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July - August 2021

Energetic kids

Study shows activity reduces adiposity-induced low-grade inflammation

Vegan children

Researchers find metabolism significantly altered – vitamin supplements recommended

150 organ transplants

A significant milestone for Cleveland Clinic Abu Dhabi

In the News

- WHO issues new recommendations on human genome editing
- Caesarean section rates continue to rise globally
- Diabetes remission diet also lowers blood pressure, reduces need for medication
- Arab participation in global genomic study could lead to new therapies for Covid-19

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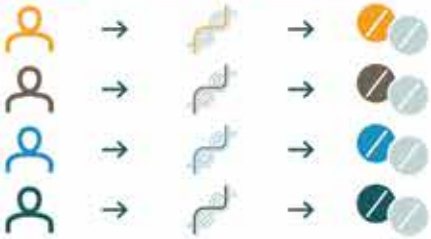

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WHO Digital Health Technical Advisory Group (DHTAG) Roster of Experts
World Health Organization

Dr. Dirk Richter
Senior Advisor, Director Health Sector Innovation,
Abu Dhabi Department of Health

Dipak Kalra
President
The European Institute for Innovation through Health Data

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Prognosis

Productive, despite pandemic

The Arab Health exhibition appears to have gone well, considering it was delayed due to the pandemic and while most of the world is still grappling with it. Speaking to a number of attendees at the show, most of them said that although attendance was understandably down compared to previous years, the 'quality' of visitors was better. I guess this is because those who made the effort to attend had a clear interest in doing business, rather than simply going for a look-see. The organisers also introduced an additional virtual format to the event which they say introduced a number of foreign visitors – albeit virtually – to the show for the first time. However, speaking to exhibitors, it is clear that the face-to-face format is better for doing business. Read the Arab Health review in this issue.

Also in this issue, in our focus on paediatrics, we report on a study by researchers at the University of Helsinki who looked at the metabolic effects of a vegan diet in children. As veganism grows in popularity around the world, the study comes as warning to parents of vegan children that their metabolism can be significantly altered and that their diets should be supplemented with vitamin B12, vitamin D and iodine, which are lacking in vegan food. They add that supplementary calcium, vitamin B2, iron and zinc may also be needed.

Another paediatric study we look at comes out of Finland, where researchers have found that brisk and vigorous physical activity in children can curb adiposity-induced low-grade inflammation. They note that long-lasting, low-grade inflammation increases the risk for type 2 diabetes and cardiovascular diseases.

Congratulations are in order for Cleveland Clinic Abu Dhabi which has recently reached a significant milestone – 150 organ transplants. This landmark is magnificent sign of the tremendous progress in healthcare in the UAE over the past several years.

As in each issue we have a range of news and reviews to keep you informed of some of the latest developments in healthcare.

Be sure to keep a check on our newly enhanced website where we continue to post informative healthcare articles for your interest – *www.MiddleEastHealth.com*

And let us know your thoughts by dropping an email to the editor.

Callan Emery
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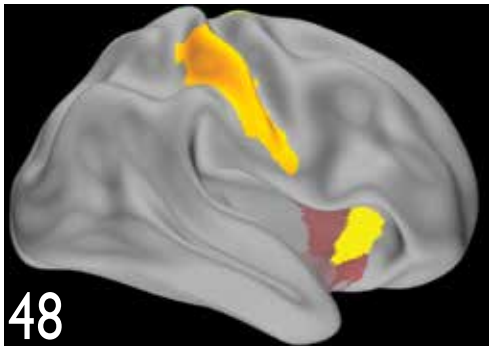

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middle east monitor

Update from around the region

Sheikh Shakhbout Medical City

SEHA integrates haematology, oncology services from Sheikh Khalifa Medical City with Sheikh Shakhbout Medical City

Abu Dhabi Health Services Company, (SEHA), the UAE's largest healthcare network, is strengthening its Group Practice Model by integrating adult haematology and oncology services from Sheikh Khalifa Medical City (SKMC), a flagship tertiary hospital in the UAE and the largest teaching medical center in Abu Dhabi, with Sheikh Shakhbout Medical City (SSMC), one of the UAE's largest hospitals for serious and complex care and a joint-venture partnership between SEHA and Mayo Clinic.

SEHA's new comprehensive Hematology and Oncology centre, located at SSMC, will combine the legacy of SKMC and international expertise of SSMC to provide patients with unparalleled standards of healthcare delivery and enhance patient access to primary and specialty care across specialties.

By adopting a Group Practice Model, SEHA is leveraging the scale and comprehensive expertise of its network to ensure widespread access to expert care for patients and a culture of knowledge-sharing that allows professionals to work closer as one cohesive team, leveraging each other's strengths and capabilities.

Dr. Tarek Fathey, Group Chief Executive Officer, SEHA, said: "SEHA's ultimate vision is to provide the highest quality of care and services to the people of the UAE and the wider region. As we support the UAE leadership's ambition of transforming the healthcare industry to deliver best-in-class treatment services, incorporating the latest technology and innovation, we have a clear strategy that includes streamlining services across facilities, improving efficiencies, and creating renowned centres for the provision of specialist and holistic care. This is an integral part of our journey towards the future in establishing a modern, progressive network fit for the next 50 years and beyond.

"By adopting a comprehensive, integrated and collaborative approach, haematology and oncology patients will now receive multidisciplinary care with a more pronounced focus on talent acquisition and treatment methods through our partners at Mayo Clinic, to elevate the patient experience and ensure a seamless continuum of care."

As part of the service line integration, SSMC's haematology and oncology department will expand to include a 30-bed inpatient unit, 8-bed apheresis unit, and a new division of transfusion services.

The only haematology-centric fellowship program in the UAE, which was formally offered at SKMC, is also being transferred to SSMC. The department will also be establishing a comprehensive Stem Cell Transplant Center at SSMC.

Dr. Naser Ammash, Chief Executive Officer, SSMC, said: "SSMC is accelerating full speed towards its mission of setting new benchmarks for medical care and treatment in the Emirates and the wider region. At the heart of our mission is patient care, and in efforts to respond to the country's haematology and oncology needs, we are pleased to join forces with SKMC's remarkable talent and expertise to strengthen the network's collective offerings to patients, adding to the mix Mayo Clinic's world renowned prowess.

"We are steadfast in our promise to build the capital's future Life-Science and Innovation hub that involves significant advancements in medical practice supported by research and medical education. By uniting SEHA's powerful network and Mayo Clinic's international expertise, we are reinforcing our focus on SSMC's strategic priorities and inching closer towards our collective overarching vision of establishing the next Mayo Clinic destination medical centre in Abu Dhabi for the care of the most complex and seriously ill patients."

Following the integration of services, SSMC will provide extracorporeal photopheresis (ECP) cancer treatment and care for acute haematology and leukaemia. The hospital's Hematology and Oncology Department, led by Dr. Shahrukh Hashmi, Department Chair of Hematology & Oncology and former Director of BMT LTFU/Survivorship Clinic at Mayo Clinic, Minnesota, will offer an interdisciplinary range of services and treatments in one location and with best-in-class expertise.

UAE's MoHAP, EHS launch International Telemedicine Service under Visiting Consultants Program

The UAE Ministry of Health and Prevention (MoHAP) and the Emirates Health Services (EHS) have launched an International Telemedicine Service, which falls within both entities' plans to develop a Visiting Consultants Program and help patients and doctors get remote 2nd opinion consultations in critical conditions.

UAE citizens can use the new service when visiting their attending physicians at any of the 16 hospitals where a doctor from outside the country is visually contacted to take medical advice. Accordingly, information on the patients' visits shall be recorded and regularly updated on the system by the ministry's and EHS's doctors.

Dr. Mohammed Salim Al Olama, MoHAP Undersecretary and Chairman of the Board of Directors of the Emirates Health Services (EHS) noted that the International Telemedicine Service falls within the ministry's and EHS's efforts to speed up the transition to digital health technologies, implement innovative models in preventive health practices, and enhance the telemedicine service in order to reduce infection, provide innovative solutions and services, and benefit from the medical expertise brought in by the Remote Visiting Doctors Program.

Dr. Sultan Ahmed Al-Sharif, Director of the Visiting Consultants Office, said that the international telemedicine service allows patients to utilize the medical expertise of consultants from several countries across the world. He hailed the sophisticated technology infrastructure of the hospitals, adding that the new telemedicine service will provide a preliminary diagnosis and healthcare consultations in coordination with medical teams of MoHAP using medical apps on smartphones and other AI-based tools.

He noted that the decision to resume the Visiting Consultants Programme amid the prevailing Covid-19 challenges aims to mitigate the suffering of patients and improve their quality of life. It will also help in reducing the burden of their traveling abroad for medical services, he added.

Dr. Sharif noted that the service aims primarily to provide diagnostic and therapeutic services to patients and boost the capacities of medical teams of the hospitals. The service focuses on the most-needed medical specialties to meet patients' needs, using an digital platform that was designed to enable the seamless exchange of data between various internal systems, in full compliance with patient confidentiality and digital safety standards.

Cleveland Clinic Abu Dhabi reaches 150 organ transplant milestone

Cleveland Clinic Abu Dhabi has reached a milestone of performing more than 150 transplants since the introduction of its multi-organ transplant program in 2017.

The UAE's sole multi-organ transplant centre, Cleveland Clinic Abu Dhabi performed the UAE's first heart, liver, lung and pancreas transplants. In addition, the hospital's transplant centre recently began performing complex dual transplant surgeries, a first in the UAE. Cleveland Clinic Abu Dhabi has now performed 82 kidney transplants, 52 liver transplants, 10 heart transplants, 6 lung transplants, 3 combined pancreas and kidney transplants and a combined kidney and liver transplant.

"It is humbling to see the life-changing impact our transplant program has had on patients and their families across the UAE. That we have reached this 150 transplant milestone during Cleveland Clinic's centennial year is a fantastic acknowledgement of the legacy of innovation and patient-centred care we are continuing here in Abu Dhabi. When we opened our doors just five years ago, we couldn't have imagined our transplant program would have touched so many lives this quickly," said Dr. Bashir Sankari, Director of Cleveland Clinic Abu Dhabi's transplant program.

Despite growing numbers of registered organ donors, demand continues to outpace supply and there remains a long waiting list of patients who require a transplant. In order to mitigate the impact of this and offer a fresh lifeline to patients waiting for a new liver, the hospital's multidisciplinary transplant team worked with their colleagues at Cleveland Clinic in the United States to introduce complex living related liver transplants that enable relatives to donate part of their liver to family members in need.

The introduction of living related liver donation has meant that 22 patients have been able to access life-saving transplants without needing to wait for a compatible donor organ to become available. The impact of this introduction has spread beyond the UAE, with patients travelling from abroad to access living related transplant services. Recently, a 14-year-old patient travelled to Abu Dhabi from Sudan so that he could receive part of his brother's liver.

"The introduction of living related liver donation has been a huge boost to some of the country's sickest patients. We are building on that success with the introduction of combined organ transplants that see patients receive two new organs in a single surgery. We are very proud to be among just a handful of centres in the world able to offer this highly complex level of care that has the ability to completely transform a patient's life, particularly when a pancreas transplant frees a patient from the need for daily insulin injections," said Dr. Luis Campos, director of the liver transplant program and head of hepatobiliary surgery at Cleveland Clinic Abu Dhabi.

Mubadala Health to acquires 60% stake United Eastern Medical Services

Mubadala Health, the integrated healthcare network of Mubadala Investment Company, has acquired a 60% stake in United Eastern Medical Services (UEMedical) from Jadwa Investment and United Eastern Group (UEG). UEMedical owns and operates multiple hospitals and clinics specializing in women's health, family medicine, paediatrics, fertility, eye care, dentistry and dermatology in the UAE and Saudi Arabia.

Through this acquisition, Mubadala Health adds Danat Al Emarat Hospital for Women & Children; the HealthPlus Network of Specialty Centers; HealthPlus Fertility, the largest IVF provider in the region; Moorfields Eye Hospital Abu Dhabi; and a stake in Al Meswak Dental Group to its network. The new services added to the Mubadala Health network include fertility & IVF, obstetrics, neonatology, and paediatric subspecialties.

Hasan Jasem Al Nowais, Chief Executive Officer of Mubadala Health, said: "Over the past decade, UEMedical has witnessed tremendous growth and success, operating facilities that have raised the bar in patient care across multiple specialties. This acquisition enhances Mubadala Health's network in the UAE and the wider GCC region, while demonstrating our unwavering commitment to transforming the regional healthcare landscape by delivering a full range of healthcare services covering every phase of a patient's life."

Ahmed Ali Al-Shorafa Al-Hammadi, Managing Director of UEG, added: "As founders of UEMedical, we are proud of what UEMedical represents, and of our role in the evolution of the health sector through well-established accredited hospitals and clinics in various specialties. While it is not easy to exit what we have built, I believe Mubadala Health provides the best ecosystem to allow it to flourish. We wish Mubadala Health all the success in achieving their vision of a world-class healthcare ecosystem in the region."

The transaction is anticipated to close by September 2021. Mubadala Health's network currently includes Cleveland Clinic Abu Dhabi, Healthpoint, Imperial College London Diabetes Centre, Amana Healthcare, National Reference Laboratory, Capital Health Screening Centre, and Abu Dhabi Telemedicine Centre. Following completion, Mubadala Health's portfolio will include more than 10,000 world-class caregivers delivering 100+ service lines across 15 prominent healthcare providers in the UAE and Saudi Arabia.

KSA's International Medical Centre to unify EMR with cloud-based platform

The International Medical Center (IMC), a leading multi-disciplinary hospital and the first member of the Mayo Clinic Care Network in Saudi Arabia, has launched a project to unify its electronic medical record system across its facilities in Jeddah using InterSystems TrakCare.

TrakCare will be implemented in IMC Hospital, Petro Rabigh Clinic, The First Clinic, Tadawi Center, and First Scan.

The Electronic Medical Record (EMR) project kick-off was announced during a ceremony at the Ritz-Carlton hotel in Jeddah in June.

"We are committed to delivering patient care the IMC way, with empathy, compassion, mercy, and divine ethics. We see this technology advancement as an enhancement to our core values. This will enhance the patient care abilities of our caregivers and significantly improve the patient experience. We aim to adopt global best practices and standardize patient care using this robust and proven EMR," said Dr Walid Fitaihi, CEO & Chairman of International Medical Center.

Dr Khalid Alem, Deputy CEO of IMC, commented: "It will be an exciting journey

for us to adopt the new EMR. TrakCare will enhance IMC's cloud footprint in line with the Kingdom of Saudi Arabia's cloud-first strategy, as we will become the first hospital to use cloud-based EMR. This also will support us with our future growth and expansion programs. The standardization of EMR is critical for this project's success as it strikes a perfect balance between optimum technology and enhanced patient care."

TrakCare, with its unified Revenue Cycle Management and clinical capabilities, will automate the hospital operations and enable IMC to deliver quality patient care and improve customer satisfaction profitably. Furthermore, TrakCare has recently added a mobile, touchscreen-enabled user interface to optimize the user experience and other enhancements that support better healthcare decision making.

