FHH is dedicated to providing hygienic solutions which go beyond the set market standards. Fine worked closely with Livinguard over the past couple of years to develop products that keep consumers safe and healthy.

"We are proud to be their exclusive partner in the MENA region, providing our communities and consumers across the globe with one of the most technologically advanced and effective hygienic face masks on the market today. We are encouraged by the confirmation of the newly-available test results from the University of Arizona and look forward to making masks treated with the Livinguard technology even more widely available."

Fine Guard face masks are reusable for up to two years and can be washed up to 30 times with hand soap and warm water, offering a more sustainable alternative than disposable masks.

With more governments recommending or mandating its citizens to wear personal protective equipment, Fine Hygienic Holding is currently working on developing new products that utilize the Livinguard technology such as gloves and wipes to help consumers stay safe and healthy.

Fine Hygienic Holding

Fine Hygienic Holding (FHH), MENA's leading manufacturer of hygienic products, serves consumers in more than 75 countries around the world. With its commitment to becoming "the shining star of the Arab FMCG business world," FHH focuses on wellness, sustainability, state-of-the-art production processes, pioneering CSR programs, and award-winning products. The company offers a diverse array of products including facial tissues, napkins, kitchen towels, toilet paper, baby diapers, adult briefs, jumbo rolls, as well as away-from-home products to accommodate all types of private and public institutions.

OR Technology helps in the fight against COVID-19

Amadeo-M-mini-Covid-19-Station

Leonardo-DR-mini-II-Covid-19-Station

Germany-based OR Technology is supplying mobile and portable X-ray equipment all over the world to fight against Covid-19. Orders for mobile X-ray solutions have multiplied several times over. Deliveries were made, for example, to Vietnam, Luxembourg, Portugal, South Africa, Ghana and Trinidad & Tobago, in order to expand the diagnostic capacity in the corona crisis there.

"With this X-ray systems, the challenges of the pandemic can be mastered better," says Managing Director Bernd Oehm. "In a few seconds, excellent pulmonary images of a suspected Covid-19 patient can be obtained. Our lightweight complete solution Amadeo M-DR mini, for example, is suitable for outdoor use as well as for bedside imaging in hospitals or nursing homes."

The system is of advanced design. All necessary components such as X-ray detector, X-ray generator and image processing station are combined in one system. The user is supported by a practical X-ray assistant. The Amadeo M-DR mini enables wireless digital X-rays of the entire body trunk.

The X-ray solution is brought directly to the patient preventing long waiting times in crowded hospitals. In less than two minutes, the unit can be set up and ready for use. Transport and operation can be carried out by one person. The integrated diagnostic software ensures a worldwide and fast exchange of information via cloud or e-mail. This saves a lot of time and transport costs.

- For more information,

visit: *www.or-technology.com*
or email: *info@or-technology.com*

Mobile and portable **X-ray** equipment "Made in Germany"

With this X-ray systems, the challenges of the pandemic can be mastered better. In a few seconds, excellent pulmonary images of a suspected Covid-19 patient can be obtained.

made in Germany

Amadeo M-DR mini

Wireless, digital X-ray imaging with a lightweight and portable full X-ray solution

Leonardo DR mini II

Compact X-ray suitcase solution for mobile use with software and detector

Leonardo DR nano

Wonderfully light, portable backpack X-ray system with software and detector

OR Technology info@or-technology.com www.or-technology.com

Due to the COVID-19 pandemic the 73rd World Health Assembly was held virtually for the first time in its history.

73rd World Health Assembly convenes virtually for the first time

The 73rd World Health Assembly was held briefly on 18 & 19 May. Due to the COVID-19 pandemic, it was the first-ever to be held virtually and is expected to be reconvened later this year.

At the virtual Assembly delegates adopted a landmark resolution to bring the world together to fight the COVID-19 pandemic.

The resolution, co-sponsored by more than 130 countries, was adopted by consensus.

It calls for the intensification of efforts to control the pandemic, and for equitable access to and fair distribution of all essential health technologies and products to combat the virus. It also calls for an independent and comprehensive evaluation of the global response, including, but not limited to, WHO's performance.

As WHO convened ministers of health from almost every country in the world, the consistent message throughout the two-day meeting – including from the 14 heads of state participating in the opening and closing sessions – was that global unity is the most powerful tool to combat the outbreak. The resolution is a concrete manifestation of this call, and a roadmap for controlling the outbreak.

> COVID-19 has robbed us of people we love. It's robbed us of lives and livelihoods; it's shaken the foundations of our world; it threatens to tear at the fabric of international cooperation. But it's also reminded us that for all our differences, we are one human race, and we are stronger together.

In his closing remarks, Dr Tedros Adhanom Ghebreyesus, the WHO Director-General, said: "COVID-19 has robbed us of people we love. It's robbed us of lives and livelihoods; it's shaken the foundations of our world; it threatens to tear at the fabric of international cooperation. But it's also reminded us that for all our differences, we are one human race, and we are stronger together." MEH

Global scientific community in virtual summit to track progress on COVID-19 R&D

The World Health Organization held a two half-day virtual summit on 1 and 2 July, to take stock of the evolving science on COVID-19 and examine progress made so far in developing effective health tools to improve the global response to the pandemic.

The event brought together researchers, developers and funders from all over the world, all of whom shared approaches and raw data freely, in a show of solidarity from the global science community. All major research institutes carrying out trials shared their data with a view to speeding up scientific discovery and implementation of solutions.

The group reviewed the latest data from the WHO Solidarity Trial and other completed and ongoing trials for potential therapeutics: hydroxychloroquine, lopinavir/ritonavir, remdesivir and dexamethasone. They agreed on the need for more trials to test antivirals, immunomodulatory drugs and anti-thrombotic agents, as well as combination therapies, at different stages of the disease.

The meeting analyzed 15 vaccine trial designs from different developers, and criteria for conducting robust trials to assess safety and efficacy of vaccine candidates. Participants discussed the use of a global, multi country, adaptive trial design, with a common Data and Safety Monitoring Board, and clear criteria to advance candidates through the various stages of trials.

They noted that most internationally funded research projects have so far favoured high-income countries, with very few funded in low- and middle-income

countries, highlighting the importance of the ACT-Accelerator Initiative <*www.who.int/initiatives/act-accelerator*> to speed up the development and equitable deployment of COVID-19 tools.

More evidence is emerging that transmission from humans to animals is occurring, namely to felines (including tigers), dogs and minks.

The Summit hosted over 1000 researchers and scientists from all over the world and addressed the following topics:

1. virus: natural history, transmission and diagnostics;
2. animal and environmental research on the virus origin, and management measures at the human-animal interface;
3. epidemiological studies;
4. clinical characterization and management;
5. infection prevention and control, including health care workers' protection;
6. candidate therapeutics R&D;
7. candidate vaccines R&D;
8. ethical considerations for research and;
9. integrating social sciences in the outbreak response.

Since the beginning of the COVID-19 outbreak, WHO has brought together the world's scientists and health professionals to accelerate understanding of the novel coronavirus and expedite research and development to find solutions to the pandemic.

WHO has been gathering the latest international multilingual scientific findings and knowledge on a COVID-19 data base, and is running an international therapeutics trial – the Solidarity trial.

As of 1 July 2020, nearly 5500 patients in 39 countries had been recruited into the trial. Overall, over 100 countries in all 6 WHO regions have joined or expressed an interest in joining the trial, and WHO is actively supporting them with:

- ethical and regulatory approvals of the WHO core protocol;
- identification of hospitals participating in the trial;
- training of hospital clinicians on the web-based randomization and data system;
- shipping the trial drugs as requested by each participating country.

