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NEWS ALERT

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GLOBAL

[Novel biomarkers identified for diseases predisposing to dementia](#)

A study by an international research group has identified 15 novel biomarkers that are linked to late-onset dementias. These biomarkers are proteins, which predict cognitive decline and subsequent increased risk of dementia 20 years before the disease onset. The proteins are related to immune system dysfunction, blood-brain-barrier dysfunction, vascular pathologies, and central insulin resistance. Six of these proteins can be modified with currently available medications prescribed for conditions other than dementia. These findings provide novel avenues for further studies to examine whether drugs targeting these proteins could prevent or delay the development of dementia.

[Metal and metal oxide thin films made more efficiently](#)

University of Minnesota Twin Cities researchers have invented a cheaper, safer, and simpler technology that will allow metals and metal oxides to be made into thin films used in many electronics, computer components, and other applications. They developed a way to evaporate metals at significantly lower temperatures, fewer than 200 degrees Celsius instead of several thousands. By designing and adding organic ligands—combinations of carbon, hydrogen, and oxygen atoms—to the metals, the researchers were able to substantially increase the materials' vapor pressures, making them easier to evaporate at lower temperatures. Not only is their new technique simpler, but it also makes higher quality materials that are easily scalable. This is a simpler and cheaper technology that enables better materials with atomic precision and could have many applications

[New drug combo shows early potential for treating pancreatic cancer](#)

A team of MIT researchers has developed an immunotherapy strategy that can eliminate pancreatic tumors in mice. Pancreatic cancer is one of the deadliest forms of cancer and treatments have limited effect. The team found a way to activate T cells to recognize and destroy cells that express cancerous proteins, using a combination of three drugs used in immune checkpoint therapy. The team combined CD40 agonist antibodies with both a PD-1 inhibitor and a TIGIT inhibitor, and found a dramatic effect. Pancreatic tumors shrank in about half of the animals given this treatment, and in 25 percent of the mice, the tumors disappeared completely. Furthermore, the tumors did not regrow after the treatment was stopped. A clinical trial on the triple combination is expected to begin later this year. Alongside the clinical trial, the MIT team plans to analyze which types of pancreatic tumors might respond best to this drug combination. They are also doing further animal studies to see if they can boost the treatment's effectiveness beyond the 50 percent that they saw in this study.

[New biocompatible glue could quickly seal injured tissues and stop bleeding](#)

Inspired by the sticky substance that barnacles use to cling to rocks, MIT engineers have designed strong, biocompatible glue that can seal injured tissues and stop bleeding. The new paste can adhere to surfaces even when they are covered with blood, and can form a tight seal within about 15 seconds of application. Such glue could offer a much more effective way to treat traumatic injuries and to help control bleeding during surgery. The MIT team used a polymer called poly(acrylic acid) embedded with an organic

compound called an NHS ester, which provides adhesion, and chitosan, a sugar that strengthens the material. The researchers froze sheets of this material, ground it into microparticles, and then suspended those particles in medical grade silicone oil. When the resulting paste is applied to a wet surface such as blood-covered tissue, the oil repels the blood and other substances that may be present, allowing the adhesive microparticles to crosslink and form a tight seal over the wound. Within 15 to 30 seconds of applying the glue, with gentle pressure applied, the glue sets and bleeding stops, the researchers showed in tests in rats. The paste can be molded to fit irregular wounds. The glue was able to rapidly stop bleeding in the liver. The seal remains intact for several weeks, giving the tissue below time to heal itself with little inflammation. The glue is slowly resorbed within the body over months, and it can also be removed earlier by applying a solution that dissolves it, if required. The researchers are commercializing the glue.

[Using Graphene foam to filter uranium and other heavy metals from water](#)

MIT-led research team has fashioned graphene foam into a device that can extract uranium and other heavy metals from tap water. Applying an electric charge to graphene oxide foam, the researchers can capture uranium in solution, which precipitates out. Within hours, the process can purify a large quantity of drinking water below the EPA limit for uranium. The team found that by sending an electric charge through the foam, splitting water and releasing hydrogen, they could increase the local pH and induce a chemical change that pulled uranium ions out of solution. The researchers found that the uranium would graft itself onto the foam's surface, where it formed crystalline uranium hydroxide. On reversal of the electric charge, the mineral, which resembles fish scales, slipped easily off the foam. Much effort went into the chemical composition of the foam, the electrolysis and to make the foam more robust. The foam can capture four times its own weight of uranium, and can achieve an extraction capacity of 4,000 mg per gram. The foam can go through seven cycles without losing its extraction efficiency. The graphene foam functions as well in seawater, where it reduces uranium concentrations from 3 parts to 0.02 parts per million, showing that other ions in the brine do not interfere with filtration. This technology could be used for water purification, and for extraction of Uranium and other metals from seawater.