IMC will implement "TrakCare as a Service", which is a private cloud-based healthcare information system that follows an OPEX model based on subscriptions. TrakCare will integrate IMC's administrative, clinical and financial data into a unified system, providing clinicians everything they need to make informed decisions quickly. Furthermore, the cloud-hosted EMR service will enable IMC to achieve their clinical and financial goals without making major upfront capital expenditure. It will also free IMC staff members from the burden of recordkeeping, offering them the freedom to focus on what they do best – delivering quality patient care, while entrusting InterSystems with their EMR landscape. MEH

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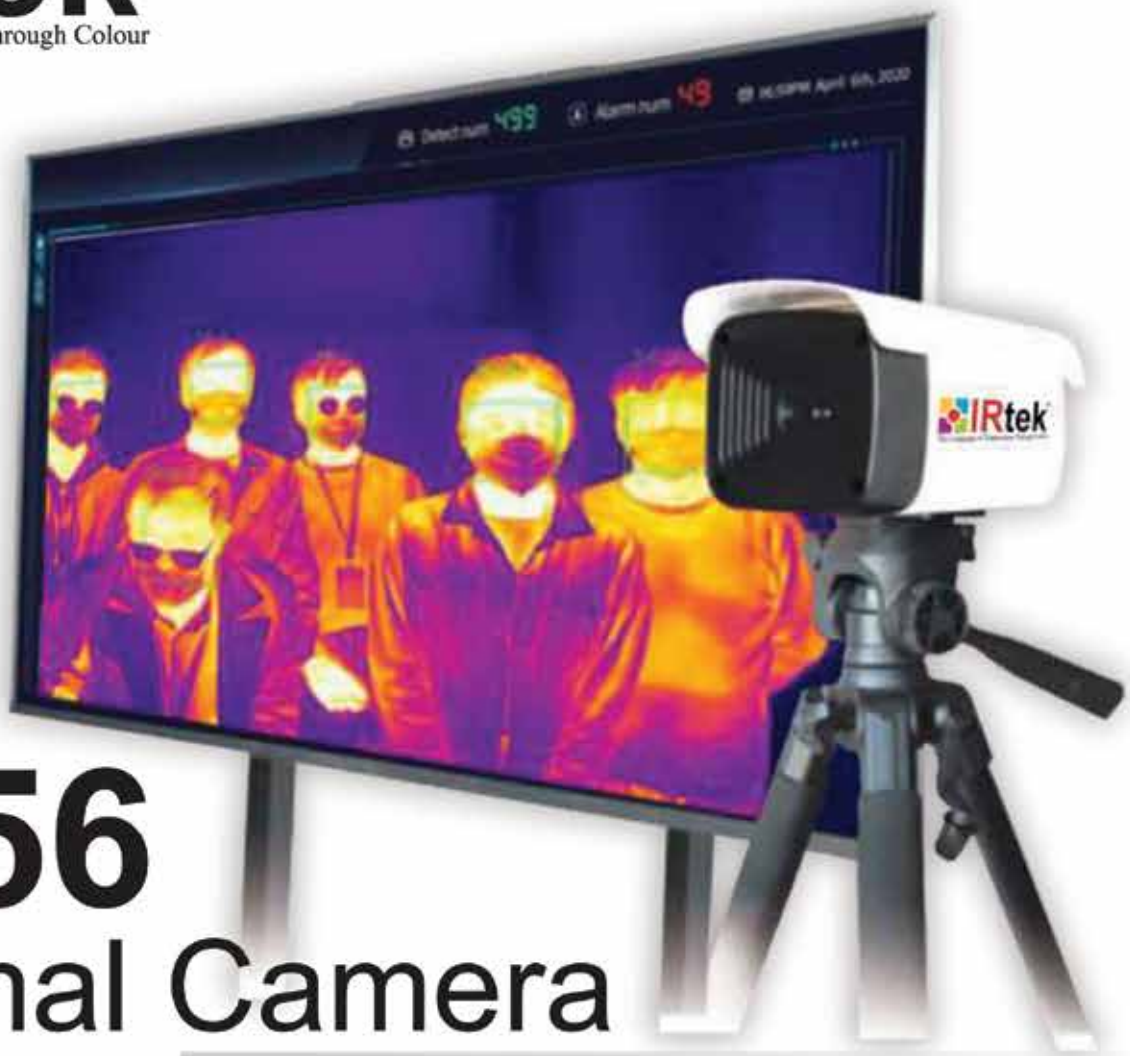

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worldwide monitor

Update from around the globe

WHO's first global report on AI in healthcare includes guiding principles

Artificial Intelligence (AI) holds great promise for improving the delivery of healthcare and medicine worldwide, but only if ethics and human rights are put at the heart of its design, deployment, and use, according to new WHO guidance published June 28.

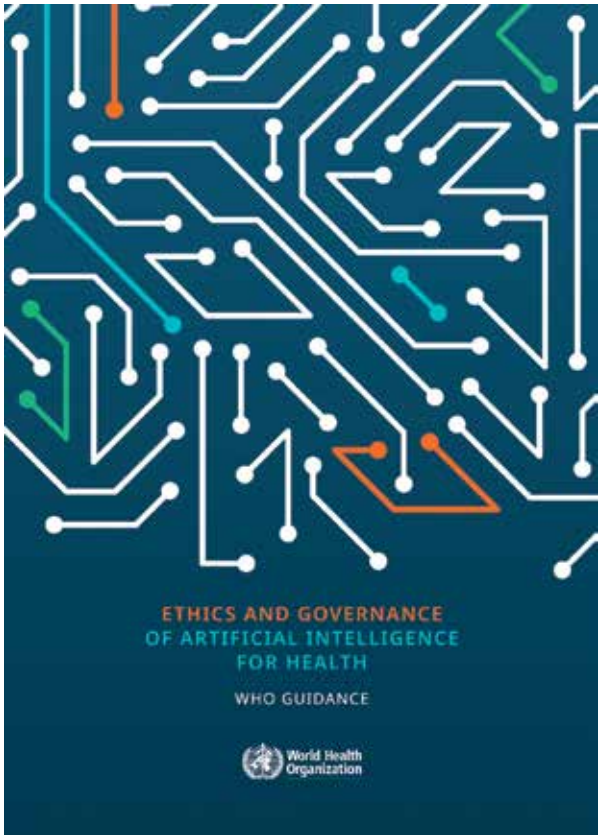
The report, *Ethics and governance of artificial intelligence for health*[1], is the result of two years of consultations held by a panel of international experts appointed by WHO.

"Like all new technology, artificial intelligence holds enormous potential for improving the health of millions of people around the world, but like all technology it can also be misused and cause harm," said Dr Tedros Adhanom Ghebreyesus, WHO Director-General. "This important new report provides a valuable guide for countries on how to maximize the benefits of AI, while minimizing its risks and avoiding its pitfalls."

Artificial intelligence can be, and in some wealthy countries is already being used to improve the speed and accuracy of diagnosis and screening for diseases; to assist with clinical care; strengthen health research and drug development, and support diverse public health interventions, such as disease surveillance, outbreak response, and health systems management.

AI could also empower patients to take greater control of their own health care and better understand their evolving needs. It could also enable resource-poor countries and rural communities, where patients often have restricted access to healthcare workers or medical professionals, to bridge gaps in access to health services.

However, WHO's new report cautions against overestimating the benefits of AI for health, especially when this occurs at the expense of core investments and strategies required to achieve universal health coverage.



It also points out that opportunities are linked to challenges and risks, including unethical collection and use of health data; biases encoded in algorithms, and risks of AI to patient safety, cybersecurity, and the environment.

For example, while private and public sector investment in the development and deployment of AI is critical, the unregulated use of AI could subordinate the rights and interests of patients and communities to the powerful commercial interests of technology companies or the interests of governments in surveillance and social control.

The report also emphasizes that systems trained primarily on data collected from individuals in high-income countries may not perform well for individuals in low- and middle-income settings.

AI systems should therefore be carefully designed to reflect the diversity of socio-economic and healthcare settings. They should be accompanied by training in digital skills, community engagement and awareness-raising, especially for millions of healthcare workers who will require digital literacy or retraining if their roles and functions are automated, and who must contend with machines that could challenge the decision-making and autonomy of providers and patients.

Ultimately, guided by existing laws and human rights obligations, and new laws and policies that enshrine ethical principles, governments, providers, and designers must work together to address ethics and human rights concerns at every stage of an AI technology's design, development, and deployment.

To limit the risks and maximize the opportunities intrinsic to the use of AI for health, WHO provides the following principles as the basis for AI regulation and governance:

1. **Protecting human autonomy:** In the context of health care, this means that humans should remain in control of health-care systems and medical decisions; privacy and confidentiality should be protected, and patients must give valid informed consent through appropriate legal frameworks for data protection.

2. **Promoting human well-being and safety and the public interest.** The designers of AI technologies should satisfy regulatory requirements for safety, accura-

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cy and efficacy for well-defined use cases or indications. Measures of quality control in practice and quality improvement in the use of AI must be available.

3. **Ensuring transparency, explainability and intelligibility.** Transparency requires that sufficient information be published or documented before the design or deployment of an AI technology. Such information must be easily accessible and facilitate meaningful public consultation and debate on how the technology is designed and how it should or should not be used.

4. **Fostering responsibility and accountability**. Although AI technologies perform specific tasks, it is the responsibility of stakeholders to ensure that they are used under appropriate conditions and by appropriately trained people. Effective mechanisms should be available for questioning and for redress for individuals and groups that are adversely affected by decisions based on algorithms.

5. **Ensuring inclusiveness and equity.** Inclusiveness requires that AI for health be designed to encourage the widest possible equitable use and access, irrespective of age, sex, gender, income, race, ethnicity, sexual orientation, ability or other characteristics protected under human rights codes.

6. **Promoting AI that is responsive and sustainable**. Designers, developers and users should continuously and transparently assess AI applications during actual use to determine whether AI responds adequately and appropriately to expectations and requirements. AI systems should also be designed to minimize their environmental consequences and increase energy efficiency. Governments and companies should address anticipated disruptions in the workplace, including training for health-care workers to adapt to the use of AI systems, and potential job losses due to use of automated systems.

References

[1] WHO: Ethics and governance of artificial intelligence for health *https://www.who.int/publications/i/item/9789240029200*

Caesarean section rates continue to rise globally

According to new research[1] from the World Health Organization (WHO), caesarean section use continues to rise globally, now accounting for more than 1 in 5 (21%) of all childbirths. In five countries (Dominican Republic, Brazil, Cyprus, Egypt and Turkey), caesarean sections now outnumber vaginal deliveries.

This number is set to continue increasing over the coming decade, with nearly a third (29%) of all births likely to take place by caesarean section by 2030, the research finds.

While a caesarean section can be an essential and lifesaving surgery, it can put women and babies at unnecessary risk of short- and long-term health problems if performed when there is not medical need.

"Caesarean sections are absolutely critical to save lives in situations where vaginal deliveries would pose risks, so all health systems must ensure timely access for all women when needed," said Dr Ian Askew, Director of WHO's Department of Sexual and Reproductive Health and Research and the UN joint programme, HRP[2]. "But not all the caesarean sections carried out at the moment are needed for medical reasons. Unnecessary surgical procedures can be harmful, both for a woman and her baby."

Caesarean sections can be essential in situations such as prolonged or obstructed labour, foetal distress, or because the baby is presenting in an abnormal position. However, as with all surgeries, they can have risks. These include the potential for heavy bleeding or infection, slower recovery times after childbirth, delays in establishing breastfeeding and skin-to-skin contact, and increased likelihood of complications in future pregnancies.

There are significant discrepancies in a woman's access to caesarean sections, depending on where in the world she lives. In the least developed countries, about 8% of women gave birth by caesarean section with only 5% in sub-Saharan Africa, indicating a concerning lack of access to this lifesaving surgery.

Conversely, in Latin America and the Caribbean, rates are as high as 4 in 10 (43%) of all births.

Worldwide caesarean section rates have risen from around 7% in 1990 to 21% today, and are projected to continue increasing over this current decade. If this trend continues, by 2030 the highest rates are likely to be in Eastern Asia (63%), Latin America and the Caribbean (54%), Western Asia (50%), Northern Africa (48%) Southern Europe (47%) and Australia and New Zealand (45%), the research suggests.

Causes of high caesarean section usage vary widely between and within countries. Drivers include health sector policies and financing, cultural norms, perceptions and practices, rates of preterm births, and quality of healthcare.

Rather than reczommending specific target rates, WHO underscores the importance of focusing on each woman's unique needs in pregnancy and childbirth.

"It's important for all women to be able to talk to healthcare providers and be part of the decision making on their birth, receiving adequate information including the risks and benefits. Emotional support is a critical aspect of quality care throughout pregnancy and childbirth," said Dr Ana Pilar Betran, Medical Officer at WHO and HRP.

WHO recommends some non-clinical actions that can reduce medically unnecessary use of caesarean sections, within the overall context of high quality and respectful care:

- Educational interventions that engage women actively in planning for their birth such as childbirth preparation workshops, relaxation programmes and psychosocial support where desired, for those with fear of pain or anxiety. Implementation of such initiatives should include ongoing monitoring and evaluation.
- Use of evidence-based clinical guidelines, performing regular audits of caesarean section practices in health facilities, and providing timely feedback

to health professionals about the findings.

- Requirement for a second medical opinion for a caesarean section decision in settings where this is possible.
- For the sole purpose of reducing caesarean sections, some interventions have been piloted by some countries but require more rigorous research:

– A collaborative midwifery-obstetrician model of care, for which care is provided primarily by midwives, with 24-hour back-up from a dedicated obstetrician

– Financial strategies that equalize the fees charged for vaginal births and caesarean sections.

References

[1] Trends and projections of caesarean section rates: global and regional estimates. BMJ Global Health *https://gh.bmj.com/content/6/6/e005671.full*

[2] UNDP-UNFPA-UNICEF-WHO-World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP)

Researchers assemble comprehensive RNA-atlas

Together with Baylor College of Medicine and the world's leading sequencing company, Illumina, researchers at Ghent University have built one of the most comprehensive catalogues of the human transcriptome ever. By cleverly combining complementary sequencing techniques they have deepened our understanding of the function of known RNA molecules and discovered thousands of new RNAs. A better understanding of our transcriptome is essential to better understand disease processes and uncover novel genes that may serve as therapeutic targets or biomarkers.

The article 'The RNA Atlas expands the catalog of human non-coding RNAs', published in Nature Biotechnology, is the result of more than five years of work to further unravel the complexity of the human transcriptome. Never before has such a comprehensive effort been undertaken to characterize all RNA-molecules in human cells and tissues.

Our transcriptome is – analogous to our genome – the sum of all RNA molecules that are transcribed from the DNA strands that make up our genome. However, there's no 1-on-1 relationship with the latter. Firstly, each cell and tissue has a unique transcriptome, with varying RNA production and compositions, including tissue-specific RNAs. Secondly, not all RNAs are transcribed from typical – protein coding – genes that eventually produce proteins. Many of our RNA molecules are not used as a template to build proteins, but originate from what once was called junk DNA: long sequences of DNA with unknown functions.

These non-coding RNAs (ncRNAs) come in all kinds of shapes and sizes: short, long, and even circular RNAs. Many of them even lack the tail of adenine-molecules that is typical for protein-coding RNAs.

"There have been other projects to catalogue our transcriptome but the RNA-Atlas project is unique because of the applied sequencing methods," commented Prof. Pieter Mestdagh from the Center for Medical Genetics at Ghent University. "Not only did we look at the transcriptome of as many as 300 human cell and tissue types, but most importantly, we did so with three complementary sequencing technologies, one aimed at small RNAs, one aimed at polyadenylated (polyA) RNAs and a technique called total RNA sequencing."

All data, analyses and results (equivalent to a few libraries of information) are available for download and interrogation in the R2 web portal, enabling the community to implement this resource as a tool for exploration of non-coding RNA biology and function.

Prof. Pavel Sumazin of the Baylor College of Medicine, said: "By combining all data in one comprehensive catalogue, we have created a new valuable resource for biomedical scientists around the world studying disease processes. A better understanding of the complexity of the transcriptome is indeed essential to better understand disease processes and uncover novel genes that may serve as therapeutic targets or biomarkers. The age of RNA therapeutics is swiftly rising – we've all witnessed the impressive creation of RNA vaccines, and already the first medicines that target RNA are used in the clinic. I'm sure we'll see lots more of these therapies in the next years and decades."

- View the R2 RNA Atlas: https://hgserver1.amc.nl

Reference

Lucia Lorenzi, Hua-Sheng Chiu et al. The RNA Atlas expands the catalog of human non-coding RNAs. Nature Biotechnology. 2021. https://doi.org/10.1038/s41587-021-00936-1

Federation of Royal Colleges of Physicians approves UpToDate clinical decision support for CPD

UpToDate, the clinical decision support tool from Wolters Kluwer, Health has been approved by the Federation of the Royal Colleges of Physicians of the United Kingdom as a continuing professional development (CPD) activity. The organization is a collaboration between the Royal College of Physicians of London, Royal College of Physicians of Edinburgh, and Royal College of Physicians and Surgeons of Glasgow. The colleges have more than 50,000 members among them worldwide. The approval of UpToDate comes following new guidelines introduced by the Federation that recognize the use of online resources with current medical content (e-libraries) as CPD.