Record number of countries contribute data revealing disturbing rates of antimicrobial resistance

A record number of countries are now monitoring and reporting on antibiotic resistance – marking a major step forward in the global fight against drug resistance. But the data they provide reveals that a worrying number of bacterial infections are increasingly resistant to the medicines at hand to treat them.

"As we gather more evidence, we see more clearly and more worryingly how fast we are losing critically important antimicrobial medicines all over the world," said Dr Tedros Adhanom Ghebreyesus, Director-General of the World Health Organization. "These data underscore the importance both of protecting the antimicrobials we have and developing new ones, to effectively treat infections, preserve health gains made in the last century and ensure a secure future."

Since the WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS) report in 2018, participation has grown exponentially. In only three years of existence, the system now aggregates data from more than 64000 surveillance sites with more than 2 million patients enrolled from 66 countries across the world. In 2018 the number of surveillance sites was 729 across 22 countries.

More countries are also reporting on the recently approved indicator on antimicrobial resistance (AMR) as part of the Sustainable Development Goal monitoring. "The enormous expansion of countries, facilities and patients covered by the new AMR surveillance system allows us to better document the emerging public health threat of AMR," said Hanan Balkhy, Assistant Director-General for antimicrobial resistance at WHO .

High rates of resistance among antimicrobials frequently used to treat common infections, such as urinary tract infections or some forms of diarrhoea, indicate that the world is running out of effective ways to tackle these diseases. For instance, the rate of resistance to ciprofloxacin, an antimicrobial frequently used to treat urinary tract infections, varied from 8.4% to 92.9% in 33 reporting countries.

WHO is concerned that the trend will further be fuelled by the inappropriate use of antibiotics during the COVID-19 pandemic. Evidence shows that only small proportion of COVID-19 patients need antibiotics to treat subsequent bacterial infections and the Organization has issued guidance not to provide antibiotic therapy or prophylaxis to patients with mild COVID-19 or to patients with suspected or confirmed moderate COVID-19 illness unless there is a clinical indication to do so.

Dr Balkhy, said: "We believe this clear guidance on the use of antibiotics in the COVID-19 pandemic will both help countries tackle COVID-19 effectively and prevent the emergence and transmission of antimicrobial resistance in the context of the pandemic."

WHO remains concerned by declining investment (including in the private sector) and lack of innovation in the development of new antimicrobial treatments – factors that are undermining efforts to combat drug-resistant infections.

"We must bolster global cooperation and partnerships including between the public and private sectors to provide financial and non-financial incentives for the development of new and innovative antimicrobials," Balkhy said.

To support this effort, WHO has released two documents on target product profiles to guide development of new treatments for common resistant bacterial infections and an economic model that simulates the costs, risks, and possible return on investment of antibacterial drug development.

on the WEB

Guidance on the use of antibiotics in the COVID-19 pandemic
www.who.int/publications/i/item/clinical-management-of-covid-19
Target product profiles for needed antibacterial agents
https://bit.ly/3e1DEYX

The defining health crisis of our time

An excerpt from the opening speech of Dr Tedros Adhanom Ghebreyesus, WHO Director-General, at the 73rd World Health Assembly. This was the first Assembly to be held virtually in its history.

Dr Tedros Adhanom Ghebreyesus

We have come together as the nations of the world to confront the defining health crisis of our time.

We come in grief for those we have lost;

We come with concern for those still fighting for their lives;

We come with determination to triumph over this common threat;

And we come with hope for the future.

The world has confronted several pandemics before. This is the first caused by a coronavirus.

This is a dangerous enemy, with a dangerous combination of features: this virus is efficient, fast, and fatal.

It can operate in the dark, spread silently if we're not paying attention, then suddenly explode if we aren't ready. And moves like a bushfire.

We have seen the same pattern repeated in cities and countries the world over.

We must treat this virus with the respect and attention it deserves.

More than 4-and-a-half million cases of COVID-19 have now been reported to WHO, and more than 300,000 people have lost their lives.

But numbers don't even begin to tell the story of this pandemic.

Each loss of life leaves a scar for families, communities and nations.

The health impacts of the pandemic extend far beyond the sickness and death caused by the virus itself.

The disruption to health systems threatens to unwind decades of progress against maternal and child mortality, HIV, malaria, tuberculosis, noncommunicable diseases, mental health, polio and many other of the most urgent health threats.

And yet this is so much more than a health crisis.

Lives and livelihoods have been lost or upended.

Hundreds of millions of people have lost their jobs.

Fear and uncertainty abound.

The global economy is headed for its sharpest contraction since the Great Depression.

The pandemic has brought out the best – and worst – of humanity:

Fortitude and fear; solidarity and suspicion; rapport and recrimination.

This contagion exposes the fault lines, inequalities, injustices and contradictions of our modern world.

It has highlighted our strengths, and our vulnerabilities.

Science has been hailed and scorned.

Nations have come together as never before, and geopolitical divisions have been thrown into sharp relief.

We have seen what is possible with cooperation, and what we risk without it.

The pandemic is a reminder of the intimate and delicate relationship between people and planet.

Any efforts to make our world safer are doomed to fail unless they address the critical interface between people and pathogens, and the existential threat of climate change that is making our earth less habitable.

For all the economic, military and technological might of nations, we have been humbled by this very small microbe.

If this virus is teaching us anything, it's humility. Time for humility.

Six months ago, it would have been inconceivable to most that the world's biggest cities would fall eerily quiet; that shops, restaurants, schools and workplaces would be closed; that global travel would grind to a standstill; that simply shaking hands could be life-threatening.

Terms once used only by epidemiologists, like "reproduction number", "physical distancing" and "contact tracing" have become common parlance.

In less than five months, the pandemic has encircled the globe.

All countries have faced challenges in coming to grips with this virus, rich and poor, large and small.

Low-income countries, small island developing states and those suffering from violence and conflict are trying to confront this threat in the most challenging of circumstances.

How do you practice physical distancing when you live in crowded conditions?

How do you stay at home when you have to work to feed your family?

How do you practice hand hygiene when you lack clean water?

Some countries are succeeding in preventing widespread community transmission; some have issued stay-at-home orders and imposed severe social restrictions to suppress community transmission; some are still bracing for the worst; and some are now assessing how to ease the restrictions that have exacted such a heavy social and economic toll.

WHO fully understands and supports the desire of countries to get back on their feet and back to work.

It's precisely because we want the fastest possible global recovery that we urge countries to proceed with caution.

Countries that move too fast, without putting in place the public health architecture to detect and suppress transmission, run a real risk of handicapping their own recovery.

Early serology studies are painting a consistent picture: even in the worst-affected regions, the proportion of the population with the tell-tale antibodies is no more than 20 percent, and in most places, less than 10 percent.

In other words: the majority of the world's population remains susceptible to this virus.

The risk remains high and we have a long road to travel.

Children more resilient against coronavirus, study reveals

The majority of children with COVID-19 in 26 countries fared well clinically compared to adults during the first four months of the pandemic, according to a systematic review of 131 studies worldwide.

In the largest systematic review to date of children and young adults with COVID-19, researchers from the Long School of Medicine at The University of Texas Health Science Center at San Antonio, published their findings June 26, 2020 in *EClinicalMedicine*, a journal of *The Lancet*. The review cover studies published between January 24 and May 14.