COVID-19

COVID-19 (WORLD)

[WHO calls for a stop to COVID Vaccine Boosters](#)

The World Health Organization has called for a moratorium on COVID-19 vaccine boosters through the end of September or later, citing global inequalities in the vaccine rollout. The statement came hours after a San Francisco hospital began offering "supplemental doses" of the Pfizer or Moderna vaccines to Johnson & Johnson recipients – following the lead of countries like Israel, which is already offering Pfizer boosters to elderly people, and European countries, planning to start boosters next month. According to an analysis by the WHO, if the 11 countries that are either rolling out boosters or considering it this year were to give the shots to everyone over 50 years old, they would use up roughly 440 million doses of the global supply. The WHO chief called for the urgent reversal from the majority of vaccines going to high-income countries to the majority going to low-income countries.

[New device can diagnose COVID-19 from saliva samples](#)

Engineers at MIT and Harvard University have designed a small tabletop device that

can detect SARS-CoV-2 from a saliva sample in about an hour. The device can also be used to detect SARS-CoV-2 variants. The new diagnostic is based on SHERLOCK, a CRISPR-based tool, and includes an RNA guide strand that allows detection of specific target RNA sequences, and Cas enzymes to cleave those sequences and produce a fluorescent signal. All of these molecular components can be freeze-dried for long-term storage and reactivated upon exposure to water. The researchers first tested their device with human saliva spiked with synthetic SARS-CoV-2 RNA sequences, and then with about 50 samples from patients who had tested positive for the virus and found that the device was just as accurate as the gold standard PCR tests.

Potential COVID-19 medication found

A team from Scripps Research, USA, has found a group of medications called salicylanilides, which have both an antiviral and anti-inflammatory properties. One compound called Saliclamide No. 11 is able to pass into the bloodstream and interfere with how the coronavirus deposits its genetic material into infected cells by blocking the viral material from getting into the infected cells. This mechanism is not dependent on the virus spike protein, and can work against new variants. In addition, No. 11 helped quiet potentially toxic inflammation in the research animals, which could be important for treating acute respiratory distress associated with life-threatening COVID infections. Salicylanilide 11 could be a potential therapeutic for COVID.

COVID diagnostic using two CRISPR enzymes developed

A research team of scientists at the University of California, Berkeley, is aiming to develop a diagnostic test that is much faster and easier to deploy than qRT-PCR. It has combined two different types of CRISPR enzymes to create an assay that can detect small amounts of viral RNA in less than an hour. The new technique is able to pick up levels of viral RNA (about 30 copies per microliter) sufficient to be used for surveillance of the population. The new technique is termed Fast Integrated Nuclease Detection In Tandem (FIND-IT) which is an amplification free technique and uses tandem nuclease approach with Cas13 and Csm6. It includes steps to collect and process samples and to run the assay on a compact microfluidic device. This opens up opportunities for faster, simpler and inexpensive diagnostic tests for many other infectious diseases as well.

Protein-based COVID-19 vaccine that mimics the shape of the virus developed

Researchers have developed a new protein-based COVID-19 vaccine by engineering polymersomes (self-assembling, spherical nanoparticles) to mimic viruses by displaying multiple copies of the receptor binding domain (RBD) on their surfaces. After characterizing the nanoparticles in vitro, they injected them into mice, along with separate polymersomes containing an adjuvant, in two doses that were three weeks apart. For comparison, they immunized another group of mice with polymersomes that encapsulated the RBD, along with the nanoparticles containing the adjuvant. Although both groups of mice produced high levels of RBD-specific antibodies, only the surface-decorated polymersomes generated neutralizing antibodies that prevented SARS-CoV-2 infection in cells. Both the surface-decorated and encapsulated RBDs triggered robust T cell responses. Safety and efficacy in humans is yet to be determined.