Members will now be able to earn and track credits eligible for continuing professional development while using UpToDate to research clinical questions at the point of care. CPD credits are earned from UpToDate by consulting information relevant to a specific clinical question, thus broadening clinical knowledge.

UpToDate will provide physicians and surgeons with quick and easy access to evidence-based clinical topics and

recommendations. CPD credits can be earned through UpToDate anytime, anywhere, on desktop or mobile devices. According to research of UpToDate use in 2020, 1 in 4 clinicians (26%) in the UK and Ireland changed their course of action to a more appropriate treatment or diagnosis after consulting UpToDate.

Alaa Darwish, country manager – Middle East, Turkey and Africa, Clinical Effectiveness, Wolters Kluwer, Health, said: "With many UK-trained clinicians delivering healthcare services in the Middle East, UpToDate provides an invaluable resource for supporting evidence-based learning and meeting CPD requirements of the Federation of the Royal Colleges of Physicians of the United Kingdom as they care for patients."

UpToDate from Wolters Kluwer contains over 12,000 clinical topics and more than 9,500 graded recommendations to support better clinical decisions at the point of care. A rigorous editorial process is implemented by 50 physician editors on staff who work with over 7,300 expert authors, editors, and peer-reviewers from 50 countries around the world to continuously publish evidence-based clinical information and recommendations.

WHO issues new recommendations on human genome editing

Two new companion reports[1] released July 12 by the World Health Organization (WHO) provide the first global recommendations to help establish human genome editing as a tool for public health, with an emphasis on safety, effectiveness and ethics.

The forward-looking new reports result from the first broad, global consultation looking at somatic, germline and heritable human genome editing. The consultation, which spanned over two years, involved hundreds of participants representing diverse perspectives from around the world, including scientists and researchers, patient groups, faith leaders and indigenous peoples.

"Human genome editing has the potential to advance our ability to treat and cure disease, but the full impact will only be realized if we deploy it for the benefit of all people, instead of fuelling more health inequity between and within countries," said Dr Tedros Adhanom Ghebreyesus, WHO Director-General.

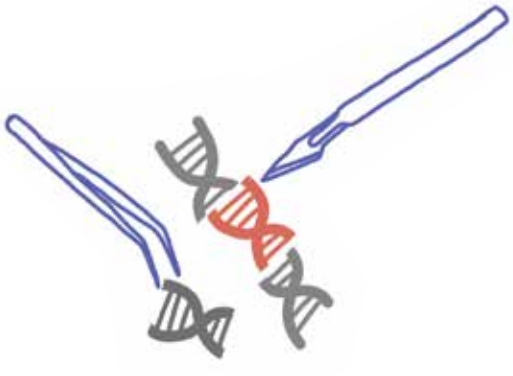
Potential benefits of human genome editing include faster and more accurate diagnosis, more targeted treatments and prevention of genetic disorders. Somatic gene therapies, which involve modifying a patient's DNA to treat or cure a disease, have been successfully used to address HIV, sickle-cell disease and transthyretin amyloidosis. The technique could also vastly improve treatment for a variety of cancers.

However, some risks exist, for example, with germline and heritable human genome editing, which alter the genome of human embryos and could be passed on to subsequent generations, modifying descendants' traits.

The reports deliver recommendations on the governance and oversight of human genome editing in nine discrete areas, including human genome editing registries; international research and medical travel; illegal, unregistered, unethical or unsafe research; intellectual property; and education, engagement and empowerment. The recommendations focus on systems-level improvements needed to build capacity in all countries to ensure that human genome editing is used safely, effectively, and ethically.

The reports also provide a new governance framework that identifies specific tools, institutions and scenarios to illustrate practical challenges in implementing, regulating and overseeing research into the human genome. The governance framework offers concrete recommendations for dealing with specific scenarios such as:

- A hypothetical clinical trial of somatic human genome editing for sickle cell disease proposed to take place in West Africa



- Proposed use of somatic or epigenetic genome editing to enhance athletic performance
- An imaginary clinic based in a country with minimal oversight of heritable human genome editing that offers these services to international clients following in vitro fertilization and preimplantation genetic diagnosis

"These new reports from WHO's Expert Advisory Committee represent a leap forward for this area of rapidly emerging science," said Dr Soumya Swaminathan, WHO's Chief Scientist. "As global research delves deeper into the human genome, we must minimize risks and leverage ways that science can drive better health for everyone, everywhere."

Going forward, WHO will:

- Convene a small expert committee to consider next steps for the Registry, including how to better monitor clinical trials using human genome editing technologies of concern
- Convene multisector stakeholders to develop an accessible mechanism for confidential reporting of concerns about possibly illegal, unregistered, unethical and unsafe human genome editing research and other activities
- As part of a commitment to increase 'education, engagement and empowerment', lead regional webinars focusing on regional/local needs. Work within the Science Division to consider how to build an inclusive global dialogue on frontier technologies, including cross-UN working and the creation of web-based resources for reliable information on frontier technologies, including human genome editing.

Reference

[1] *https://www.who.int/publications/i/item/9789240030381*

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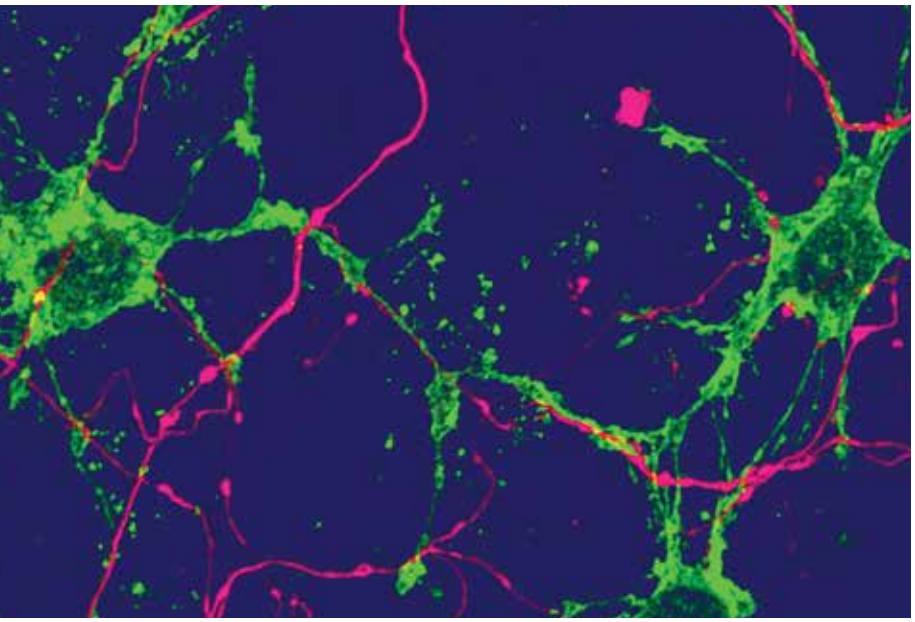

(Image: University of Basel, Biozentrum)

New type of glia cell (green), arising from adult stem cells in the brain, contact nerve cells (magenta)

New glial cells discovered in the brain: Implications for brain repair

Neurons, nerve cells in the brain, are central players in brain function. However, a key role for glia, long considered support cells, is emerging. A research group at the University of Basel has now discovered two new types of glial cells in the brain, by unleashing adult stem cells from their quiescent state. These new types of glia may play an important role in brain plasticity and repair.

The brain is malleable well into adulthood. Brain plasticity is not only due to the formation of new nerve connections. Stem cells present in the adult brain also generate new nerve cells. For more than a hundred years, scientists have concentrated on investigating different types of nerve cells.

In the brain, however, another class of cells, called glia, are also essential for brain function. However, the importance of glial cells has been underestimated for decades. How many types of glia there are, how they develop and what roles they play are all still largely unexplored.

Stem cells – unleashed from quiescence

The research group of Prof. Fiona Doetsch at the Biozentrum of the University of Basel is investigating stem cells in the ventricular-subventricular zone in the adult mouse brain. In this region, many of the stem cells are in a quiescent state, sensing signals in the environment that stimulate them to awaken and transform into new nerve cells.

In their study in the journal Science, Doetsch's team identified a molecular signal that awakened the stem cells from their quiescent state, allowing them to uncover multiple domains that give rise to glial cells in this stem cell reservoir.

Stem cells – birthplace of glial cells

"We found an activation switch for quiescent stem cells," Doetsch explains. "It is a receptor that maintains the stem cells in their resting state. We were able to turn off this switch and thus activate the stem cells," Doetsch says. In addition, the researchers were able to visualize the development of the stem cells into different glial cells in specific areas of the stem cell niche.

"Some of the stem cells did not develop into neurons, but into two different novel types of glial cells," Doetsch reports. This brain region studied is therefore a birthplace for different types of glial cells as well as its role as a breeding ground for neurons.

"What was very unexpected was that one glial cell type was found attached to the surface of the wall of the brain ventricle, rather than in the brain tissue." These cells are continuously bathed by cerebrospinal fluid and interact with axons from other brain areas, and therefore are poised to sense and integrate multiple long-range signals.

Glial cells – active in health and disease

The research team also found that both glial cell types were activated in a model of demyelination. These new glial cell types may therefore be a source of cells for repair in neurodegenerative diseases, such as multiple sclerosis or after injury.

As a next step, Doetsch would like to specifically trace these new glial cell types and to investigate their roles in normal brain function and how they respond in different physiological contexts. This will provide important clues to understanding brain plasticity and how the renewal and repair of neural tissue occurs.

Reference

Release of stem cells from quiescence reveals gliogenic domains in the adult mousebrain *Science* (2021), doi: *https://doi.org/10.1126/science.abg8467*

Diabetes remission diet also lowers blood pressure and reduces need for medication

New research has shown that if people achieve and maintain substantial weight loss to manage their type 2 diabetes, many can also effectively control their high blood pressure and stop or cut down on their anti-hypertensive medication.

A weight management programme, de-

veloped by researchers at the Universities of Glasgow and Newcastle for the Diabetes UK funded Diabetes Remission Clinical Trial (DIRECT)[1], has proved effective at lowering blood pressure and reducing the need for antihypertensive medications, as well as bringing remission of type 2 diabetes.

The programme involves an initial 12 weeks on a nutritionally complete formula diet (low calorie soups and shakes) which will induce weight loss of over 15 kg if followed fully. Diabetes and blood pressure drugs were stopped at the start, and only restarted if blood sugar or blood pressure rose.

The weight loss phase is followed by support to choose foods and eat wisely for weight loss maintenance. Maintaining the 15 kg weight loss allowed 8 out of 10 people to become free from type 2 diabetes, without the need for diabetes medications for at least 2 years.

This study, published in the journal *Diabetologia* (the journal of the European Association for the Study of Diabetes [EASD]), looked at 143 people who started the diet programme, with more than half (78 people) on tablets for high blood pressure at the start (and 44 on two or more drugs). The researchers found that, overall, average blood pressure fell steadily as people lost weight. And blood pressure remained lower after the formula diet period finished, and then at 12 and at 24 months.

For those not previously treated for high blood pressure, blood pressures fell sharply from week one. For those who had stopped their blood pressure tablets, blood pressure still fell, although more slowly. Just over a quarter (28%) needed to reintroduce a blood pressure tablet during the formula diet period. However, researchers also found that the same proportion of participants (28%) were able to remain off their medications for at least two years.

Prof Mike Lean, from the University of Glasgow, said: "We wanted to evaluate the safety and efficacy of withdrawing blood pressure medication when beginning our specially-designed weight-loss programme for type 2 diabetes, and we are really pleased with the results.

"Our study shows that, in addition to possible remission from type 2 diabetes, there are other very important health benefits, as weight loss is a very effective treatment for hypertension and its associated serious health risks.

"The DiRECT trial was done entirely in primary care. The evidence shows that GPs can safely offer an evidence-based intensive weight management intervention, aiming for substantial weight loss and remission of type 2 diabetes. The study further highlights the links between diet, weight, type 2 diabetes and hypertension, and how long-term support to maintain weight loss is vital."

Professor Roy Taylor, from Newcastle University, said: "Guidelines encourage doctors to start tablets but there have been few demonstrations of how tablets can be stopped.

"My patients, like so many, do not like swallowing multiple tablets, and this study is important as we can now reassure them that stopping blood pressure tablets is not only safe but also good for their health. We've shown that when substantial weight loss is achieved and maintained, patients can effectively manage both their blood pressure and type 2 diabetes without drugs."

Reference

[1] Antihypertensive medication needs and blood pressure control with weight loss in the Diabetes Remission Clinical Trial (DiRECT). *Diabetologia*. doi: https://doi.org/10.1007/s00125-021-05471-x

Researchers show human cells can write RNA sequences into DNA

Cells contain machinery that duplicates DNA into a new set that goes into a newly formed cell. That same class of machines, called polymerases, also build RNA messages, which are like notes copied from the central DNA repository of recipes, so they can be read more efficiently into proteins. But polymerases were thought to only work in one direction DNA into DNA or RNA. This prevents RNA messages from being rewritten back into the master recipe book of genomic DNA. Now, Thomas Jefferson University researchers provide the first evidence that RNA segments can be written back into DNA, which potentially challenges the central dogma in biology and could have wide implications affecting many fields of biology.

"This work opens the door to many other studies that will help us understand the significance of having a mechanism for converting RNA messages into DNA in our own cells," says Richard Pomerantz, PhD, associate professor of biochemistry and molecular biology at Thomas Jefferson University. "The reality that a human polymerase can do this with high efficiency, raises many questions." For example, this finding suggests that RNA messages can be used as templates for repairing or re-writing genomic DNA.

The work was published June 11 in the journal *Science Advances*.

Polymerase theta

Together with first author Gurushankar Chandramouly and other collaborators, Dr. Pomerantz's team started by investigating one very unusual polymerase, called polymerase theta. Of the 14 DNA polymerases in mammalian cells, only three do the bulk of the work of duplicating the entire genome to prepare for cell division. The remaining 11 are mostly involved in detecting and making repairs when there's a break or error in the DNA strands. Polymerase theta repairs DNA, but is very error-prone and makes many errors or mutations. The researchers therefore noticed that some of polymerase theta's "bad" qualities were ones it shared with another cellular machine, albeit one more common in viruses – the reverse transcriptase. Like Pol theta, HIV reverse transcriptase acts as a DNA polymerase, but can also bind RNA and read RNA back into a DNA strand.

In a series of elegant experiments, the researchers tested polymerase theta against the reverse transcriptase from HIV, which is one of the best studied of its kind. They

showed that polymerase theta was capable of converting RNA messages into DNA, which it did as well as HIV reverse transcriptase, and that it actually did a better job than when duplicating DNA to DNA. Polymerase theta was more efficient and introduced fewer errors when using an RNA template to write new DNA messages, than when duplicating DNA into DNA, suggesting that this function could be its primary purpose in the cell.

The group collaborated with Dr. Xiaojiang S. Chen's lab at USC and used x-ray crystallography to define the structure and found that this molecule was able to change shape in order to accommodate the more bulky RNA molecule – a feat unique among polymerases.

"Our research suggests that polymerase theta's main function is to act as a reverse transcriptase," says Dr. Pomerantz. "In healthy cells, the purpose of this molecule may be toward RNA-mediated DNA repair. In unhealthy cells, such as cancer cells, polymerase theta is highly expressed and promotes cancer cell growth and drug resistance. It will be exciting to further understand how polymerase theta's activity on RNA contributes to DNA repair and cancer-cell proliferation."

Reference:

Pol theta reverse transcribes RNA and promotes RNA-templated DNA repair, *Science Advances*. doi: *https://doi.org/10.1126/sciadv.abf1771, 2021.*

Early blood-sugar level control in type 2 diabetes crucial for future prognosis

People who get type 2 diabetes need to gain control of their blood-sugar levels – fast. The years immediately after diagnosis are strikingly critical in terms of their future risk for heart attacks and death. This is shown by a joint study from the Universities of Gothenburg and Oxford.