Among the findings:

- 19% of the paediatric population with COVID-19 had no symptoms.
- 21% exhibited patchy lesions on lung X-rays.
- 5.6% suffered from co-infections, such as flu, on top of COVID-19.
- 3.3% were admitted to intensive care units.
- Seven deaths were reported.

"Our data is compiled from 131 studies and encompasses 7,780 patients who span the paediatric age spectrum," said study senior author Alvaro Moreira, MD, MSc, assistant professor of paediatrics at UT Health San Antonio and a fellowship-trained neonatologist.

"In the study we report the most common symptoms, quantify laboratory findings and describe imaging characteristics of children with COVID-19," Dr. Moreira said.

"Furthermore, we summarize treatments that were administered and offer an initial glimpse of a handful of patients who met the U.S. Centers for Disease Control and Prevention (CDC) criteria for multisystem inflammatory syndrome in children."

Symptoms

The most frequent symptoms, similar to the adult population, were fever and cough. Those were found in 59% and 56% of the paediatric population.

In 233 individuals, a past medical history was noted, and among this group, 152 were children with compromised immune systems or who had underlying respiratory or cardiac disease.

The number of children with excellent outcomes surprised the research team. "Although we are hearing about severe forms of the disease in children, this is occurring in very rare circumstances," Dr. Moreira said.

The majority of journal articles were from China. The largest study that was included was a case series of 2,572 patients reported by the U.S. CDC COVID-19 team.

Laboratory measures that were consistently abnormal in paediatric COVID-19 patients included inflammatory markers such as creatine kinase, interleukin-6 and procalcitonin.

Few severe cases

Thankfully, only a small number of patients met inclusion for multisystem inflammatory syndrome in children. Their disease paralleled the extreme forms of COVID-19 seen in adults.

"Children with systemic inflammation had a significant decrease in the amount of lymphocytes in their blood," Dr. Moreira said. "COVID-positive children who didn't have the extreme form of the disease had 42% lymphocytes in their blood, versus 11% in children with the multisystem syndrome."

Lymphocytes are one of the main types of immune cells in the body.

Kidney failure was seen in nine paediatric patients, liver failure also in nine and shock in 19. Mechanical ventilation was required by 42 patients.

The study does not take into consideration a new surge of patients in New York, England and Italy where specialists are now starting to see children with multisystem inflammatory syndrome, Dr. Moreira said.

- doi: *https://doi.org/10.1016/j.eclinm.2020.100433*

Hyperinflammatory condition emerges in children post-COVID-19

In recent weeks, a multisystem hyperinflammatory condition has emerged in children in association with prior exposure or infection to SARS-CoV-2. A new case series published in the journal *Radiology* examines the spectrum of imaging findings in children with the post-COVID-19 inflammatory condition known in the U.S. as Multisystem Inflammatory Syndrome in Children (MIS-C).

The array of findings includes airway inflammation and rapid development of pulmonary edema, coronary artery aneurysms, and extensive intra-abdominal inflammatory changes.

In April 2020, Evelina London Children's Hospital in London, U.K., experienced a surge of children with a multisystem hyperinflammatory syndrome. The children had a variety of symptoms, including fever, headaches, abdominal pain, rash and conjunctivitis. Clinical features and lab findings shared some similarities to those of Kawasaki disease – which causes inflammation in the walls of blood vessels – Kawasaki-disease shock syndrome or toxic-shock syndrome, although atypical and more severe.

"Our hospital saw an unprecedented cluster of children presenting with MIS-C, a new hyperinflammatory syndrome in children related to the current COVID-19 pandemic – the recognition of which led to a national alert," said the study's lead author, Shema Hameed, M.B.B.S., consultant paediatric radiologist at Evelina London Children's Hospital.

"As paediatric radiologists, we were interested in the emerging pattern of imaging findings that we observed in these children," Dr. Hameed said. "Our intention is to bring these findings to the attention of the wider radiological community."

Shema Hameed, M.B.B.S.

> As paediatric radiologists, we were interested in the emerging pattern of imaging findings that we observed in these children. Our intention is to bring these findings to the attention of the wider radiological community.

For the study, researchers performed a retrospective review of clinical, laboratory and imaging findings of the first 35 children under age 17 who were admitted to the paediatric hospital that met the case definition for MIS-C. The children were admitted from April 14 to May 9, 2020, and included 27 boys and eight girls, with a median age of 11 years old.

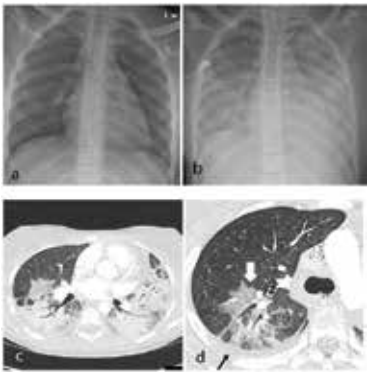

Figure 1. Thoracic findings in a 15-year-old girl with Multisystem Inflammatory Syndrome in Children (MIS-C). (a) Chest radiograph on admission shows mild perihilar bronchial wall cuffing. (b) Chest radiograph on the third day of admission demonstrates extensive airspace opacification with a mid and lower zone predominance. (c, d) Contrast-enhanced axial CT chest of the thorax at day 3 shows areas of ground-glass opacification (GGO) and dense airspace consolidation with air bronchograms. (c) This conformed to a mosaic pattern with a bronchocentric distribution to the GGO (white arrow, d) involving both central and peripheral lung parenchyma with pleural effusions (black small arrow, d).

The most common clinical presentation was fever, found in 33 (94%) of the children, gastrointestinal symptoms including abdominal pain, vomiting and diarrhoea in 30 (86%) of the children, rash (13 or 37%) and conjunctivitis (9 or 26%). Twenty-one children (60%) were in shock. Clinical status was severe enough to warrant man-

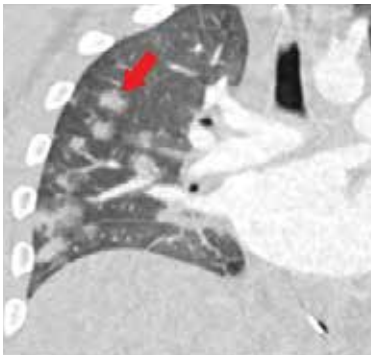

Figure 4. 15-year-old male presenting with fever, sepsis, and shock with impaired cardiac function. Coronal reconstruction of a contrast-enhanced CT chest shows multiple round consolidative foci with surrounding ground glass halos (red arrow).

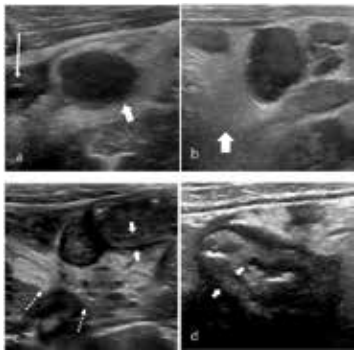

Figure 5. The ultrasound features of right iliac fossa inflammation in four children (a) 7-year-old boy with MIS-C and abdominal pain. High-frequency sonographic image depicts an enlarged mesenteric lymph node within the right iliac fossa (wide arrow), with associated hyperechoic mesenteric fat. The appendix is normal in diameter (thin arrow). (b) 15-year-old boy with MIS-C. Multiple mesenteric lymph nodes within the right iliac fossa, the short axis diameter of the largest lymph node measured 13mm (calipers), with associated hyperechoic mesenteric fat (arrow) were noted on US. (c) 9-year-old boy with MIS-C. US shows loops of thickened small bowel (between solid arrows) with associated hyperechoic mesenteric fat (dotted arrows). (d) 16-year-old boy with severe right iliac fossa pain. High-frequency sonogram shows marked cecal wall thickening (arrows).