New COVID-19 vaccine moves ahead

A South Australian-developed SARS-CoV-19 vaccine is preparing to progress to final stages of human clinical trials after early animal testing confirmed its safety and effectiveness in preventing COVID-19 lung infection. The researchers used artificial intelligence and protein engineering to develop a synthetic spike protein which was then

produced in insect cell cultures. Once purified, the protein-based coronavirus vaccine named COVAX-19™ incorporates a plant derived adjuvant - advax. Results of the initial studies show that the vaccine is safe and effective in animals (mice and ferrets) and also give some indication that it may also be able to reduce the risk of transmission based on the lack of virus shedding in the noses of ferrets

[COVID vaccine booster trial in transplant patients proves third shot very effective](#)

Scientists with the Ajmera Transplant Centre at UHN have conducted a first-in-the-world randomized placebo-controlled trial of third dose COVID-19 booster vaccine for transplant patients, which show substantially improved protection. The study enrolled 120 transplant patients vaccinated with two doses of the Moderna vaccine and none of them had COVID previously. Half of the participants received a third shot of the vaccine and the other half received placebo. The primary outcome was based on antibody level greater than 100 U/ml against the spike protein of the virus. In the placebo group, the response rate was only 18 percent whereas in the Moderna three-dose group, the response rate was 55 percent. The third dose was safe and well tolerated and could lead to a change in practice of giving third doses to this vulnerable immunocompromised population.

[WVU researcher develops copper-infused mask](#)

West Virginia University researcher developed a copper-infused comfortable and well-fitted mask called Hygenmask. It is a three-layered facemask containing a copper-infused nano-coated fabric, a sustainable bamboo fabric and an ePTFE (a biomaterial) filter. The mask bears elastic head loops that go over the head and can be tightened for a customized fit. The bamboo fabric offers a smooth feel and fits tight around the face. The mask has been tested and it blocked up to 93 percent of droplets being respired. The mask is comfortable and does not leave marks on the face. It is ideal for people who are at the front desk and need to wear the mask for long durations.

[Lab-grown beating heart cells identify potential drug to prevent long COVID-19](#)

A team of scientists at the University of Cambridge has used human embryonic stem cells to grow clusters of heart cells in the lab and shown that these cells mimic the behaviour of the cells in the body, beating as if to pump blood. These model heart cells also contained the key components necessary for SARS-CoV-2 infection, the ACE2 receptor. The researchers used this system to show that an experimental peptide drug called DX600 can prevent the virus from entering the heart cells. Further research on this drug would be carried out. This can provide a new treatment to reduce harm to the heart in patients recently infected with the virus, particularly those who already have underlying heart conditions.

COVID-19 (INDIA)

[Scientists from BRICS to carry out genomic sequencing and modelling of the COVID-19 pandemic](#)

Scientists from India, in partnership with those from China, Russia and Brazil, will carry out genomic sequencing of SARS-CoV-2 and studies on the epidemiology and mathematical modeling of the COVID-19 pandemic. This will help trace genetic mutations, recombinations as well as distribution of the virus and also make projections about the future of its spread. A 4 country consortium will carry out different arms of this BRICS-Multilateral Research and Development Project. India and Brazil will assess

distribution of SARS-CoV-2 in environmental samples through metagenome analysis for wastewater-based epidemiology (WBE) surveillance. China and Russia will carry out the Real-Time PCR detection of SARS-CoV-2 in biological material (nasopharyngeal swabs) from patients with symptoms of respiratory diseases and investigate the genomic variability, comparative genomics and phylogenetic analysis. The genomic, metagenomic and epidemiological data from India, China, Russia and Brazil will be integrated to develop mathematical models for mutations analysis, population genetics, phylogenetic relationship, recombination analysis and risk evaluation to reveal spread network and dynamics of the virus.