In a collaboration between the University of Gothenburg in Sweden and the University of Oxford in the UK, the significance of blood sugar levels from the time type 2 diabetes is diagnosed for the risk of heart attacks and death has been studied. The project was led jointly by Professor Marcus Lind in Gothenburg and Professor Rury Holman in Oxford.

The research was based on a key trial in type 2 diabetes, the UK Prospective Diabetes Study (UKPDS). This new analysis examined the role of blood-sugar levels in the first years after type 2 diabetes was diagnosed for the prognosis of myocardial infarction and death 10-20 years later.

The results, presented in the scientific journal *Diabetes Care*, show that blood-sugar levels early in the course of the condition have a much greater impact on the future prognosis than had been thought previously. They show that targeting blood-sugar levels according to treatment guidelines (HbA1c 52 mmol/mol or lower) from the time of diagnosis was associated with an approximately 20 percent lower risk of death 10-15 years later, compared with targeting a higher blood-sugar level (HbA1c 63 mmol/mol). In addition, it showed that delaying the introduction of good blood-sugar levels until 10 years after diagnosis was associated with only a 3% lower risk of death.

"These latest results are evidence that proper early blood-sugar treatment in type 2 diabetes is crucial to optimise diabetes care. Previously we haven't performed this kind of analysis, or understood just how important early blood-sugar control is for the prognosis. They also mean that there is a need for a greater focus on detecting type 2 diabetes at the earliest opportunity to prevent people living with undetected high blood-sugar levels for several years," said Prof Lind.

Prof Holman, from the Radcliffe Department of Medicine at the University of Oxford, said: "These new results provide a mechanistic explanation for the glycaemic 'legacy effect', first identified by the UKPDS, whereby instituting good blood-sugar control in newly-diagnosed type 2 diabetes was shown to reduce the risks of diabetic complications and death for up to 30 years. The discovery of the 'legacy effect' has led treatment guidelines worldwide recommending the need to achieve good blood-glucose control as soon as possible".

Reference:

Historical HbA1c Values May Explain the Type 2 Diabetes Legacy Effect: UKPDS 88. *Diabetes Care*. doi: *http://dx.doi.org/10.2337/dc20-2439*

Arab participation in global genomic study could lead to new therapies for Covid-19 patients

In March 2020, thousands of scientists around the world united to answer a pressing and complex question: which genetic factors influence the wide variation in Covid-19 severity? Why are some patients severely affected while others escape with mild or no symptoms at all?

A comprehensive summary of their findings to date, published in *Nature* revealed 13 loci, or locations in the human genome, that are strongly associated with infection or severe Covid-19. The researchers also identified causal factors such as smoking and high body mass index.

The findings could help provide targets for future therapies and illustrate the power of genetic studies in learning more about infectious disease. And these results come from one of the largest genome-wide association studies ever performed, which includes nearly 50,000 Covid-19 patients and two million uninfected controls.

Hamdi Mbarek, Research Partnerships Manager at Qatar Genome Programme (QGP), part of Qatar Foundation's Research, Development and Innovation, and lead analyst of the Qatari dataset, said that scientists from around the world have moved at breakneck speed to unravel the role of genetics in the wide variation in Covid-19 severity – one of the most distinctive and perplexing features of the disease.

He added that the identification of the genetic factors can ultimately lead to potential therapeutic targets in addition to the protection conferred by the vaccines. Both

approaches are necessary for improvement in Covid-19 prevention and treatments.

"The more we understand Covid-19 pathogenesis, the better we get at treating and managing the disease. Based on these results, genetic tests are being developed to predict the course of the disease, potential targeted therapies, and drug repurposing candidates are being evaluated," he said.

QGP became the first and only member from the Arab world to contribute to this global effort, called the Covid-19 Host Genomics Initiative. It was founded in March 2020 by Andrea Ganna and Mark Daly from the Institute for Molecular Medicine Finland, University of Helsinki and the Broad Institute of MIT and Harvard. The initiative has grown to be one of the most extensive collaborations in human genetics and currently includes more than 3,500 authors and 61 studies from 25 countries.

To do their analysis, the consortium pooled clinical and genetic data from the nearly 50,000 patients who tested positive for the virus, and two million controls across numerous biobanks, clinical studies, and direct-to-consumer genetic companies such as 23andMe. Because of the large amount of data pouring in from around the world including more than 13,000 genomes from Qatar, the scientists were able to produce statistically robust analyses far more quickly, and from a greater diversity of populations, than any one group could have on its own.

Of the 13 loci identified so far by the team, two had higher frequencies among patients of Asian or Middle Eastern ancestry than in those of European ancestry, underscoring the importance of diversity in genetic datasets. "We've been much more successful than past efforts in sampling genetic diversity because we've made a concerted effort to reach out to populations around the world," said Daly. "I think we still have a long way to go, but we're making very good progress."

The team highlighted one of these two loci near the FOXP4 gene which is linked to lung cancer. The FOXP4 variant associated with severe Covid-19 increases the gene's expression, suggesting that inhibiting the gene could be a potential therapeutic strategy. Other loci associated with severe Covid-19 included DPP9, a gene also involved in lung cancer and pulmonary fibrosis, and TYK2, which is implicated in some autoimmune diseases.

Mbarek emphasized that scientists were able to find robust genetic signals because of their collaborative efforts, a cohesive spirit of data-sharing and transparency, and the urgency that comes with knowing that the entire world faces the same threat at the same time.

He added that geneticists, who regularly work in large consortia, have known the benefits of open collaboration for a long time. "This kind of study usually takes three to five years to deliver, by working together we were able to achieve these results in a significantly shorter period of time," Mbarek said.

Reference:
The Covid-19 Host Genetics Initiative. Mapping the human genetic architecture of Covid-19. *Nature*. doi: *https://doi.org/10.1038/s41586-021-03767-x*

Newborn screening for epilepsy in sight through the discovery of novel disease biomarkers

The door has finally opened on screening newborn babies for pyridoxine-dependent epilepsy (PDE), a severe inherited metabolic disorder. This screening promises to enable better and earlier treatment of the disease. To identify new biomarkers that can be used in the newborn screening protocol, also known as the neonatal heel prick, researchers at the Radboud University Medical Center joined forces with scientists at the Radboud University's FELIX laser laboratory. They published their findings in *The Journal of Clinical Investigation*.

The discovery and identification of the new biomarkers could lead to an important addition to worldwide newborn screening protocols. Currently, there are over a thousand known inborn metabolic diseases (IMD), but only 2% of them can be detected through the neonatal heel prick. While these are relatively rare as individual disorders, in the Netherlands, every other day a child is born with an IMD. These disorders have severe health consequences for patients and are currently one of the leading causes of early death among children in the Netherlands.

"Using new techniques in our clinical laboratory where we study the products of chemical processes (metabolomics), we were able to detect the presence of compounds in body fluids of patients that are not present in persons unaffected by PDE – that was a great first step. However, we could only identify the exact structure of these compounds, the new PDE biomarkers, using the infrared laser at FELIX," said Karlien Coene, laboratory specialist and researcher at the Translational Metabolic Laboratory of the Radboud University Medical Center. This is the first time that an infrared free electron laser – of which there are only a hand full in the world – is combined with these clinical experiments.

Pyridoxine-dependent epilepsy (PDE) is an inherited metabolic disorder that is primarily characterized by intractable seizures that do not respond to conventional antiepileptic medications. Seizures are often controlled by daily high doses of vitamin B6, however 80% of affected children nevertheless suffer developmental delay and intellectual disability.

Biomarker discovery and identification is a well-known bottleneck in research of metabolic diseases. "To overcome this hurdle, we decided to combine the advanced analytical instrumentation with the infrared laser of the FELIX laboratory," said Jonathan Martens, researcher at Radboud University's FELIX Laboratory. "The measurements obtained using the unique FELIX laser gives us information about the bonds between the atoms and leads us to the precise molecular structure. With this information, we ultimately managed to synthesize the molecules and this allowed us to further investigate their role in the disease."

How cloud-computing is facilitating the global response to Covid-19

By **Jens Dommel**,
Head of Healthcare, EMEA,
Amazon Web Services

During this unprecedented COVID-19 global pandemic, cloud computing has played an important role in healthcare's response to the disease.

The impact of COVID-19 on healthcare professionals began with a surge of new patients in need of urgent care. But new and unforeseen challenges arose as the crisis unfolded. For example, social distancing restrictions had to be navigated to keep everybody as safe as possible. The crisis led to the rapid proliferation of new research on vaccines and therapeutics, which needed to be analysed and understood for life-saving value. We have also seen a surge in misinformation, leading to new demands for accurate information from healthcare professionals.

These factors have squeezed the sector's time, resources and personnel on all sides, which has accelerated the demand for innovative digital solutions. Around the world, healthcare organisations including the WHO, Imperial College London, Genomics England, Moderna, and UC San Diego Health are using Amazon Web Services (AWS) Cloud technology to help. Cloud computing supports these organisations by providing technology needed to measure COVID-19's spread, to test citizens, monitor its impact, decode immune system responses, develop therapeutics, distribute and manage vaccine rollouts, and many other critical functions.

Supporting researchers

Healthcare professionals have faced a tidal wave of information about the virus. In fact, more than 300,000 medical research articles were published on the topic of COVID-19 treatment between December 2019 and May 2020.

To tackle this 'infodemic', a team at Imperial College London has created a global knowledge platform called REDASA (REaltime Data Analysis and Synthesis) <*https://www.pansurg.org/redasa*>. The platform combines artificial intelligence with human expertise to help the healthcare community quickly make sense of this tidal wave of information, ultimately finding better treatments for COVID-19 and saving clinicians tens of thousands of hours.

Vaccine rollout

Many of us will be focused on when we can receive our COVID-19 vaccinations, and the cloud has proven to be an invaluable tool in supporting the development and rollout of these vaccines. Developing, managing, and distributing a vaccine that can fight a global pandemic requires innovation and modernized IT systems to ensure doses get to patients quickly and efficiently.

In vaccine development, Moderna's scientists are using AWS to compress the time needed to advance drug candidates to clinical studies; increase the agility of its research, development, and manufacturing processes; and achieve results – such as personalized cancer vaccines – that would have been impossible even a few years ago.

Patient care

In patient care, there has been a boom in outpatient video consultations as digital platforms make it easier, safer and quicker and more convenient for patients to speak with practitioners.

In the UK for example, video consultation provider Attend Anywhere enabled tens of thousands of individuals to virtually see their clinicians in just a few months at the start of the crisis last year, and many more on an ongoing basis since then as trusts adopt video as a standard option provided to patients. And in the United Arab Emirates, Germany and the UK, Huma's Remote Patient Monitoring (RPM) solution is helping to manage patients diagnosed with COVID-19 by tracking symptoms, monitoring vital signs and any deterioration, and can also automatically flag high-risk patients.

This shift to digital platforms is expected to outlast the crisis and provide long-term benefits to patients and practitioners alike.

AWS Diagnostic Development Initiative

With participation from 35 global research institutions, start-ups and businesses, last

year AWS launched the 'AWS Diagnostic Development Initiative' (DDI) <*https://aws.amazon.com/government-education/nonprofits/disaster-response/diagnostic-dev-initiative*> – an initial commitment of $20 million in computing credits and customised expertise to support customers working on rapid testing and accurate detection of COVID-19. Applications are open until the end of the year.

In the first phase of the initiative, AWS helped 87 organizations in 17 countries on a range of diagnostic projects, including molecular tests for antibodies, antigens, and nucleic acids; diagnostic imaging; wearables; and data analytics tools that use artificial intelligence and machine learning to detect the virus.

In the next phase, the DDI is broadening its scope to new areas including early disease detection to identify community outbreaks; prognosis to better understand disease trajectory; and public health genomics to bolster viral genome sequencing worldwide.

Beyond the crisis

Clearly, this is a pivotal moment where the healthcare industry is seeking opportunities to identify partnerships, work collaboratively, and accelerate digital innovation to address the challenges of the pandemic and the industry more broadly, using their findings to identify new ways to provide better care at scale and save more lives.

A global knowledge platform like REDASA at Imperial College London, for example, is immensely useful to understand and treat COVID-19 right now. But, importantly, this technology and many others like it can be applied to other forms of disease, such as cancer treatment, with a wide-ranging legacy for healthcare as a whole.

Dr James Kinross on the REDASA team explained why this kind of technology can be transformative: "We're never going back to a pre-digital healthcare. Life has fundamentally changed in terms of how we communicate with patients, how we empower them with information to make better decisions, and how we use digital transformation to achieve that."

"We are still counting the human cost of this crisis," Dr Kinross added, "but as clinicians we can see how the first truly global catastrophe in our modern world is accelerating advances in medicine and technology that could benefit people for many generations to come."

The future of cloud computing in healthcare is incredibly exciting – and the speed of innovation and adoption across healthcare will only accelerate as organisations and businesses demonstrate efficacy in real-world examples. Most importantly, these innovations can be seen and felt in patient care, and patient outcomes, around the world.

GOSH study reports most symptoms of severe Covid-19 in children are resolved after six months

Scientists and doctors from Great Ormond Street Hospital (GOSH) and UCL Great Ormond Street Institute of Child Health (GOS ICH) have reported that, despite severe illness, most children who had PIMS-TS (Paediatric Multisystem Inflammatory Syndrome – Temporally Associated with SARS-CoV-2) after contracting SARS-CoV-2 infection had their symptoms resolve after six months.

All 46 children in this observational study, published in the journal, *The Lancet Child & Adolescent Health*[1] were treated at GOSH and, as a specialist paediatric hospital, the study noted that they represent more severe cases and further studies are needed to determine if the findings apply to all PIMS-TS patients. In addition, some children did experience problems at six months that require ongoing physical therapy and mental health support.

PIMS-TS is a rare condition associated with SARS-CoV-2 infection that was first defined in April 2020. More than 250 cases were identified in the UK and Ireland from March to June, 2020. It is not known what triggers the condition, but it is thought to be a rare immune overreaction to SARS-CoV-2 infection. The symptoms include fever, rash, eye infection, and gastrointestinal symptoms (e.g. diarrhoea, stomach ache, nausea). In some rare cases, the condition can lead to multi-organ failure.

As the condition only emerged in 2020 during the Covid-19 pandemic, this is the first research to report six-month follow-up findings, providing an important indication of the longer-term effects, which are vital for clinicians treating PIMS-TS and recovering patients and their families. However, the study did not have a control group, making it difficult to determine to the extent to which some findings are attributable to the experience of being admitted to paediatric intensive care unit, having a severe new condition during a pandemic, or to the PIMS-TS condition itself.

Cautious optimism

Dr Justin Penner, Clinical Fellow in Infectious Diseases at GOSH' and lead author of the study, said: "As PIMS-TS is a very rare complication from Covid-19 in children, our study included a small number of children from one hospital. Nevertheless, these findings can hopefully signal cautious optimism that many of the most severe effects of PIMS appear to resolve within six months. However, the persisting fatigue, difficulty exercising, and mental health effects we saw in some children, which can interfere with daily lives, must be closely monitored, and patients should continue to be supported by medical teams with a range of specialisms."

The authors analysed the children's medical records, in-

cluding medical tests at the time of admission, six weeks, and six months after discharge. These commonly included SARS-CoV-2 PCR and antibody tests, tests for organ inflammation, echocardiograms, abdominal ultrasounds, a test that measured walking, muscle function, and limb mobility. At follow-up, children and their parents completed questionnaires to assess the child's physical and emotional wellbeing, as well as their social and school life.

All children had systemic inflammation when they were admitted to hospital, but none of the patients died. Most children experienced severe effects on different systems in the body during their initial illness, with 45 children experiencing gastrointestinal symptoms, 24 children reporting neurological symptoms, and 15 children had heart symptoms.

At six months follow-up, most symptoms were resolved, with systemic inflammation gone in all but one child, echocardiograms in two children showed abnormalities, while six children were still reporting gastrointestinal symptoms.

Although small abnormalities were found on neurological examination in 18 children at six months, children experienced little difficulty walking and carrying out everyday tasks. The researchers say this implies that any lasting neurological effects are probably mild and do not cause disability, although the test used might not be able to capture subtle effects, so they call for more detailed research on long-term neurological effects.

In addition, all but one child were back in full-time education (virtually or face-to-face) by six months.