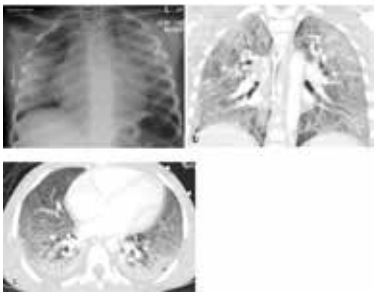

Figure 2. Thoracic findings in a 5-year-old boy with Multisystem Inflammatory Syndrome in Children (MIS-C). (a) Chest radiograph 4 days after admission shows perihilar bronchial wall cuffing and interstitial thickening with hazy surrounding airspace consolidation extending towards the peripheries. (b, c) Coronal and axial contrast-enhanced CT chest 1 day after the radiograph shows diffuse bilateral airspace consolidation with an anteroposterior gradient suggestive of acute respiratory distress syndrome (ARDS).

Figure 6. 15 year-old boy with MIS-C. US shows a well-defined subcapsular hypoechoic splenic lesion (arrow) felt to be likely an infarct as the clinical course did not conform with this being a splenic abscess, the main other differential diagnosis for this appearance.

Figure 3. Range of cardiothoracic imaging findings in Multisystem Inflammatory Syndrome in Children (MIS-C). (a) Chest radiograph and (b) axial contrast-enhanced CT chest of a 4-year-old male presenting with fever, rash, abdominal pain, and diarrhoea show features of pulmonary oedema including perihilar interstitial thickening (thin arrow, a), septal lines (thin arrows, b), and pleural effusions (wide arrow, b). Left lower lobe collapse and consolidation (wide arrow, a) was also confirmed on CT (b). (c) 8-year-old boy with MIS-C noted to have impaired cardiac function and coronary artery aneurysms on echocardiogram. Contrast-enhanced cardiac CT demonstrating an axial view of the left main stem (LMS) (dotted arrow) and left anterior descending (LAD) (solid arrow) coronary arteries. There is medium sized aneurysmal dilation of the LMS (5.0 x 5.1mm z-score +2) and a large aneurysm in the proximal LAD (6.5 x 7.7mm z-score +13.9).

Figure 7. Contrast enhanced CT abdomen and pelvis of a 15-year-old male who presented with sepsis. (a) Coronal image of the abdomen demonstrates gallbladder wall oedema (wide arrow). There is extensive thickening of the cecal wall thickening (thin arrow) and free-fluid within the pelvis (dotted arrow). (b) Axial slice through the lower abdomen showing the cecal wall thickening (wide arrow) with multiple adjacent mesenteric nodes (thin arrow) and surrounding fat-stranding. (c) Coronal image through the left upper quadrant shows a focal subcapsular, hypoattenuating region within the spleen in keeping with a splenic infarct (arrow).

agement in the paediatric intensive care unit in 24 of 35 children (69%), of which 7 (20%) required mechanical ventilation and 20 (57%) inotropic support.

Two children required extracorporeal membrane oxygenation (ECMO) due to severe myocardial dysfunction. Lab tests revealed that all of the children had abnormal white blood cell counts.

The study identified a pattern of imaging findings in post COVID-19 MIS-C, including airway inflammation, rapidly progressive pulmonary oedema, coronary artery aneurysms and extensive abdominal inflammatory changes within the right iliac fossa.

All 35 children underwent chest X-ray due to fever, sepsis or features of multisystem inflammation. Nineteen X-rays were abnormal, the most common finding being that of bronchial wall thickening.

The predominant findings on chest CT were basal consolidation, or part of the lung filling with fluid; and collapsed lung with pleural effusions, or build-up of fluid in the outer membranes of the lungs.

Abdominal ultrasound findings included inflammatory changes within the right iliac fossa, with mesenteric fat stranding, lymphadenopathy and bowel wall thickening, as well as free fluid in the pelvis.

The authors advise that future studies should include a larger group of patients, ideally utilizing multi-centre databases to assess the radiological findings alongside the complex clinical course of these young patients.

• doi: *https://doi.org/10.1148/radiol.2020202543*

Kids with COVID-19 presenting with Kawasaki disease symptoms

Recent reports of children experiencing Kawasaki disease, possibly tied to the COVID-19 pandemic, are raising concerns among patients and paediatricians.

Most children with COVID-19 are asymptomatic or exhibit only mild symptoms. However, in the past few months, first in Europe, and more recently in the U.S., a small number of children developed a more serious inflammatory syndrome with COVID-19, often leading to hospitalization and occasionally requiring intensive care.

COVID-19 infection leading to critical illness in children remains very infrequent. According to the leaders of the American Heart Association's Council on Lifelong Congenital Heart Disease and Heart Health in the Young (Young Hearts), a few patients display symptoms found in other paediatric inflammatory conditions, most notably Kawasaki disease.

Children with this new, possibly COVID-19-related syndrome may have some or all the features of Kawasaki disease. These children have a persistent fever, inflammation and evidence of single or multi-organ dysfunction (shock, cardiac, respiratory, renal, gastrointestinal or neurological disorder) and may or may not test positive for COVID-19.

"We want to reassure parents – this appears to be uncommon. While Kawasaki disease can damage the heart or blood vessels, the heart problems usually go away in five or six weeks, and most children fully recover," said Jane Newburger, M.D., M.P.H., FAHA, American Heart Association Young Hearts Council member, associate cardiologist-in-chief, academic affairs; medical director of the neurodevelopmental program; and director of the Kawasaki Program at Boston Children's Hospital; and Commonwealth Professor of Pediatrics at Harvard Medical School. "Rarely, but sometimes, the coronary artery damage persists. Because of this, Kawasaki disease is the most common cause of acquired heart disease in children in developed countries. Prompt treatment is critical to prevent significant heart problems."

Since some children are becoming very ill extremely quickly, children with these symptoms should be swiftly evaluated and cared for in hospitals with paediatric cardiac intensive care units, as needed. Because there is a small but increasing number of children with fever and evidence of inflammation who are not severely ill, all children with unexplained fever and elevated C- Reactive Protein (CRP) or white blood cell count should be carefully monitored.

In order to learn more, the American Heart Association's Young Hearts Council feels it is important for children to be enrolled, wherever possible, in COVID-19 research projects that include obtaining serum or plasma samples, DNA and RNA studies for biobanking. Clinical trials and data integration across existing and planned registries of children ill from COVID-19 are needed. The Council is adopting the case definition put forth by the Royal College of Paediatrics and Child Health <*https://bit.ly/2O6Sgfi*>

Further research is needed on the full spectrum of inflammatory disorders that appear to be related to COVID-19. Recently, the American Heart Association funded 12 research grants looking at the heart and brain health implications of coronavirus including a study examining impacts on the cardiovascular system due to a robust inflammatory response.

The American Heart Association's Young Hearts Council is a volunteer scientific group of leading paediatric cardiologists. MEH

What is Kawasaki Disease?

Kawasaki disease (KD), also known as Kawasaki syndrome or mucocutaneous lymph node syndrome, is the most common cause of acquired heart disease in children in developed countries.