Road to recovery

Muscle function improved significantly from hospital admission to six months, but in a six-minute walking test, 18 patients were in the bottom 3% for their age and sex after six months. As the study did not have a control group, the authors caution the importance of interpreting this finding within the context of the pandemic.

Dr Karyn Moshal, GOSH Consultant in Paediatric Infectious Disease, commented: "The levels of fatigue we found at six months follow-up is concerning and requires close monitoring. However, it's difficult to determine whether this finding is caused directly by PIMS-TS or if it's a result of the disruption on children's lives that the Covid-19 pandemic has caused on a wider scale. Therefore, it's really important that we continue to monitor this as social distancing relaxes and children return to school and more active routines."

"There was no control group in our study, so we cannot determine whether these mental health effects were caused directly by PIMS-TS – but we do know that going through any severe illness is likely to have impacts on mental health and the disruption and uncertainty of the wider Covid-19 pandemic could also play a role. These children and their families must be able to access ongoing mental health support in addition to continued monitoring for any long-term physical effects from PIMS-TS."

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3 doses of Covid-19 vaccine may be better for immunocompromised people

In a study published in the *Annals of Internal Medicine*, Johns Hopkins Medicine researchers say they believe that, for the first time, there is evidence to show that three doses of vaccine increase antibody levels against SARS-CoV-2 – the virus that causes Covid 19 – more than the standard two-dose regimen for people who have received solid organ transplants.

"Our findings suggest clinical trials are warranted to determine if transplant recipients should receive Covid-19 vaccine booster doses as standard clinical practice, similar to what is currently done with hepatitis B and influenza vaccinations for this population," said study lead author William Werbel, M.D., an infectious diseases research fellow at the Johns Hopkins University School of Medicine.

People who receive solid organ transplants (such as hearts, lungs and kidneys) often must take drugs to suppress their immune systems and prevent rejection. Such regimens may interfere with a transplant recipient's ability to make antibodies to foreign substances, including the protective ones produced in response to vaccines.

In the first [1] of two previous studies, the researchers showed that only 17% of the participating transplant recipients produced sufficient antibodies after one dose. Then, in the second study [2], they found the level improved to 54% after the second shot. In both cases, even those transplant recipients with antibodies had levels well below what has been typically seen in people with healthy immune systems.

In their latest study [3], the researchers evaluated 30 organ transplant recipients who received a third dose of one of three vaccines – Johnson & Johnson/Janssen, Moderna or Pfizer/BioNTech – between March 20 and May 10, 2021. They had previously received two doses of either the Moderna or Pfizer/BioNTech vaccine. The median age of the study participants was 57, 17 were women and one identified as non-white. No study participant reported an illness prior to vaccination or a positive test for SARS-CoV-2. All were taking multiple immunosuppressive medications to prevent rejection of their transplanted organs.

"Our findings revealed that a third of the participants who had negative antibody levels and all who had low positive levels before the booster increased their immune response after a third vaccine dose," says study senior author Dorry Segev, M.D., Ph.D., the Marjory K. and Thomas Pozefsky Professor of Surgery and Epidemiology and director of the Epidemiology Research Group in Organ Transplantation at the Johns Hopkins University School of Medicine.

A week after receiving their third vaccine dose, 23 study participants completed a questionnaire about adverse effects. Reactions were generally mild or moderate, with one participant reporting severe arm pain and another a severe headache. No participant reported fever or an allergic reaction. There was one case of mild organ rejection during the study.

"These reactions seem acceptable, considering the benefits that vaccines can confer," said Segev.

Werbel and Segev noted that this study only examined antibody levels, and that future research is needed to see if the increased immune response after a third vaccine dose is associated with lower SARS-CoV-2 infection rates.

"Although the third vaccine dose appears to raise the immune response of transplant recipients to higher levels than after one or two doses, these people may still be at greater risk for SARS-CoV-2 infection than the general population who have been vaccinated," said Werbel. "Therefore, we recommend that transplant recipients and other immunocompromised people continue to wear masks, maintain physical distancing and practice other Covid-19 safety measures."

Our findings revealed that a third of the participants who had negative antibody levels and all who had low positive levels before the booster increased their immune response after a third vaccine dose.

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Keeping gold cold: Securing, preserving and maximizing the value of Covid-19 vaccines

By **Tarek Kassab**, MD, MSc Biomed Eng, and **James Waterson**, RN, M.Med.Ed.
Becton Dickinson, Medical Affairs

Vaccination has been lauded as one of the greatest achievements of modern civilization. Childhood infectious diseases that were commonplace less than a generation ago are now increasingly rare, and one of the greatest examples of the world uniting to advance health was the campaign to eradicate smallpox via mass-vaccination. Smallpox is practically forgotten now, despite the fact that the disease blighted humankind for centuries and carried a 30% fatality rate.

The Covid-19 pandemic, and the race to repeat the achievements of the smallpox campaign with initially limited supplies of vaccines, requires that we protect, track, utilize absolutely 'every drop' of vaccine available to us. The speed at which these vaccines have come to market also places a responsibility on us to produce actionable Real-World Evidence (RWE), as we deal with virus mutations and variants, and heterogenous population responses.

Vaccine security

Medical device technology is central to the successful rollout, maintenance, and monitoring of high-quality vaccination programs. As soon as a vaccination clinic or health centre receives a supply of vaccine the issue of security and storage arises. There are already news reports of an emerging black market for Covid-19 vaccines and of 'mafias' looking to obtain these scarce resources. The core vaccines available also require judicious temperature control and an effective tracking of thawing, refrigeration, removal from refrigeration, time spent at room temperature, and documented delivery to the patient.

Vaccine tracking

Technology can assist in ensuring safety and maximized usage of all supplies as medical-grade 'intelligent' refrigerated units integrated to Automated Dispensing Cabinets ensure accurate temperature control and create alerts for any deviation. They can also track a vaccine vial's location through simple scanning processes and connected inventory systems. Distinct secure compartments within an integrated-intelligent fridge add the required security and access-privileges via codes or biometric recognition to enable tracking of the vial and alerting to any discrepancies in count.

The Institute for Safe Medication Practices (ISMP) suggests that vaccine centres and pharmacies carefully consider the timeframe for vaccine stability at room temperature and patient scheduling to minimize waste. A date and timestamp for removal of vials from the refrigerator is extremely valuable for both keeping this safe workflow going and for auditing. Verification of the doses needed per day from the vaccination centre to central cold-chain suppliers on a frequent basis – particularly in the case of those requiring ultra-cold temperatures – is also advocated by ISMP to prevent waste.

Medical grade, intelligent and inventory integrated, refrigeration units can also assist in this, as well in the allotment of doses based on footfall trends through the centre. As the currently available vaccines all require a second-dose, this is particularly important for Group Purchasing Organizations that service many vaccine distribution centres and need to know regional or national stock levels.

Real World Evidence

Vaccine usage data, when integrated into Electronic Medical Records (EMR), also has the potential to be a real asset for rapid review of appropriate and prudent usage. The societal value of reducing medication wastage has never been so well represented as it has been by the current crisis. Equally this data, as it can tie vaccine type, lot, vaccination date, and location to patient demographics from the EMR, assists in the gathering of Real World Evidence by specialized, effective tracking technology that has already shown an impact on the tracking of Antibiotic Microbial Resistance. This technology and knowhow are now being applied to help track and share Covid-19 insights with hospitals and public health agencies across the United States.

Given how potentially fragile an adequate global supply chain of vaccines is, utilization and protection are required in order to ensure these vital resources are shared as effectively and equably as possible. High rates of vaccine waste could potentially lead to extending the pandemic unnecessarily and make our societies vulnerable to continuing waves of infection. MEH

Vegan diet significantly remodels metabolism in young children: Statuses of vitamin D and A require special attention

University of Helsinki researchers report a comprehensive pilot study on the metabolic effects of full vegan diet on young children. The study found vegan children to have remarkably altered metabolism and lower vitamin A and D status compared to children with no special diet.

The study concludes that vegan diet has a broad effect on children's metabolism. Serum biomarker levels for vitamins A and D, cholesterol forms and essential amino acids were significantly lower in children on vegan diet compared to age-adjusted omnivores. In addition, docosahexaenoic acid is absent from vegan diet. The results were recently published in *EMBO Molecular Medicine*.

Vegan diets gain popularity especially among young adults, and through choices of the families, vegan diet is becoming more common in young children, too. The motives behind choosing a vegan lifestyle are ecological, ethical and health-related: vegan diets exclude all animal-based products. It is recommended that full vegan diet is always supplemented with vitamin B12, vitamin D and iodine, and based on individual assessment the supplementation for calcium, vitamin B2, iron and zinc may be needed.

Except for vitamin D, the study did not find differences between diet groups in the levels of these nutrients in young children. All of the participated vegan children used regular vitamin B12, and

all but one used regular vitamin D and iodine supplementation, indicating that Finnish vegan families are well familiar with the previously known nutritional requirements of vegan diets. However, current nutritional recommendations are based on studies conducted on adult vegans, and previous studies on metabolic effects of vegan diets in children do not exist.

In their recently published article, Topi Hovinen, MD, and Liisa Korkalo, PhD, together with the multidisciplinary team led by academy professor Anu Suomalainen-Wartiovaara and docent Maijaliisa Erkkola studied comprehensively the nutrition and metabolism of 40 healthy children in day care centres of Helsinki. The children were following a vegan, vegetarian or omnivore diet according to the choice of their families. Their nutritional intake, metabolic biomarkers and micronutrient statuses were extensively studied.

The children on a fully vegan diet were found to have significantly lower vitamin D levels compared to children without a special diet despite having regular vitamin D supplementation and blood samples being collected in late summer. Surprisingly, also their vitamin A status was lowered. Levels for LDL and HDL cholesterol, essential amino acids and docosahexaenoic acid, a fatty acid with a central role in development of visual function, were low while folate levels were remarkably high in vegan children.

According to the researchers, the new findings motivate further and larger studies on the health consequences of a vegan diet in young children.

c"The vegan families were active participants in our study. This is important, because without such voluntary contribution of the families it is not possible to undertake this kind of study," remarked Korkalo.

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Vegan diet in young children remodels metabolism and challenges the statuses of essential nutrients. *EMBO Molecular Medicine* (2021). doi: *https://doi.org/10.15252/emmm.202013492*

Corticosteroids may be an effective treatment for COVID-19 complications in children

Corticosteroids may be an effective treatment for children who develop a rare but serious condition after COVID-19 infection.

This is the finding of an international study of 614 children, published in the New England Journal of Medicine, led by Imperial College London.

All children in the study developed a serious disorder following COVID-19 infection. This condition, called multi-system inflammatory syndrome in children (MIS-C), is thought to affect 1 in 50,000 children with SARS-CoV-2 infection.

Paediatric inflammatory multi-system syndrome

The new disorder, which is also called paediatric inflammatory multi-system syndrome temporally associated with SARS-CoV-2 infection (PIMS-TS), affects children of all ages but is more common in older children and teenagers. The disorder generally occurs 2-6 weeks after infection with the SARS-CoV-2 virus.

The illness is characterisedzzz by persistent high fever, often accompanied by abdominal pain, vomiting, red eyes and red rash. Severely affected children have developed heart inflammation, with shock and failure of multiple organs.

Fortunately, with optimal treatment the majority of affected children have recovered well. However, worldwide most reports suggest a fatality rate of 2-4%.

An important concern has been that some affected children have developed inflammation of their arteries that supply the heart with blood, resulting in widening of these arteries.

> The finding that outcome is similar for patients treated with steroids alone as with those treated with steroids and immunoglobulin or immunoglobulin alone, suggests that steroids may be a cheaper and more available alternative to immunoglobulin.

This is also known to happen in another condition called Kawasaki disease.

The new study, supported by the EU's Horizon 2020 programme, investigated two initial treatments for this condition: corticosteroids (such as methyl prednisolone) and antibody treatment (immunoglobulin). The antibodies come from human blood, and have been shown to reduce inflammation in the body. The study also compared initial treatment with steroids together with immunoglobulin.

The study involved hundreds of doctors worldwide uploading information about patient outcomes onto an online database, and was not a randomised controlled trial.

Three treatments

All three treatments (immunoglobulin, immunoglobulin combined with corticoste-

roids and corticosteroids alone) resulted in more rapid resolution of inflammation, as measured by the level of C-reactive protein (CRP) that indicates inflammation levels in the body.

The CRP fell by half approximately one day quicker in those receiving treatment. There were no clear differences between the three treatments in rate of recovery from organ failure, or progression to organ failure.

The number of fatal cases (2%) was too low to enable comparison between treatments, but death was included in a combined assessment with organ failure, which found no significant differences between the three treatments.

However, when analysis was restricted to the 80% of children who met the World Health Organization's criteria for MIS-C, there was evidence of a lower rate of organ support or death at 2 days in those receiving steroids alone as initial treatment, compared to immunoglobulin alone.

Dr Elizabeth Whittaker, one of the authors of the study from Imperial's Department of Infectious Disease, and one of the first doctors in the world to originally identify this condition, together with colleagues at Imperial College and Imperial College Healthcare NHS Trust, said: "The finding that outcome is similar for patients treated with steroids alone as with those treated with steroids and immunoglobulin or immunoglobulin alone, suggests that steroids may be a cheaper and more available alternative to immunoglobulin. Corticosteroids are cheap and available worldwide whereas immunoglobulin is expensive, and there is a worldwide shortage of it. This is a particular problem in many low and middle income countries."

However the authors stress there is insufficient data to establish that all three treatments are equivalent in preventing coronary artery aneurysms. Around 6 per cent of children in the study suffered a coronary artery aneurysm.

Professor Michael Levin, from the Department of Infectious Disease at Imperial, who led the study, said: "The study has been a real example of international collaboration and the willingness of paediatricians in many countries to share their data and experience to enable important questions as to optimal treatment to be answered. Our finding, that treatments with immunoglobulin, steroids or a combination of both agents all result in more rapid resolution of inflammation (and have similar rates of progression to organ failure or recovery from critical illness), will be of great value to paediatricians worldwide in their treatment of children with this new disorder. As immunoglobulin is unavailable or in short supply in many countries, and is expensive, the findings of this study may provide some reassurance for those who only have access to corticosteroids, particularly in those countries with more limited resources.

"However it is important to note that our study does not yet provide a definitive answer as to whether any of the treatments lowers the risk of coronary artery aneurysms, as the numbers with this complication were too low. The study is continuing to enrol patients and our planned further analysis with larger numbers of patients should provide answers to this question."

The BATS study

Soon after MIS-C was first recognised in April and May 2020, the research team at Imperial College London, headed by Professor Michael Levin, initiated an international study to identify the optimal treatment for this new disease. The study called "Best Available Treatment Study" (BATS) invited paediatricians worldwide to upload data from patients with MIS-C. The hypothesis underlying the study was that if a large enough number of patients were included and treated using whatever drugs individual paediatricians felt were beneficial, the outcome of children treated with different treatment regimes could be compared. Although randomised placebo-controlled trials provide the best evidence for benefit of any drugs, randomised trials take considerable time to develop and often require extensive funding. The speed with which the new disease was evolving made it unlikely that there would be information from such trials rapidly. As an alternative the BATS study utilised new statistical approaches to correct for any differences in severity or other confounding effects in order to compare the different treatments given to children with MIS-C.

The study compared the outcome of children with MIS-C treated with the three most common regimes: intravenous immunoglobulin (the proven treatment of Kawasaki disease), immunoglobulin combined with corticosteroids and corticosteroids alone. The study showed evidence that all three treatment regimes resulted in more rapid resolution of inflammation than in children who did not receive immune modulating drugs. No statistically significant differences were seen between each of the three treatments in either the rate of progression to organ failure or recovery from organ failure. More patients who were treated with a single agent (immunoglobulin or steroids) required additional treatment than those who were commenced initially on both drugs. In children whose condition met the World Health Organisation definition of MIS-C, there was evidence for more rapid improvement in organ failure in children receiving corticosteroids than those receiving immunoglobulin alone. The number of patients who developed coronary artery aneurysms in each of the three treatment groups were too low for firm conclusions as to the role of these drugs in preventing coronary artery aneurysms.