It is a rare condition that presents with a fever above 38.8°C to 40°C for at least five days. The fever is accompanied by at least four of the following five symptoms:

- A rash over the torso, especially in the groin area.
- Redness and swelling of the palms and soles of the feet when the illness starts. Light peeling of the skin on the fingertips and toes occurs in the second and third weeks. Larger pieces of skin can peel off the hands and feet as well.
- Bloodshot eyes that can be sensitive to light.
- Swollen lymph glands in the neck (one large lymph node that measures more than 1.5 cm). Sometimes the neck feels stiff.
- Irritation and inflammation of the mouth, lips and throat. "Strawberry" tongue – the tongue is bumpy and red with enlarged taste buds.

KD affects children and a smaller percentage of teens, creating inflammation in the blood vessels, particularly the coronary arteries. The average age of those affected is 2. 75% are younger than 5 and boys are 1.5 times more likely than girls to get KD.

Although the illness occurs worldwide and across all racial or ethnic groups, it's more frequent in Japan and in children of Asian descent. Named after Dr. Tomisaku Kawasaki, a Japanese paediatrician, the condition wasn't recognised as a separate syndrome until 1967. It may have been around for a long time before that.

Prompt treatment is critical to prevent significant heart problems. Most children recover fully.

Universal preoperative COVID-19 screening of paediatric patients improves safety

Universally screening paediatric patients for COVID-19 before they undergo surgical procedures has allowed hospitals to improve safety by identifying all patients who test positive for the virus, half of whom have no symptoms, according to new research led by Children's Hospital of Philadelphia (CHOP). The study, which analysed universal screening procedures at CHOP and two other major children's hospitals, found that screening patients for COVID-19 allowed hospitals to ensure patients and physicians were not exposed to the virus.

The findings were published June 4, 2020 in *JAMA Surgery*.

"CHOP's commitment to screening every patient preoperatively has significantly improved patient safety," said lead author Apurva Shah, MD, MBA, an orthopaedic surgeon in CHOP's Division of Orthopaedics. "Our study shows that many paediatric patients who have COVID-19 are asymptomatic, even though the overall number of positive cases is small, so parents can feel reassured that their children and other children undergoing procedures have been screened for the virus."

The research team, which consisted of physicians from CHOP, Seattle Children's Hospital, and Texas Children's Hospital, gathered COVID-19 screening data on preoperative paediatric patients for one month, from late March to late April 2020. CHOP had begun screening all preoperative patients for COVID-19 on March 26, 2020, as part of its hospital-wide safety procedures. Each of the three hospitals used an in-house, lab-developed reverse transcriptase polymerase chain reaction (RT-PCR) assay to detect COVID-19 in patients with scheduled surgical procedures.

Of the 1,295 patients included in the study, the overall incidence of COVID-19 was 0.93%. However, the researchers found significant variation across hospitals, ranging from 0.22% to 2.65%. Even more striking, at CHOP, 55.56% of positive patients were from a single township, indicating that the incidence in children may vary depending on COVID-19 infection rates in the patients' communities.

Asymptomatic

Among those paediatric patients who tested positive for COVID-19, half had no symptoms. Of those who did have symptoms, the most common were fever and a runny nose. Nevertheless, the researchers noted symptoms were not useful in differentiating those who tested positive for COVID-19 and those who tested negative.

Given that the study covered a time period when all three hospitals had cancelled elective surgeries, the data reflect paediatric patients who required time-sensitive surgery and thus may not represent the incidence in children undergoing elective surgery. However, the authors say the findings show the value of universal screening in protecting both patients and physicians from COVID-19 exposure in all types of surgery at times when the SARS-CoV-2 virus is actively circulating in a community.

"If a patient tests positive for COVID-19, and the procedure doesn't need to happen immediately, providers can reschedule surgery for a time when the patient has recovered," Shah said. "But in some cases, surgery cannot wait, and in that situation, knowing a patient is positive for COVID-19 allows staff to protect themselves with appropriate personal protective equipment and prevent that patient from coming into contact with other patients and families."

"As we start to relax social distancing measures, and children return to their 'new normal' with exposure to the community, universal testing for children undergoing surgery will be even more important," said first author Elaina E. Lin, MD, an anaesthesiologist in CHOP's Department of Anesthesiology and Critical Care Medicine.

• **doi:**10.1001/jamasurg.2020.2588

Reducing alert fatigue to minimise medication error

By **Alaa Darwish**
Country Manager Middle East, Turkey & Africa, Wolters Kluwer Clinical Effectiveness

Medication errors remain a challenge for healthcare providers across the Middle East. While work to address the problem has yielded many improvements, there are still challenges to overcome.

The evolution of health information technology over the past decade has created new opportunities and challenges for the healthcare industry. EHRs, for example, have paved the way for increased awareness of the effect of medication errors while automated drug screening has helped healthcare professionals avoid potential errors.

Today, healthcare leaders increasingly recognise the value of Clinical Decision Support (CDS) and drug decision support, especially as rapid medical advancement continually introduces new medications to the market. Clinicians working in a changing healthcare environment find it difficult to keep up with the pace of development and a growing body of medical evidence.

When decision support solutions are well designed and integrated into the clinical workflow, an increasing number of studies associate their use with better patient outcomes. However, many initiatives fall short due to 'alert fatigue', a condition where an overload of information causes clinicians to override alerts without consideration.

The problem of alert fatigue

Alert fatigue has become an increasing concern due to information systems generating alerts that are not relevant to a professional's treatment or prescribing decisions. Industry research points to a direct link between overrides and medication errors, highlighting how this issue can have serious consequences for patient safety.

Industry data estimates that between 40 and 90 per cent of alerts are overridden by clinicians.1 Since it is estimated that 50 per cent of alerts are relevant to patient care, these statistics indicate not only that we are compromising on care quality, but that we are missing the true potential of decision support technology.

Healthcare IT vendors have struggled to find the right balance of alerts, one that weighs clinical significance against a clinician's ability to consume information.

What's the solution?

Going forward, clinical and information technology teams must come together to identify ways to customise, filter, and suppress alerts based on clinical evidence and patient risk. This strategy begins with a basic understanding of how many alerts are firing, factors that contribute to high volumes of alerts and why alerts are overridden.

There is no "one size fits all" approach to addressing alert fatigue, however some high-level considerations can help:

1. Choose EHR technology that allows for user controls, whether at an organisational, departmental or end-user level
2. Adopt system design strategies that consider human factors to guide the presentation of alerts
3. Personalise alert rules by adjusting alert thresholds and timing
4. Provide patient profile-specific alerts and in-line screening to help clinicians act quickly on relevant information
5. Ensure evidence-based clinical content is regularly updated to deliver current and relevant information

When optimally deployed, decision support solutions have the potential to significantly help enhance patient care and reduce medication errors. By implementing systems that effectively address alert fatigue, healthcare leaders can realise the value of their investments and ultimately raise the bar on care quality and patient safety.

References

1 *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447540/*

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Interview

Eliminating avoidable blindness: Mobilizing resources and integrating services for better eye healthcare

Trachoma is the world's leading infectious cause of blindness and one of 20 neglected tropical diseases (NTDs) that affect over one billion of the world's poorest people. While countries in Africa are the most affected by trachoma, it is a public health problem in countries in the Middle East, such as Yemen, Egypt, Iraq and Iran. Although trachoma elimination efforts are succeeding, other eye health issues like cataract and refractive error have not had the same focus.

In this interview, as part of our series on avoidable blindness, we speak to **Dr. Yeneneh Mulugeta Deneke** from The Fred Hollows Foundation about the intensification of trachomatous trichiasis surgery through their comprehensive eye healthcare service project. He also explains why integrated health services help to meet the community-wide eye care needs, such as cataract and refractive error.

What is the TT Plus project?

■ **Dr. Yeneneh Mulugeta Deneke:** In 2018, we introduced the "trachomatous trichiasis surgery intensification through provision of comprehensive eye health care service" project in Ethiopia. Known as "TT Plus". The innovative model is a pilot project which aims to provide a comprehensive healthcare service delivery system for communities in need and deliver a broad range of eyecare services to treat trachoma, cataract and refractive error. The pilot project targeted local communities residing in a semi urban and rural areas.

Why was the TT Plus project set up?

■ **YMD:** During trachoma elimination outreach services, The Foundation and its partners also received patients with cataract, refractive error, or other eye conditions. We had to turn these requests down as our service was only treating trachoma. So, the question was, why we are only dealing with TT (trachomatous trichiasis)? Why don't we add services that treat not only trachoma, but also other eye diseases?

Why was the pilot study beneficial to The Foundation and governments?

■ **YMD:** The Fred Hollows Foundation knew that TT services were not adequate to address the eye care needs of the community. We conducted a pilot study because we knew the findings could help us to identify barriers in the eye healthcare system and identify gaps and opportunities, such as: Governance and leadership; eye healthcare structure and services; financing; infrastructure; human resources; service delivery; information management, and; community demand.

TT Plus wasn't a donor-driven pilot project but rather a government-driven request. The pilot study gave us the opportunity to align and integrate international development efforts to eliminate avoidable blindness with national efforts such as clearing the cataract backlog. The findings helped us to understand the importance of not only sharing resources, but also how better to utilize them. We were able to see the impact of leveraging existing human, financial, infrastructure, and mobilizing resources through integration to implement a cost-efficient project where trachoma, cataract and refractive error were all being addressed.

In addition, this innovative approach helped us to gain community trust which was a win-win for everyone.

How can local communities benefit from the study?

■ **YMD:** Community research provides evidence-based practise to identify areas of strength, weaknesses, opportunities and challenges of the project. So, data collected from TT Plus helped us to serve and respond to community demands better, effectively and more efficiently. Data is also important to communicate with potential donors or funders who are interested in supporting similar initiatives.

Did the study provide any interesting findings?

■ **YMD:** The pilot study was implemented in two different settings (rural and semi-urban areas). The semi urban setting was near to the capital and the hospital was staffed by ophthalmologists. The other hospital was located in a rural area (400km away from the capital) staffed by two cataract surgeons who are trained nurses. The rural hospital was more successful in achieving planned outputs than the semi-urban hospital. Our understanding is that the rural hospital had better patient flow due to a relatively higher patient demand than the urban and near urban residing patients. What we have learned is that the

Children in Afghanistan have their eyes checked

The Fred Hollows Foundation work in Ethiopia supported treatment for Azmera who had bilateral lower lid trachiasis. She had been experiencing pain for six years.

more rural the area, the higher the number of patients and the higher the outputs. So, most of the outputs were achieved by cataract surgeons who are not medical doctors, but nurses who are trained to be surgeons. This was something we did for our trachoma projects and is an approach we will start using in Africa.

What are the key lessons learned from the pilot study?

■ **YMD:** TT Plus provided an integrated system of comprehensive eye health care for communities of high prevalence of trachoma and cataract. The integration component and resource mobilization have strengthened and expanded the existing services' capabilities, thus increasing the quality of the services. We managed most of the patients with trachomatous trichiasis, cataract and refractive errors who sought medical interventions. By the end of the year, more than 24,000 patients were screened for cataract and trachoma and more than 1252 cataract surgeries were performed.

Also, the findings confirmed that mobilizing resources can help provide better access to services for highly affected populations in rural communities, like women, disabled and old-aged groups. The additional cost for integrated TT and cataract surgery was about AED 200 (US$55) per patient.

Is it possible to implement the research study in other healthcare contexts?

■ **YMD:** The evidence-based practice project supported by a pilot study is a must before scaling up comprehensive eye care programming, planning or implementation. The project was successful because the study was piloted in counties with high prevalence of active trachoma. The study confirms that the integration of comprehensive eyecare services and resources is more efficient and beneficial than addressing a single disease. It can be carried out in countries under surveillance, or endemic, for blinding trachoma such as Yemen, Iraq, and Egypt. MEH

George and Alice, siblings from a small village in Kenya, both had successful cataract surgery supported by The Foundation.

The Fred Hollows Foundation

Founded in 1992, The Fred Hollows Foundation is an international development organisation working to eliminate avoidable blindness in more than 25 countries. In 2019, The Foundation performed 646,835 eye operations and treatments; treated 20+ million people with antibiotics for trachoma; trained 68,293 people and; equipped 4,677 facilities. Visit: *www.hollows.org*

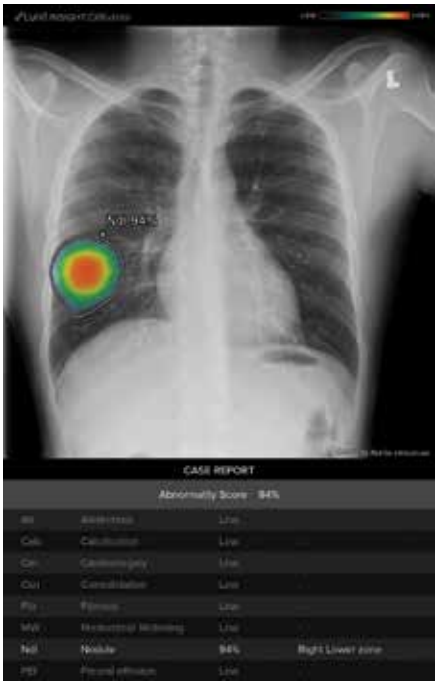
GE Healthcare launches new AI suite to detect chest X-ray abnormalities in effort to speed up diagnosis of pneumonia caused by COVID-19

GE Healthcare has introduced its Thoracic Care Suite, a collection of eight artificial intelligence (AI) algorithms from Lunit Insight CXR to help alleviate clinical strain due to COVID-19. The AI suite quickly analyzes chest x-ray findings and flags abnormalities to radiologists for review, including pneumonia, which may be indicative of COVID-19 as well as tuberculosis, lung nodules, and other radiological findings.

"The launch of our Thoracic Care Suite is a part of GE Healthcare's larger effort to help ensure clinicians and partners on the front lines have the equipment they need to quickly diagnose and effectively treat COVID-19 patients," says Kieran Murphy, President & CEO, GE Healthcare. "The pandemic has proven that data, analytics, AI and connectivity will only become more central to delivering care. For GE Healthcare, that means continuing to advance intelligent health and providing innovative technologies. This new offering is the latest example of how x-ray and AI can uphold the highest standard of patient care amidst the most modern of disease threats."

As the spread of the virus continues – overwhelming radiologists, technologists, and physicians – clinicians continue to need tools to help manage new cases and complications caused by the virus – including pneumonia and acute respiratory distress – which have further increased pressure on radiologists to quickly read chest x-ray exams.

The Thoracic Care Suite harnesses the power of AI to help alleviate these pressures by automatically analyzing images for the presence of eight abnormal radiologic findings, including suspected tuberculosis and pneumonia findings, which can be indicative of COVID-19. Upon reading the flagged report in picture archiving and communication systems (PACS), radiologists can quickly find the abnormality



score for each of the eight possible abnormalities, an image overlay, and a written location description to help expedite diagnosis and treatment.