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New clinical study aims to prevent type 1 diabetes in children

Type 1 diabetes is the most common metabolic disease in children and adolescents worldwide. It can be particularly dangerous as often there is no diagnosis until severe and sometimes life-threatening symptoms have already developed. The new 'SINT1A' study explores the potential of a specific probiotic to strengthen the immune system early-on in children with increased genetic risk of type 1 diabetes, and thus prevent its development. *Middle East Health* reports.

Around one in 300 children and adolescents are diagnosed with the autoimmune disease type 1 diabetes by 18 years of age. Around 90 percent of patients do not have a close relative with type 1 diabetes, meaning the disease can affect any child without a disease history in their family. People with type 1 diabetes must inject the hormone insulin for the rest of their lives because their immune system attacks the insulin-producing cells in the "islets" of their pancreas. Insulin has a vital function, transporting sugar from the blood into the body's cells. The body's own insulin is often the first target of the immune reaction which leads to type 1 diabetes.

Improving the immune system with probiotics

In early stages of type 1 diabetes, so-called islet autoantibodies appear in the blood as a result of the immune system attacking the insulin-producing cells. Researchers know from earlier studies that children who develop these antibodies can suffer from imbalances in their intestinal flora in early childhood. The new SINT1A (Supplementation with B. Infantis for Mitigation of Type 1 Diabetes Autoimmunity) study aims to prevent the occurrence of islet autoantibodies in children with an increased genetic risk of type 1

diabetes by administering a probiotic containing a strain of Bifidobacterium Infantis (activated B. infantis EVC001) together with their daily nutrition. This is hypothesized to promote a healthy and balanced development of the intestinal flora, which is thought to have beneficial effects on the immune system before the first signs of autoimmunity appear.

SINT1A follows the ongoing Primary Oral Insulin Trial (POInT), which administers insulin orally to train and sensitize the immune system at an early stage so that autoimmunity against insulin does not occur.

"We believe that the immune system of the oral and gut mucosa is very important for preventing immune-mediated diseases like type 1 diabetes. The POInT study uses the gut to familiarize the immune system with insulin and prevent an autoimmune response against it. SINT1A was designed based on the knowledge that a healthy gut microflora reduces inflammation and this helps the immune system better distinguish antigens that are safe from those that are dangerous," explained Dresden study leader Ezio Bonifacio, Professor at the Medical Faculty and Center for Regenerative Therapies Dresden (CRTD) at the TU Dresden, Germany.

In this way, the SINT1A investigators want to reduce the chances that children with a high genetic risk of developing type 1 diabetes start immune responses that lead to autoimmunity.

"If the results for both studies show what we are hoping for," explained Prof. Bonifacio, "we will aim to combine both studies for an optimized synergistic type 1 diabetes prevention strategy. Type 1 diabetes could be transformed from a previously unavoidable fate into a disease that can be prevented."

The SINT1A study started in April 2021 in multiple European countries as part of GPPAD (Global Platform for the Prevention of Autoimmune Diabetes) – an international initiative to prevent type 1 diabetes. The GPPAD research sites are located in Belgium (Leuven), Germany (Dresden, Hanover, Munich), Poland (Warsaw), Sweden (Malmö) and the UK (Cambridge, Newcastle).

SINT1A, POInT and the newborn screening study are part of GPPAD. The GPPAD studies are led by Helmholtz Zentrum München. All data generated in the GPPAD studies aim to serve scientific progress that might eventually benefit patients. Therefore, GPPAD makes pseudonymized data and samples from the biobank available to the scientific community upon request.

- Learn more about GPPAD data sharing: *https://www.gppad.org/en/data-sharing/*

Innovative mouse model pumps new blood into study of paediatric heart disease

Researchers from University of Tsukuba, Japan, collaborating with scientists from Germany, develop a mouse model for restrictive cardiomyopathy and uncover the underlying mechanisms of the disease.

Severe childhood restrictive cardiomyopathy is a condition that causes the muscles in the walls of the heart to become stiff, so that the heart is unable to fill properly with blood. A mutation in a protein called BAG3 is known to result in restrictive cardiomyopathy, muscle weakness, difficulty taking in enough oxygen, and damage to multiple peripheral nerves, often shortening the patient's lifespan significantly. Until now there has been no successful model for the disease, making it extremely difficult to study.

However, researchers in Japan and Germany have now created a mouse model that mimics the human pathology, allowing the disease to be studied more easily. The team's data suggest that the restrictive cardiomyopathy caused by BAG3 mutation changes the process by which damaged proteins are broken down and removed. This causes proteins to build up in the cells, disrupting the cardiac muscle.

The team was able to express a human version of the mutant BAG3 protein in mouse cardiomyocytes, the cells that make up the heart muscle.

"Our mouse model successfully mimicked the human disease," said lead author Assistant Professor Kenichi Kimura. "The mice had increasingly severe symptoms of heart failure and growth retardation starting shortly after birth, and only survived for around five weeks."

The team studied the heart tissue of the mice expressing the mutant human BAG3 protein, and uncovered changes to the protein quality control system, which ensures proteins are correctly folded, alongside increased levels of autophagy, a process by which damaged cells are removed and recycled. BAG3 is involved in the breakdown of proteins that have become damaged due to mechanical stress. The mutation that causes restrictive cardiomyopathy involves the alteration of just a single base in the DNA, leading to a leucine amino acid in the mutant BAG3 protein where there should be a proline.

The team showed that this leads to the mutant protein having reduced solubility and mobility, causing it to build up in the muscle cells. This causes fibrosis, or scarring, and results in the heart muscle stiffening and losing the ability to fully relax, meaning that the heart is unable to properly fill with blood. Moreover, in preliminary investigations using a technique to knockdown and reduce the mutant protein expression, the researchers were able to mitigate the disease symptoms in the mouse model.

Childhood restrictive cardiomyopathy is a rare but very serious disease. Hopefully, the knowledge provided in this study, and the establishment of a mouse model of the disease to support further research, will bring about the development of better treatments for children with this condition.

Reference

Overexpression of human BAG3P209L in mice causes restrictive cardiomyopathy, *Nature Communications*. doi: *https://doi.org/10.1038/s41467-021-23858-7*.

Physical activity helps curb low-grade inflammation in children

According to a recent Finnish study, accumulating more brisk and vigorous physical activity can curb adiposity-induced low-grade inflammation. The study also reported that diet quality had no independent association with low-grade inflammation. The findings, based on the ongoing Physical Activity and Nutrition in Children (PANIC) Study conducted at the University of Eastern Finland, were published in the *European Journal of Sport Science*.

The study was carried out in collaboration with researchers from the University of Jyväskylä, the University of Eastern Finland, the Norwegian School of Sport Sciences, and the University of Cambridge.

Photo: University of Jyväskylä.

Low-grade inflammation is linked to many chronic diseases

Long-lasting low-grade inflammation increases the risk for type 2 diabetes and cardiovascular diseases. Being overweight and obese contribute to low-grade inflammation, but little is still known about the role of lifestyle in curbing low-grade inflammation beginning in childhood.

"Our study showed that children who were physically more active and less sedentary had a healthier inflammatory profile than children who were physically less active," explained Dr. Eero Haapala from the Faculty of Sport and Health Sciences at the University of Jyväskylä. "However, our results suggest that the positive effects of high levels of vigorous physical activity and low levels of sedentary time on low-grade inflammation are partly explained by their positive effects on body composition."

In children with the lowest levels of physical activity, poorest diet quality and the highest body fat percentage, researchers found an unhealthy inflammatory profile.

"The key message of our results is that increasing physical activity and reducing sedentary time are key in preventing low-grade inflammation starting in childhood," said Haapala. "They would be particularly important for overweight children."

The study looked at the associations between physical activity, sedentary time, diet quality, body fat content, and low-grade inflammation in 390 children aged 6 to 8 years. Physical activity and sedentary time were measured by a combined heart rate and movement sensor and body composition with a DXA device. Low-grade inflammation was assessed using biomarkers measured from blood samples.

Reference

Associations of physical activity, sedentary time, and diet quality with biomarkers of inflammation in children. *European Journal of Sport Science*.

doi: *https://doi.org/10.1080/17461391.2021.1892830*

The GOSH surgical and medical team, who successfully separated craniopagus twins in 2019 and 2020 included more than 100 staff from over 15 disciplines across the hospital (photo taken before COVID-19 pandemic).

Great Ormond Street Hospital for Children: A multidisciplinary approach

Great Ormond Street Hospital for Children (GOSH) in London is a world-renowned paediatric hospital, treating children from around the world with rare and complex conditions. Ever since GOSH opened its doors in 1852 it has been dedicated to providing world-class treatment, education and research for the benefit of all children and families.

Every year the International and Private Care service at GOSH treats over 5,000 patients from more than 80 countries, including 1,500 from the GCC. Offering a tailored service for international families, GOSH provides exceptional care under one roof.

GOSH has a unique approach to supporting families undergoing treatment at the hospital. Using a multidisciplinary team (MDT) approach, GOSH provides holistic care for patients with multiple and complex conditions.

All 64 clinical specialties and sub-specialties at GOSH hold regular MDT meetings, which can include up to 30 specialist clinicians who review both new and current cases. GOSH also holds individual patient MDT meetings for specific complex cases.

What is an MDT?

An MDT is a group of professionals from multi-disciplines who come together to make decisions about the recommended treatment of individual patients.

At GOSH, MDTs consist of clinical consultants, specialist nurses, consultant radiologists, consultant pathologists, allied health professionals and other support services.

The power of the MDT

The MDT approach is an effective and efficient way for specialist staff to come together and holistically review specific cases. Each member of the MDT has an important role in contributing their expertise into the child's overall treatment plan. The approach allows for regular communication and collaboration between expert clinicians and support services.

At GOSH every child, including their condition and circumstances, is recognised as being unique. The MDT approach allows GOSH to provide tailored care that has been specifically created for each individual patient.

GOSH MDT meetings: What happens?

The majority of MDT meetings are held weekly, but some specific disease MDTs happen bi-weekly or monthly according to need.

The patient's consultant will present the case to the MDT which leads to a detailed discussion, with all attendees contributing to thoughts on the diagnosis and treatment plan. Team members share their experience of similar conditions, diagnostic difficulties, risks, or new treatments. If the patient's consultant receives new information from further tests, or if there is a complication, they will bring the case back to the MDT.

Accessing the GOSH MDT service remotely

International patients and clinicians can also access GOSH MDT services via the hospital's telehealth service.

The telehealth service at GOSH facilitates two-way, real-time interaction between clinical experts at GOSH and patients, families, and healthcare professionals around the world. The latest technology, which includes integration with the electronic patient record system, allows world-leading clinicians at GOSH to provide a range of services, including MDTs.

For more information, visit: *https://www.gosh.com.kw/about-hospital/telehealth*

MDT webinars for healthcare professionals

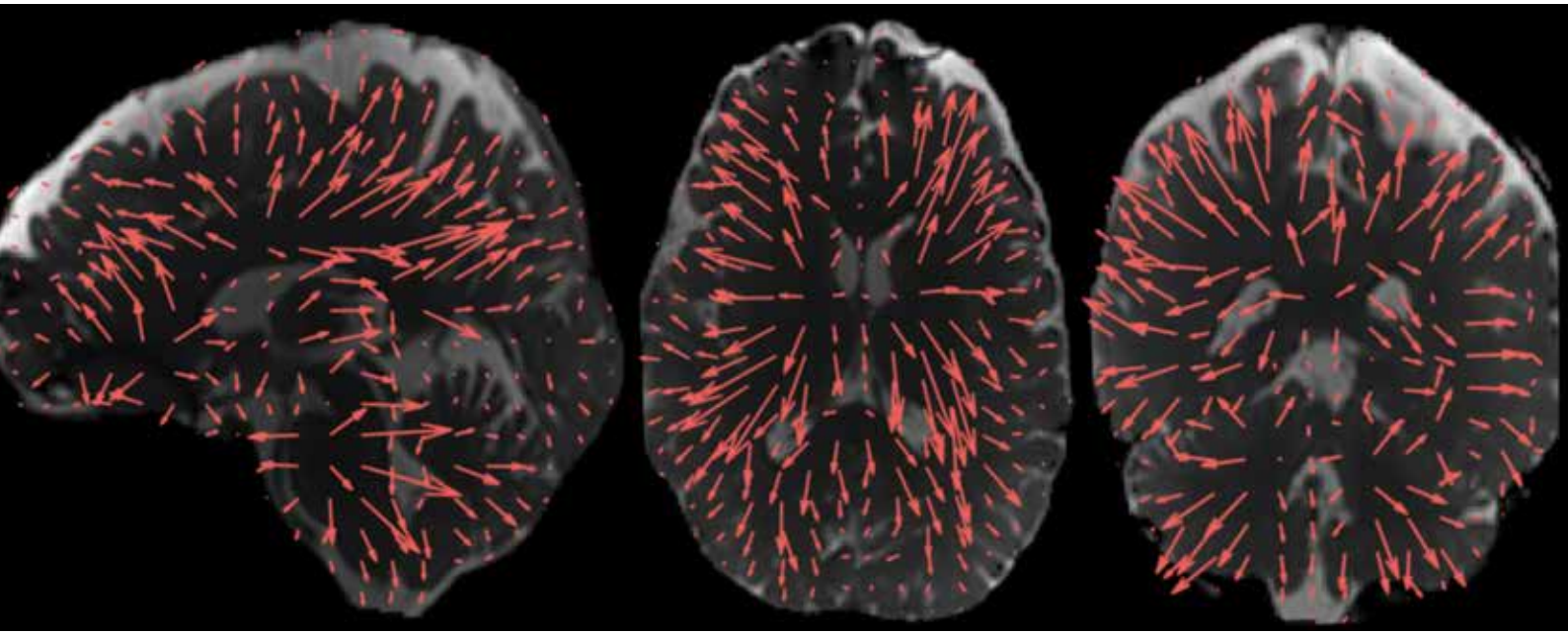
GOSH hosts a free bi-monthly webinar series for healthcare professionals, exploring the MDT service provided in different specialties.

In September the webinar theme will be Paediatric Cardiology. A live Q&A session is hosted after the expert presentations, allowing for international colleagues to ask questions and share knowledge.

Please email: *gulfoffice@gosh.nhs.uk*
or visit *www.gosh.com.kw/education-and-training/multidisciplinary-seminars* for more info on our webinar series.

Contact GOSH

For more details on GOSH's Telehealth, Webinar Series, MDT service or to refer a patient please contact the hospital:
Email: *Gulfoffice@gosh.nhs.uk*
Telephone: +971 4 3624722
Website: *www.gosh.ae*



The arrows show the direction and amplitude of the brain's movement. These displacement patterns, which were enabled by extra processing of 3D aMRI, may help us understand how the brain moves with different disorders. 3D aMRI method outlined in Abderezaei et al. Brain Multiphysics (2021); Terem et al. *Magnetic Resonance in Medicine (2021)*.

3D amplified MRI: Newly enhanced imaging technique captures brain movement in stunning detail, holds potential to inform diagnosis of brain disorders

Magnetic Resonance Imaging (MRI) images are usually meant to be static. But now, researchers from Matai Medical Research Institute (Matai), Stevens Institute of Technology, Stanford University, the University of Auckland and other institutions, report on an imaging technique that captures the brain in motion in real time, in 3D and in stunning detail, providing a potential diagnostic tool for detecting difficult-to-spot conditions such as obstructive brain disorders and aneurysms – before they become life threatening.

The new technique, called 3D amplified MRI, or 3D aMRI, reveals pulsating brain movement which could help researchers to non-invasively visualise brain disorders and inform better treatment strategies for tiny deformations or disorders that obstruct the brain or block the flow of brain fluids.

Samantha Holdsworth, director of research at Matai, senior lecturer at the University of Auckland and principle investigator at the Centre for Brain Research, and Mehmet Kurt, an assistant professor of mechanical engineering at Stevens Institute of Technology, have now published two papers on aMRI in collaboration with Stanford University, the University of San Diego California, Queens University, and the Icahn School of Medicine at Mount Sinai.

The first paper, published online in Magnetic Resonance in Medicine[1], presents the 3D aMRI method, comparing it with its 2D aMRI predecessor. The new method results in a stunning visualization of the human brain's movement that can be seen in all directions. The second paper, published online today as well in Brain Multiphysics[2], visualizes, validates and quantifies both the amplitude and direction of the brain as it moves in three dimensional space. The validation and quantification ensures that the software processing reflects an amplified version of real movement.

Clinical insights for brain disorders

The approaches reported in the two papers could hold important clinical insights for a number of brain disorders. For example, the abnormal motion of two areas at the base of the brain, the pons and cerebellum, has been proposed as a diagnostic marker of Chiari I malformation, an abnormality that causes brain tissue to extend into the spinal canal.

2D amplified MRI was developed by Holdsworth, Mahdi Salmani Rahimi, Itamar Terem and other collaborators at Stanford University, enabling MRI imaging to capture brain motion in a way that had previously never been seen before. 3D amplified MRI builds on this previous work developed and published in 2016. The aMRI algorithm uses a video motion processing method developed by Neal Wadhwa, Michael Rubinstein, Fredo Durand, William Freeman and colleagues at Massachusetts Institute of Technology.

"The new method magnifies microscopic rhythmic pulsations of the brain as the heart beats to allow the visualization of minute piston-like movements, that are less than the width of a human hair," explained

Itamar Terem, a graduate student at Stanford and lead author of the first paper. "The new 3D version provides a larger magnification factor, which gives us better visibility of brain motion, and better accuracy."

3D aMRI of the human brain shows minute movements of the brain at an unprecedented spatial resolution of 1.2 mm3, approximately the width of a human hair. The actual movements are amplified (made larger, up to 25 times) to allow clinicians and researchers to view the movements in detail. The striking detail of these animated magnified movements may be able to help identify abnormalities, such as those caused by blockages of spinal fluids, which include blood and cerebrospinal fluid.

"We showed that 3D aMRI can be used for the quantification of intrinsic brain motion in 3D, which implies that 3D aMRI holds great potential to be used as a clinical tool by radiologists and clinicians to complement decision making for the patient's treatment," said Kurt, senior author of the second paper. "In my lab at Stevens, we are already seeing the benefits of using variants of 3D aMRI technique in a variety of clinical conditions including Chiari Malformation I, hydrocephalus, and aneurysms, in collaboration with clinicians at Mount Sinai."

Research projects

A number of research projects are underway using the new imaging software. Holdsworth said: "We are using 3D aMRI to see if we can find new insights into the effect of mild traumatic brain injury on the brain. She added: "One study already underway, a collaboration between Matai and the University of Auckland, uses 3D aMRI together with brain modelling methods to see whether we can develop a non-invasive way of measuring brain pressure, which may in some cases remove the need for brain surgery". This could be valuable clinically, for example, in children with idiopathic intracranial hypertension who often require invasive brain pressure monitoring.

> The new method magnifies microscopic rhythmic pulsations of the brain as the heart beats to allow the visualization of minute piston-like movements, that are less than the width of a human hair.

Miriam Sadeng, an associate professor at the University of Auckland in the department of anatomy and medical imaging, who is a physician and is an author on both papers, said: "This fascinating new visualisation method could help us understand what drives the flow of fluid in and around the brain. It will allow us to develop new models of how the brain functions, that will guide us in how to maintain brain health and restore it in disease or disorder."

"Validating the method through computational modelling gave us further confidence about the potential impact of this work," said Javid Abderezaei, a graduate student in Kurt's lab at Stevens and lead author on the second paper. "What is exciting to see is that the dominant displacement patterns in the healthy brain qualitatively matched with the underlying physiology, which means that any changes in the physiological flow as a result of a brain disorder should be reflected in the displacements we measure."

The capability to view the differences in brain motion could help us better understand a variety of brain disorders. In the future, the technology could be expanded to use in other health disorders throughout the body.

Three videos explain in more detail the workings 3D aMRI

Video 1
The 3D aMRI method, showing exquisite brain motion that is captured in all three planes of the brain (coronal, axial and sagittal views). Previously amplified motion was only reliably visible in the sagittal plane – the 3D aMRI method now captures motion in all planes. Outlined in *Terem et al. Magnetic Resonance in Medicine (2021); Abderezaei et al. Brain Multi-physics (2021).* *https://youtu.be/bC05R_tcyW4*

Video 2
Using the new 3D aMRI software, 4D animation models of brain motion can be created from an MRI image. The striking detail of these animated magnified movements may be able to help identify abnormalities, such as those caused by blockages of spinal fluids, which include blood and CSF (spinal fluid in the brain). 3D aMRI method outlined in Terem et al. *Magnetic Resonance in Medicine* (2021); Abderezaei et al. Brain Multi-physics (2021). *https://youtu.be/mRsnPqK4LCQ*

Video 3
Video: 3D aMRI not only provides a stunning look inside the "beating brain", but it can also measure this physiological motion in all directions. Here, the amplitude of brain motion is overlayed for each brain slice and orientation in 3D. 3D aMRI method outlined in Abderezaei et al. *Brain Multiphysics (2021)*; Terem et al. *Magnetic Resonance in Medicine (2021).* *https://youtu.be/Yfplh32y5GY*

References

[1] *https://doi.org/10.1002/mrm.28797*
[2] *https://doi.org/10.1016/j.*

GE Healthcare's AIR Recon DL receives FDA clearance on SIGNA 7.0T

GE Healthcare's AIR Recon DL, the industry's first deep learning image reconstruction technology that works across all anatomies, is now FDA 510(k) cleared on SIGNA 7.0T magnetic resonance imaging (MRI) scanners – the world's most advanced FDA-cleared MRI device.

Since it first launched on GE Healthcare's 3.0T and 1.5T MRI scanners, AIR Recon DL has benefited over a half a million patients around the world, improving the patient experience through shorter scan times while also increasing diagnostic confidence with better image quality.

AIR Recon DL, a deep learning image reconstruction technology, makes full use of all the raw data coming off the MRI scanner, maximizing image quality and resolution even with shorter scan times. Feedback from clinical users has been overwhelmingly positive, including observations of sharper and less noisy images as well as a 30-50% reduction in exam times.

GE Healthcare's SIGNA 7.0T MRI

A more complete picture

"The images truly are amazing," explains Garry Gold, MD, Professor of Radiology at Stanford and clinical reviewer of GE Healthcare's FDA application. "AIR Recon DL for SIGNA 7.0T takes everything we love about the ultra-high-field 7.0T's strength – namely its ability to visualize high-resolution tissue structures – and brings it to the next level by reducing noise and edge ringing. As a result, AIR Recon DL with 7.0T helps reveal a more complete picture – providing greater clinical insight for improved patient outcomes and opening up new opportunities for research across various care areas."

With a powerful 7.0 Tesla (7.0T) magnet at its core, SIGNA 7.0T [1] can be used for both research and clinical purposes to image anatomy, function, metabolism and microvasculature in the brain and joints with incredible resolution and detail, for a broad range of applications across neurologic and musculoskeletal diseases. The completely new system features UltraG gradient technology, GE's state-of-the-art, whole-body gradient coil with 113 mT/m and 260 T/m/s, to meet the demands of ultra-high field imaging speed, contrast, resolution, advanced diffusion, and functional brain imaging.

AIR Recon DL on SIGNA 7.0T joins a host of other state-of-the art applications in GE's latest SIGNAWorks software platform, enabling more clinical translation of research and development between GE Healthcare MRI systems – from the ultra-high-field 7.0T to the more commonly available 1.5T and 3.0T scanners in clinical settings.

"We are thrilled to make our industry-leading AIR Recon DL technology available on SIGNA 7.0T, our most powerful scanner," says Jie Xue, President and CEO, MR, GE Healthcare. "SIGNA 7.0T is a powerful tool in research for the visualization of smaller structures and subtle pathologies across various, evolving areas of study, including: neurological disorders like Alzheimer's disease, psychological disorders like depression, and articular cartilage degradation in osteoarthritis. AIR Recon DL – which has received overwhelmingly positive user feedback and fast, broad adoption – further extends the capabilities of GE Healthcare's completely new SIGNA 7.0T system, empowering our research and clinical partners to pursue new frontiers in neuroscience and musculoskeletal imaging."

AIR Recon DL, developed on GE Healthcare's Edison intelligence platform, is available as an upgrade or with new system purchases. It is currently available on GE Healthcare 1.5T, 3.0T, and 7.0T MR systems.

Reference

[1] SIGNA 7.0T is not yet CE marked. It is not available in all markets. MEH

Philips, Elekta deepen strategic partnership in precise, individualized oncology care

Royal Philips and Elekta have signed agreements to deepen their existing strategic partnership to advance comprehensive and personalized cancer care through precision oncology solutions.

The extended collaboration builds on the two companies' successful cooperation in the fast-emerging field of magnetic resonance (MR)-guided adaptive radiation therapy. Through deeper cross-portfolio collaboration, Philips and Elekta will utilize their complementary capabilities to further improve patient care.

Oncology care is transforming, driven by an increasingly precise diagnosis of each tumour, and a continuously expanding range of therapy options. To fully capitalize on these opportunities, healthcare providers require integrated solutions throughout the entire cancer care pathway, from diagnosis to treatment and follow-up.

In this preferred, although non-exclusive, partnership, Elekta and Philips will leverage their capabilities to pursue integrated vendor-agnostic solutions, enhancing interoperability between the two parties' systems and software in order to drive precision in oncology.

This integrated approach has the potential to provide:

- Quicker, more accurate visualization of the tumour
- Easier decision of optimal treatment strategy
- Earlier assessment of therapy response
- More effective and efficient therapy delivery

The strengthened strategic partnership intends to further deliver a superior experience in diagnosis and adaptive, personalized treatments for clinicians, shorter treatment times and more precise therapy for patients, and lowered costs of care for healthcare providers.

"To capitalize on the opportunities presented by increasingly precise diagnosis and the fast-expanding range of therapies available for cancer patients, it's essential to provide integrated systems and solutions that provide the right insights at the right time throughout each patient's care journey," said Kees Wesdorp, Chief Business Leader of Precision Diagnosis at Philips. "By deepening our already-successful collaboration with Elekta, we will accelerate towards our goal of providing clear care pathways and predictable outcomes for every cancer patient. [This] announcement is an important next step in the implementation of our strategy in precision diagnosis."

Gustaf Salford, Elekta's President and CEO, said: "I expect this extended partnership to unlock opportunities that will provide better outcomes for people with cancer. Together, we'll combine advanced informatics and image-guided radiation therapy solutions to deliver greater precision in oncology. This means easier selection by clinicians of the optimal treatment strategy and more efficient and effective therapy delivery." MEH

Arab Health generates more than $200k in new business

Arab Health and Medlab Middle East generated AED767.7 million (US$209 million) of new business deals during the live, in-person element of the show in June, according to the organizers, Informa Markets.

The four-day exhibition saw 22,800 visitors from 172 countries connect with 1,700 exhibitors from 61 countries, including 30 international pavilions.

Wouter Molman, Executive Vice President for Informa Markets, said: "Arab Health and Medlab Middle East have been a resounding success this year and underscored the importance, and perhaps, more importantly, the demand, to host live and in-person events once again. Our overarching goal was to create a platform that was conducive to facilitating business deals by providing an opportunity to make connections, network and ultimately to support global healthcare recovery."

Deals completed during the event included a collaboration between American Hospital Dubai and Etisalat Digital to enhance the patient experience by utilising multiple digital technologies.

Al Jalila Children's Specialty Hospital (AJCSH) announced a high-profile agreement with Illumina Netherlands BV, the world's leader in next-generation sequencing, to provide technical expertise, reagents and analysis tools and training to the group.

Elsewhere on the show floor, Gulf Medical University signed an MOU with GEOTAR-Med LLC, a leading company in Russia providing complex turnkey solutions for medical education, to develop, produce and advance exciting simulation equipment for education in healthcare professions.

As part of the online element of the show, 19,699 visitors attended from countries including Chile, Congo, Mauritius, Zambia, Bolivia, Costa Rica & Dominican Republic, totaling over 31 countries who were only represented online thanks to the virtual aspect of the exhibitions. A survey of online participants revealed that 47% of online attendees had never attended either show in the past.

"These results underscore the importance of our online event by providing an opportunity for an even greater audience to participate. While the physical events remain a strong and impactful platform, which resulted in millions of dirhams worth of business generated at the in-person shows, the online element has so far facilitated over 46,300 unique connections from around the world," added Molman.

The 2022 edition of the show, which returns as a co-located event for the healthcare and laboratory industries, will take place from 24 – 27 January at the Dubai World Trade Centre.

Amedeo Scarpa, Italian Trade Commissioner

Italian pavilion

Speaking to Middle East Health, Amedeo Scarpa, the Italian Trade Commissioner in the UAE, who attended the exhibition, said that although the show attendance was smaller than in previous years due to the pandemic, "the quality of visitors was better".

Italy is a major player in the life science sector and is internationally recognised for its excellence in biotech, pharma and medical devices.

Scarpa said that the healthcare sector in the Middle East was one of the fastest growing markets in the world – and that for this reason they were looking at a restructuring of production by moving from the Far East to the Middle East – so called near-shoring of established companies.

"There are many important buyers in this region, particularly from Saudi Arabia," he said.

"In the UAE, Italian healthcare companies, including pharma, have 9-10% market share."

He noted that medical device exports to the UAE has seen a 19.3% increase in the first quarter of 2021 compared to the same period last year.

For the first time at Arab Health, Italy assisted eight Italian start-ups to showcase their products at the Italian pavilion. Scarpa said the Italian contingent at Arab Health showcased one of the largest offerings by any country. "The exhibition is one of the most important globally in this sector and as a country, we heavily invest in healthcare innovation by supporting young individuals with a dynamic outlook."

Valiamo, one of the Italian start-ups at the show, manufactures hospital equipment, home care and medical solutions using artificial intelligence. One of their products is an innovative smart bed called Angelo with built-in patient monitoring capabilities. The sensors which monitor vital signs, patient movement, quality of sleep and other parameters with artificial intelligence, are built in to the bed's structure and can relay information on the patient's condition directly to attending doctors and nurses.

Other Italian start-ups included ComfTech, an innovative start-up that develops, produces and sells wearable monitoring systems. Their textile sensors enable measurement of vital signs, such as heart rate, breathing rate and other parameters, such as body position and activity level, which can inform clinicians of the patient's health through remote monitoring.

USA pavilion

US technology was also on show at Arab Health with more than 100 US manufacturers, suppliers, service providers, hospitals, clinics and practitioners participating.

The centrepiece of America's effort at Arab Health was the USA Partnership Pavilion, organized since 1993 by Kallman Worldwide, the show's official US representative, in coordination with government agencies, including the departments of Commerce and State.

Cardiac Insight was one of the US companies exhibiting at the event. The company specialises in wearable cardiac sensors and proprietary software that automatically analyses ECG data to improve early detection and diagnosis of cardiac arrhythmias, such as atrial fibrillation. At the show they launched their Cardea SOLO ECG system combines a single-use patient-friendly wearable ECG sensor with in-clinic automated software managed by clinicians for arrhythmia analysis.

Another US company at Arab Health was IMI (International Medical Industries), an industry leader in tamper-evident products that enhance medication safety throughout the pharmaceutical supply chain. IMI's Prep-Lock brand of tamper evident products includes security devices for IV, oral, and enteral syringes, IV bags, and CADD medication cassettes.

IMI's Prep-Lock tamper evident port cap

Dubai Healthcare City

Dubai Healthcare City (DHCC) used Arab Health as platform to galvanize key partners for a major drive focused on its research and development capabilities. At Arab Health, DHCC had partner zones where organizations, including Al Jalila Children's Specialty Hospital, Al Jalila Foundation and the Mohammed Bin Rashid University of Medicine and Health Sciences demonstrated some of their past, current and planned R&D projects. The idea was to highlight the research capabilities and initiatives of its community partners as part of DHCC's drive to develop the destination as a global research hub.