Thoracic Care Suite provides much needed support to help quickly identify high-risk cases as well as monitor patients showing the progression and regression of mild respiratory symptoms. With 97-99% accuracy rate (Area Under the Curve - AUC), the powerful algorithms behind the AI suite have been trained to detect radiologic findings within seconds. In one study, results showed a 34% reduction in reading time per case .

In addition to detecting pneumonia, Thoracic Care Suite also supports tuberculosis, atelectasis, calcification, cardiomegaly, fibrosis, mediastinal widening, lung nodule, and pleural effusion detection.

Thoracic Care Suite is available to GE Healthcare's thousands of global fixed, mobile and R&F x-ray customers at point of sale, meaning the technology can more quickly be deployed in market and in hospital without the fear of annual fees – an important consideration if a second wave of COVID-19 were to occur. Furthermore, installation of the technology does not require customers to engage with any enterprise IT projects, helping to lower the barrier for entry in adopting AI.

To provide this technology, GE Healthcare partnered with Lunit, a South Korean medical AI software company that develops AI-powered analysis of lung diseases via chest x-ray images. Founded in 2013, Lunit has been recognized for its advanced, state-of-the-art technology and medical imaging applications in international competitions – including ImageNet, TUPAC, and Camelyon – surpassing top companies like Google, IBM, and Microsoft.

- For more information on GE Healthcare's Thoracic Care Suite and COVID-19 solutions visit *www.gehealthcare.com*

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Samsung introduces premium RS85 Prestige ultrasound

Samsung recently released the RS85 Prestige, the latest addition to the company's portfolio of ultrasound systems. The RS85 Prestige was designed for scanning performance and delivers consistent image clarity, depth of penetration and sensitivity to perfusion of blood flow.

Dan Monaghan, Senior Director, Ultrasound at NeuroLogica, commented: "I have been incredibly impressed with the RS85 Prestige's processing power, grey scale and colour quality images, and its features like ShadowHDR that allow higher quality scanning in more difficult-to-image windows.

"Health systems are under increasing pressure to deliver high-quality care, and the RS85 Prestige is a perfect example of a technology that can help meet the high expectations of patients, providers and administrators. The combination of processing speed, leading software and Advanced Intelligence features and performance makes the RS85 Prestige a beneficial addition to a hospital's radiology suite."

At the core of the image quality of the RS85 Prestige is Crystal Architecture™, which combines advanced beamforming (CrystalBeam™), sophisticated image processing (CrystalPure™) and advanced S-Vue Transducers™ to produce clear, uniform, high-resolution images. Additional features include:

ShadowHDR™ - Designed to suppress shadows and enhance the clarity of detailed greyscale images.

TAI™, TSI™ - Provides quantitative tissue attenuation measurement and tissue scatter distribution measurement to assess steatotic liver changes.

LumiFlow™ - Displays a "3D-like" appearance to 2D color Doppler, enhancing spatial comprehension of blood vessels and aiding in the understanding of vessel boundaries.

MV-Flow™ - An advanced Doppler technology providing detailed documentation of microvascular perfusion into tissues and organs.

S-Shearwave Imaging™ - Allows for non-invasive assessment of the stiffness for tissue/lesions in various applications such as breast, liver, MSK and prostate.

- For more information, visit: *www.neurologica.com/rs85-prestige-ultrasound-system*

Abbott announces CE Mark and immediate availability of its COVID-19 laboratory-based antibody test in UAE

Abbott received CE Mark to the IVD Directive (98/79/EC) for its laboratory-based serology blood test for the detection of the antibody, IgG, that identifies if a person has had the novel coronavirus (COVID-19). Antibody testing is an important next step to tell if someone has been previously infected. It will provide more understanding of the virus including how long antibodies stay in the body and if they provide immunity. This type of knowledge could help support the development of treatments and vaccines.

"Abbott has been singularly focused on bringing COVID-19 tests to market as quickly as possible to help address this pandemic," said Mohammad Aburub, Managing Director of Abbott's diagnostics business in Gulf & Levant. "We are proud to be providing our antibody tests immediately as they will help understand who has had the virus, leading to greater confidence as we get back to living life."

Antibody tests to expand testing

While molecular testing detects whether someone has the virus, antibody tests determine if someone was infected.

Abbott's SARS-CoV-2 IgG test identifies the IgG antibody, which is a protein that the body produces in the late stages of infection and may remain up to months and possibly years after a person has recovered. The test demonstrated specificity and sensitivity to detect IgG antibodies of greater than 99 percent 14 days or more after symptoms started.

Abbott's IgG antibody test will initially be available on its ARCHITECT®i1000SR and i2000SR laboratory instruments. ARCHITECT is one of the most widely used laboratory systems in the world and it's been used for decades. Hundreds of these instruments are in use in laboratories throughout UAE. These instruments can run up to 100-200 tests per hour.

Abbott is significantly scaling up its European manufacturing for antibody testing and will expand testing to its Alinity i system. Abbott will also be expanding its laboratory antibody testing to the detection of the antibody, IgM, in the near future. MEH

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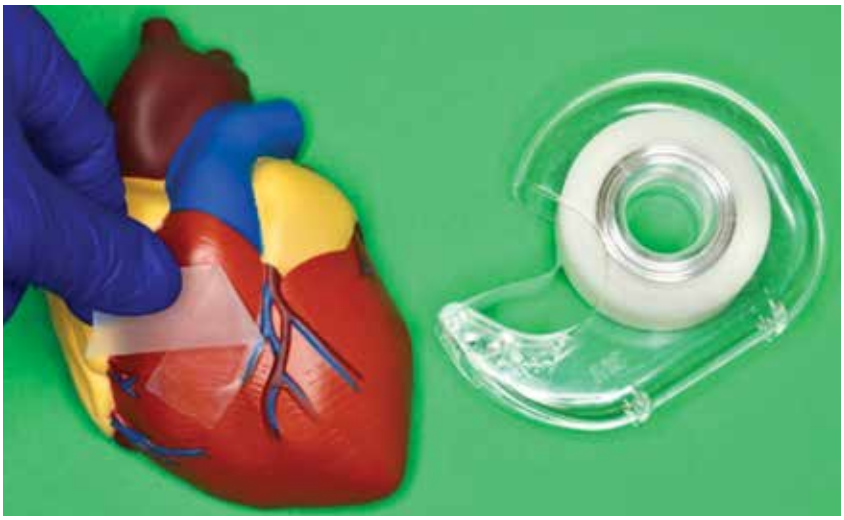
Surgical tape re-engineered to detach on demand



Last year, MIT engineers developed a double-sided adhesive that could quickly and firmly stick to wet surfaces such as biological tissues. They showed that the tape could be used to seal up rips and tears in lungs and intestines within seconds, or to affix implants and other medical devices to the surfaces of organs such as the heart.

Now they have further developed their adhesive so that it can be detached from the underlying tissue without causing any damage. By applying a liquid solution, the new version can be peeled away like a slippery gel in case it needs to be adjusted during surgery, for example, or removed once the tissue has healed.

"This is like a painless Band-Aid for internal organs," says Xuanhe Zhao, professor of mechanical engineering and of civil and environmental engineering at MIT. "You put the adhesive on, and if for any reason you want to take it off, you can do so on-demand, without pain."

The team's new design is detailed in a paper published June 22, 2020 in the Proceedings of the *National Academy of Sciences*.

Unbreakable bonds

In considering designs for their original adhesive, the researchers quickly realized that it is extremely difficult for tape to stick to wet surfaces, as the thin layer of water lubricates and prevents most adhesives from taking hold.

To get around a tissue's natural slipperiness, the team designed their original adhesive out of biocompatible polymers including polyacrylic acid, a highly absorbent material commonly used in diapers and pharmaceuticals, that soaks up water, then quickly forms weak hydrogen bonds with the tissue's surface. To reinforce these bonds, the researchers embedded the material with NHS esters, chemical groups that form stronger, longer-lasting bonds with proteins on a tissue's surface.

While these chemical bonds gave the tape its ultrastrong grip, they were also difficult to break, and the team found that detaching the tape from tissue was a messy, potentially harmful task.

"Removing the tape could potentially create more of an inflammatory response in tissue, and prolong healing," Yuk says. "It's a real practical problem."

Scotch tape for surgeons

To make the adhesive detachable, the team first tweaked the adhesive itself. To the original material, they added a new disulfide linker molecule, which can be placed between covalent bonds with a tissue's surface proteins. The team chose to synthesize this particular molecule because its bonds, while strong, can be easily severed if exposed to a particular reducing agent.

The researchers then looked through the literature to identify a suitable reducing agent that was both biocompatible and able to sever the necessary bonds within the adhesive. They found that glutathione, an antioxidant naturally found in most cells, was able to break long-lasting covalent bonds such as disulfide, while sodium bicarbonate, also known as baking soda, could deactivate the adhesive's shorter-lasting hydrogen bonds.

The team mixed concentrations of glutathione and sodium bicarbonate together in a saline solution, and sprayed the solution over samples of adhesive that they placed over various organ and tissue specimens, including pig heart, lung, and intestines. In all their tests, regardless of how long the adhesive had been applied to the tissue, the researchers found that, once they sprayed the triggering solution onto the tape, they were able to peel the tape away from the tissue within about five minutes, without causing tissue damage.

"That's about the time it takes for the solution to diffuse through the tape to the surface where the tape meets the tissue," Chen says. "At that point, the solution converts this extremely sticky adhesive to just a layer of slippery gel that you can easily peel off."

The researchers also fabricated a version of the adhesive that they etched with tiny channels the solution can also diffuse through. This design should be particularly useful if the tape were used to attach implants and other medical devices. In this case, spraying solution on the tape's surface would not be an option. Instead, a surgeon could apply the solution around the tape's edges, where it could diffuse through the adhesive's channels.

"Our hope is that some day, operating rooms can have dispensers of these adhesives, alongside bottles of triggering solution," Yuk says. "Surgeons can use this like Scotch tape, applying, detaching, and reapplying it on demand."

The team is now checking whether the new adhesive can help repair conditions such as haemorrhages and leaky intestines.

"Our goal is to use bioadhesive technologies to replace sutures, which is a thousands-of-years-old wound closure technology without too much innovation," Zhao says. "Now we think we have a way to make the next innovation for wound closure." MEH

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World's first ready-to-use 'Plug and Play' bionic arm prosthesis implanted in patients

A team from the Clinical Laboratory for Bionic Limb Reconstruction at MedUni Vienna's Department of Surgery has developed the world's first fully integrated bionic arm prosthesis that is ready to use. So far, the so-called 'plug and play' arm has been used in four male patients who have had upper-arm amputations.

The implant allows for bidirectional communication between a prosthetic hand and electrodes implanted in the nerves and muscles of the upper arm and is anchored to the humerus through osseointegration, the process in which bone cells attach to an artificial surface without formation of fibrous tissue.

One of the researchers, Oskar Aszmann, of the Clinical Laboratory for Bionic Limb Reconstruction, explained: "The main advantage of this system, and what makes it a world first, is that all components are directly implanted at the amputation site with a closed control circuit. Information runs into the prostheses and from there back into the brain. Signal transmission from the prosthesis into the stump and via specific nerve interfaces onwards to the person's brain is so detailed that the patient is able to perceive individual fingers of the prosthesis in real time, for example."

Sensors which are incorporated in the prosthesis from MedUni Vienna's commercial partner Otto Bock Healthcare Products are directly coupled to the appropriate neural pathways to create a user-friendly "Plug and Play" system, says Aszmann. In previous bionic reconstructions, some patients needed weeks or months of training before they could use a prosthesis properly, however, use of this device does not require formal training and depends on the intuitive intent of the user to activate movement and sensory feedback from the prosthesis.

Connecting nerves to the prosthesis

A surgical procedure lasting 6-8 hours is required. During this procedure, a titanium implant is placed in the bones on the upper arm and the nerves are wired with a novel system developed together with MIT Harvard and Integrum at Chalmers University in such a way that signals arrive directly in the prosthesis, as it were, and are conducted back again from there. For the first time, this system is self-contained and everything takes place directly in the arm. The battery inserts directly into the prosthesis and can easily be removed in the evening for recharging. Says Aszmann:

"We have developed this system over the past four years and we are also extremely satisfied with the long-term stability of signal transmission," said Aszmann.

In July 2019, shortly after opening of the Clinical Laboratory for Bionic Limb Reconstruction at MedUni Vienna's Department of Surgery, the research group, working with the Alfred Mann Foundation from the USA, successfully managed, for the first time in the world, to implant sensors in three male patients following nerve transfers, to transmit biosignals for wireless control of bionic prostheses. MEH

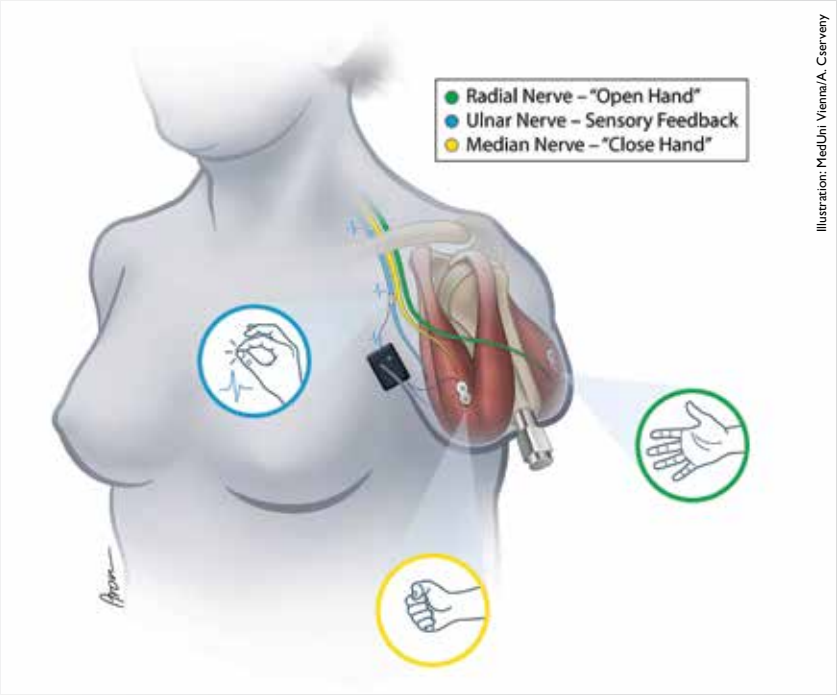

Illustration: MedUni Vienna/A. Cserveny

This implant, for the first time, allows for bidirectional communication between a prosthetic hand and electrodes implanted in the nerves and muscles of the upper arm and was anchored to the humerus through osseointegration.

Reference:
Self-contained Neuromusculoskeletal Arm Prostheses. Max Ortiz Catalan, Enzo Mastinu, Paolo Sassu, Oskar Aszmann and Rickard Branemark. N Engl J Med 2020;382:1732-8.
doi: 10.1056/NEJMoa1917537.

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