French Healthcare pavilion

France brought 51 companies to Arab Health. The most represented sectors at the pavilion included consumer goods, diagnostic tests, digital health, hospital and medical equipment, medical gas equipment, orthopaedics and physiotherapy/rehabilitation. In the UAE, France is the fourth largest supplier of pharmaceutical products and has developed substantial economic and commercial activity, with many subsidiaries already established in the health sector, such as Sanofi, Ipsen, Servier, Air Liquide and Hygienair.

Philips eICU

LG's advanced medical monitors

LG Electronics showcased a range advanced medical display solutions.

Hongju Jeon, President of LG Electronics Gulf, commented: "As a leader in the premium monitor market, LG is supporting healthcare providers in their efforts to ensure more accurate medical diagnosis, operations and treatment. Medical displays play a pivotal role in ensuring positive long-term outcomes, so the importance of proper perception and interpretation cannot afford to be overlooked. We are proud to be catering towards the healthcare sector and believe that our medical displays are offering a clear market differentiator – owing to the level of detail and practicality we have embedded into each of their designs."

At the event LG unveiled an improved X-ray acquisition software for the company's Digital X-Ray Detector (DXD) line-up. This software has been developed in close partnership with VUNO – an industry-renowned specialist in AI-based medical solutions. It represents the first healthcare solution in LG's medical imaging portfolio to make use of AI. When combined with LG DXD, the advanced software enables a more seamless, time-efficient way of generating and analyzing X-ray images.

Within LG's portfolio of Diagnostic Monitors, model 31HN713D features a 12MP IPS display for mammography and also separate functions under Pathology Mode and Focus View Mode. Diagnostic monitors often need to be connected to various modalities, all with differing resolutions. With 31HN73D's Multi-resolution Mode, users can adjust the resolution of monitor to optimize in accordance with the connected device.

LG's latest 4K Surgical Monitor (model 32HL714S) comes with a large 31.5-inch IPS Display for greater clarity and precision. The monitor provides visual comfort for viewing accurate images from a 178 degree viewing angle and as a result, reduces the risk of misperception. It is compatible with HDR-supported medical devices such as endoscope cameras and can deliver images from devices vividly without crushing blacks in dark areas. LG's surgical monitors also feature anti-reflection and anti-fingerprint protection glass for enhanced usability.

LG also showcased Clinical Review monitors, hospital TVs and Interactive Display Boards.

Philips' reimagined future of healthcare

Philips demonstrated a reimagined future of healthcare, realized through AI-driven clinical collaboration command centres and key telehealth solutions. The company showcased healthcare innovations and workflows that facilitate communication and collaboration between technologists and experts, including:

- **Digital Pathology with remote and real-time collaboration:** The use of an enterprise-wide digital pathology platform contributes to earlier and more accurate detection and tissue assessment. In addition, a digital pathology solution can lead to a decrease in the rate of interpretation errors, especially in difficult and diagnostically rare diseases conducted by non-subspecialized pathologists. It can also save time for pathologists in administration tasks such as matching slides and paperwork to cases, transporting cases, error correction, and retrieving prior records. This frees up capacity for a higher volume of patients to receive the access to care they need.
- **Tele-ICU:** Tele-ICUs, such as the Philips eICU, enables clinicians to interact with staff at the bedside and consult on individual care – even from offsite. This means one centralized specialized critical care team can manage large number of ICU locations, and exchange health information electronically, in real time. This offers a supplement – not a replacement – to the bedside team, by creating added support structures to increasingly scarce clinical resources.
- **Tele-ultrasound:** Philips Lumify – award-winning tablet-based ultrasound solution with Reacts, the world's first truly integrated tele-ultrasound solution, brings professionals, places and patients together. Key to future care delivery and collaboration, it enables live communication for better support and more meaningful collaborations.
- **Virtual Care:** Philips' telehealth solutions and capabilities enable customers to extend where, when and how care is delivered. Virtual care can help to improve efficiency while maintaining quality of care and optimizing staff allocation and productivity through data-driven insights. MEH

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Middle East HEALTH

المشاعر الإنسانية
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Residential and Day Care for Special Needs

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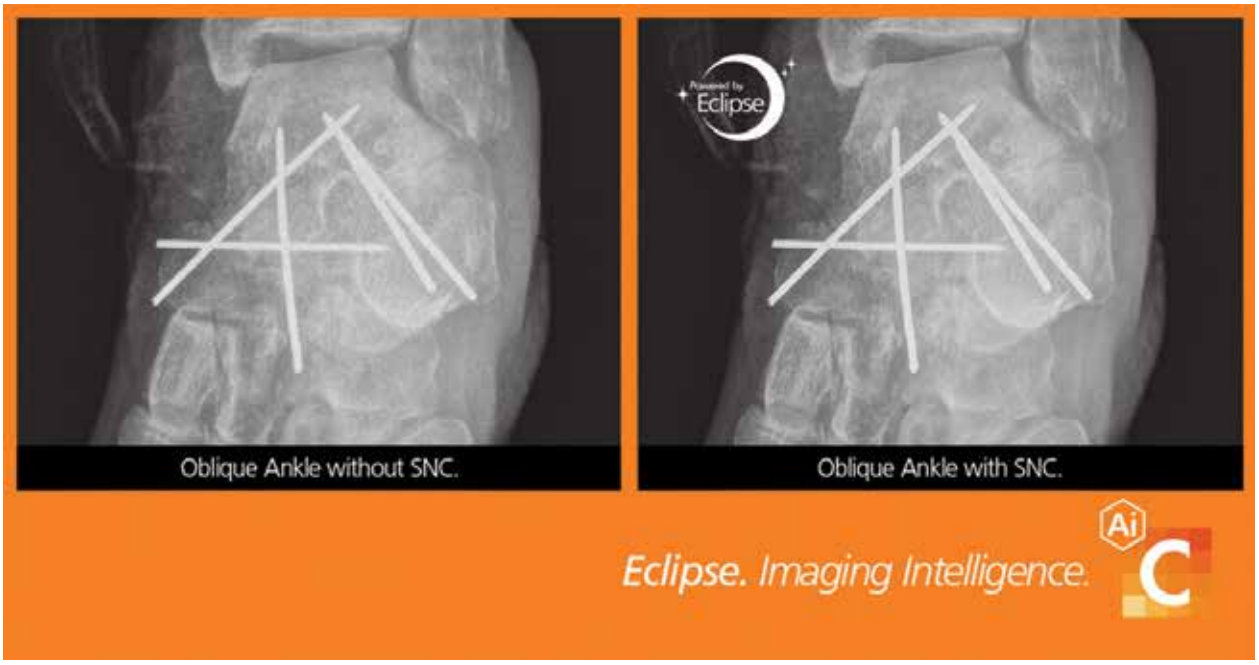

Carestream advances X-ray image quality with Smart Noise Cancellation

Carestream Health has released Smart Noise Cancellation (SNC), a groundbreaking artificial intelligence (AI)-based technology that significantly improves image quality – producing images that are clearer than with standard processing. SNC has received FDA 510(k) Clearance and is available as an optional feature with Carestream's ImageView Software powered by Eclipse –the intelligent image-processing engine behind the company's innovative imaging software – on DRX-Evolution and DRX-Evolution Plus systems.

"Carestream is a leader in using AI for noise cancellation with X-ray images. Our team of imaging scientists has been able to separate image noise from sharpness and contrast using AI-based algorithms that result in remarkable image quality," said Jill Hamman, Worldwide Marketing Manager, Global X-ray Solutions at Carestream. "This technology provides improved anatomical clarity, preservation of fine detail and better contrast-to-noise ratio for images acquired at a broad range of exposures, which can help improve diagnostic confidence and alleviate physician fatigue. It also enables radiology professionals to better optimize radiation dose." Optimizing radiation dose is especially important with neonatal and paediatric diagnostic imaging, where imaging at the lowest possible dose is crucial for young patients.

Separating noise from an image has been a challenge for medical imaging scientists. Traditional noise reduction introduces blurring, which degrades image sharpness and might remove important anatomical information. Conversely, the more an image is sharpened, the more noise may be enhanced. Noise is often an undesirable by-product of image capture and can obscure critical anatomical data. Carestream's SNC is able to isolate noise to produce images that are significantly clearer than with standard processing.

As the preferred level of noise on X-ray images is subjective – for example, some radiologists expect to see a certain degree of noise in images, which assures them that the patient was not overexposed – Carestream enables imaging professionals to adjust the amount of noise cancellation and exposure to meet their desired image quality.

Objective testing demonstrated that SNC processing enables a 2x-4x noise reduction in flat image areas, preserves high frequency sharpness and improves contrast detail. Additionally, a blind Clinical Reader Study using board-certified radiologists found that 89.5% of all study ratings showed a slight to strong preference for SNC-processed images. Sixty-four percent of the diagnostic quality ratings improved – based on the RadLex rating scale – and 56% of these ratings improved from "limited" or "diagnostic" to "exemplary".

When combined with SmartGrid software, Smart Noise Cancellation software promises benefits in gridless imaging where the removal of scatter typically leads to an increase in noise appearance.

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Learn the way to automation in your laboratory

In the past, sample identification in pathology, cytology and histology laboratories has been accomplished by handwriting information. However, handwriting tends to be difficult to read, can be inaccurate and might even rub off during processing. DTM Medical, an international OEM and solution provider, offers printing solutions which reduce the risk of specimen misidentification.

With the Signature Series labs can now print text, graphics, logos and 2D bar codes directly onto slides and tissue cassettes. That eliminates handwriting or expensive and difficult-to-apply labels and makes the lab workflow more efficient while increasing patient safety. The printers support full-colour and black printing with UV- and chemical-resistant ink, only white-frosted slides and white cassettes need to be stored. That leads to significant cost reduction.

The Signature Series includes the Signature Slide and Signature Cassette Printer. The latter is available as a manual stand-alone system or as a fully automatic feed model with a robotic picking system called Autoloader. Labs can first purchase a manual printer and later upgrade that printer with robotics to make it a completely automated solution.

By placing a cassette printer at each grossing station and a slide printer at each microtome station the labs' efficiency is significantly increased while the risk of specimen misidentification is reduced or even eliminated. Labs can certainly afford and cost-justify to do so as the Signature printers cost less than all other monochrome-only slide and cassette printers currently available. They are easily integrated into existing laboratory information systems or can be used as stand-alone systems. Signature printers offer a new and better way for laboratories as well as medical, education and research organizations to process and manage slides and cassettes.

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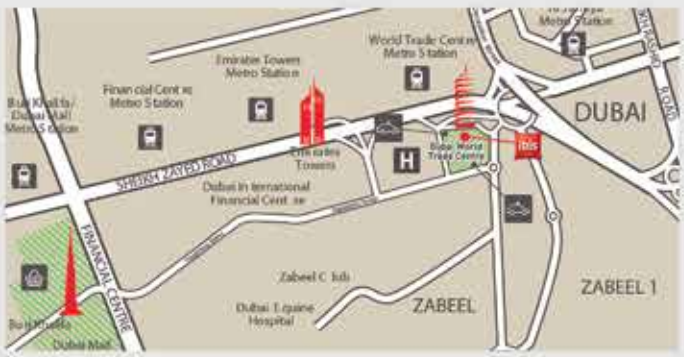

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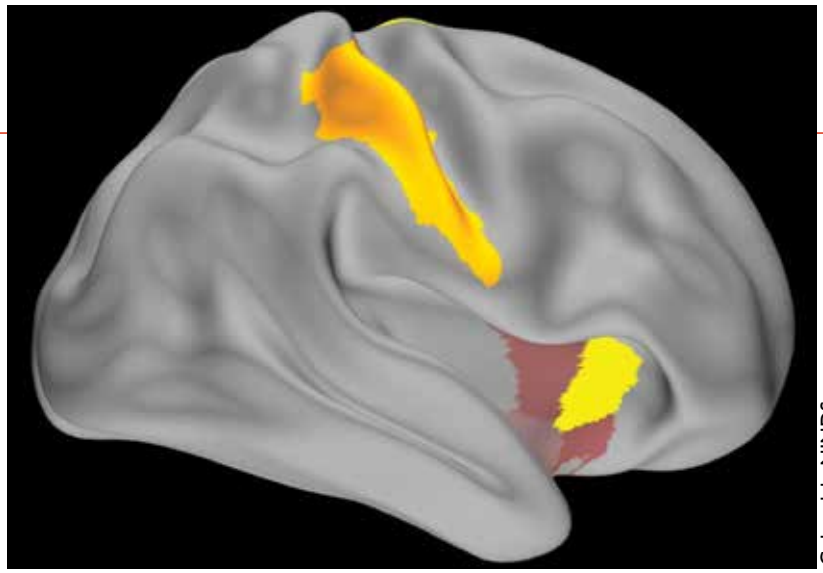

Cohen lab, NINDS

In a study of healthy volunteers, NIH researchers discovered that our brains may replay compressed memories of learning new skills when we rest. Above is a map of the memory replay activity observed in the study.

Taking short breaks may help our brains learn new skills

In a study of healthy volunteers, US National Institutes of Health researchers have mapped out the brain activity that flows when we learn a new skill, such as playing a new song on the piano, and discovered why taking short breaks from practice is a key to learning. The researchers found that during rest the volunteers' brains rapidly and repeatedly replayed faster versions of the activity seen while they practiced typing a code. The more a volunteer replayed the activity the better they performed during subsequent practice sessions, suggesting rest strengthened memories.

"Our results support the idea that wakeful rest plays just as important a role as practice in learning a new skill. It appears to be the period when our brains compress and consolidate memories of what we just practiced," said Leonardo G. Cohen, M.D., senior investigator at the NIH's National Institute of Neurological Disorders and Stroke (NINDS) and the senior author of the study published in *Cell Reports*. "Understanding this role of neural replay may not only help shape how we learn new skills but also how we help patients recover skills lost after neurological injury like stroke."

The study was conducted at the NIH Clinical Center. Dr. Cohen's team used a highly sensitive scanning technique, called magnetoencephalography, to record the brain waves of 33 healthy, right-handed volunteers as they learned to type a five-digit test code with their left hands. An experiment began when a subject was shown the code "41234" on a screen and asked to type it out as many times as possible for 10 seconds and then take a 10 second break. Subjects were asked to repeat this cycle of alternating practice and rest sessions a total of 35 times.

Brain waves

During the first few trials, the speed at which subjects correctly typed the code improved dramatically and then levelled off around the 11th cycle. In a previous study, led by former NIH postdoctoral fellow Marlene Bönstrup, M.D., Dr. Cohen's team showed that most of these gains happened during short rests, and not when the subjects were typing. Moreover, the gains were greater than those made after a night's sleep and were correlated with a decrease in the size of brain waves, called beta rhythms. In this new report, the researchers searched for something different in the subjects' brain waves.

"We wanted to explore the mechanisms behind memory strengthening seen during wakeful rest. Several forms of memory appear to rely on the replaying of neural activity, so we decided to test this idea out for procedural skill learning," said Ethan R. Buch, Ph.D., a staff scientist on Dr. Cohen's team and lead author of the study.

To do this, Leonardo Claudino, Ph.D., a former postdoctoral fellow in Dr. Cohen's lab, helped Dr. Buch develop a computer program which allowed the team to decipher the brain wave activity associated with typing each number in the test code.

The program helped them discover that a much faster version – about 20 times faster – of the brain activity seen during typing was replayed during the rest periods. Over the course of the first eleven practice trials, these compressed versions of the activity were replayed many times – about 25 times – per rest period. This was two to three times more often than the activity seen during later rest periods or after the experiments had ended.

Interestingly, they found that the frequency of replay during rest predicted memory strengthening. In other words, the subjects whose brains replayed the typing activity more often showed greater jumps in performance after each trial than those who replayed it less often.

"During the early part of the learning curve we saw that wakeful rest replay was compressed in time, frequent, and a good predictor of variability in learning a new skill across individuals," said Dr. Buch. "This suggests that during wakeful rest the brain binds together the memories required to learn a new skill."

"Overall, our results support the idea that manipulating replay activity during waking rest may be a powerful tool that researchers can use to help individuals learn new skills faster and possibly facilitate rehabilitation from stroke," said Dr. Cohen.

References

Consolidation of human skill linked to waking hippocampo-neocortical replay. *Cell Reports*. June 8, 2021. doi: https://doi.org/10.1016/j.celrep.2021.109193

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