Mixing Covishield, Covaxin may provide better immunity

Administering people a dose of Covishield, followed by Covaxin in the second dose is safe and improves immunity, according to a study by the Indian Council of Medical Research (ICMR). 18 people from eastern Uttar Pradesh, after receiving Covishield as the first dose, were inadvertently administered Covaxin in the second dose after an interval of six weeks. The study compared the safety and immunogenicity profile of them against that of individuals receiving either Covishield or Covaxin in both doses. The results showed that the people in the mix and match group had superior immunogenicity profiles against Alpha, Beta and Delta variants of COVID-19. The IgG antibody and neutralizing antibody response of the participants was also significantly higher compared to other groups, the ICMR said. The study reported no major adverse events. However, a multicentre randomized larger control trial needs to be carried out to confirm these preliminary findings.

First National Heart Failure Biobank inaugurated

The first National Heart Failure Biobank that would collect blood, biopsy samples, and clinical data and guide future therapies to benefit patients of heart failure was inaugurated at the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST). The storage facilities (currently for 25,000 samples) include minus 20 to minus 80 degrees mechanical freezers and a liquid nitrogen storage system to store bio-samples at minus 140 degrees perpetually for years. The bio-samples include the blood, serum, tissue samples obtained during open-heart surgery and peripheral blood mononuclear cells (PBMCs) and genomic DNA collected from heart failure patients. Researchers and clinicians interested in research related to heart failure can collaborate with SCTIMST once the proposal is approved by the Ethics Committee of SCTIMST. The facility will be useful for the research and treatment of post-Covid heart failure.

Johnson & Johnson's single-dose COVID vaccine gets EUA approval in India

Johnson & Johnson's single-dose COVID-19 vaccine has been given Emergency Use Approval (EUA) in India. This will be the fifth COVID-19 vaccine to get approval after Covishield, Covaxin, Sputnik V and Moderna in India. According to the pharma company, the EUA submission is based on efficacy and safety data from the Phase 3 clinical trial ENSEMBLE, which demonstrated the single-shot vaccine was 85 percent effective in preventing severe disease across all regions studied, and showed protection against COVID-19 related hospitalization and death, beginning 28 days after vaccination.

Novavax, Serum Institute seek nanoparticle COVID-19 vaccine approval in India

US based Novavax and the Serum Institute of India (SII), have filed regulatory submissions for emergency use authorization of Novavax's recombinant nanoparticle protein-based COVID-19 vaccine candidate with Matrix-M adjuvant in India. SII and

Novavax have also completed the submission of all modules required by regulatory agencies in India, Indonesia and the Philippines for the initiation of the review of the vaccine, including preclinical, clinical, and chemistry, manufacturing and controls data. SII will be manufacturing, and developing the vaccine and will also be responsible for commercializing the vaccine in India.

IICT develops membrane-based 4 layer face mask

Indian Institute of Chemical Technology (IICT) has developed a 4 layer SaanS mask which has two different hydrophobic layers sandwiched between two textile layers. The team used the hydrophobic 'polyethylene terephthalate' layer extracted from used membrane modules as the second layer to repel respiratory droplets carrying the virus with first layer being 100 percent cotton. Next critical layer is the non-woven hydrophobic polypropylene barrier with a high contact angle of 120 degrees to create minimum critical pressure as a barrier and prevent aqueous aerosols from entering the human respiratory system. First and last textile layers provide tight porosity and comfort to the wearer. This reusable mask prevents entry of small particles, aerosols, harmful microbes and other air-borne pollutants like pollen grains, but also offers high air permeability and comfort. The technology has been transferred to a startup and voluntary organizations to make the product in 20 States, creating livelihood opportunities for self-help groups.

India-made drug likely to cure mild COVID-19

iSera Biological, Maharashtra has developed a new drug that could potentially become India's first indigenously developed cure for COVID-19. The drug is a cocktail of COVID-19 antibodies which, when administered to a mild or moderately ill patient, prevents the disease from spreading further in the body, and neutralizes the existing virus. Early tests found infected patients to turn RT-PCR negative in 72-90 hours. The antibodies are harvested from horses after injecting them with specific COVID-19 antigens and then put through a very high-quality purification process, so that the end product is at least 95 percent pure antibodies. The candidate drug is currently undergoing phase 1 human trials and is likely to be completed by the end of this month. The company is planning for combined phase 2 and phases 3 clinical trials in September and October.

First Nasal Vaccine developed by Bharat Biotech gets nod for Phase 2 Trial

The first Nasal Vaccine developed by Bharat Biotech has received the regulatory approval for Phase 2 trials in India. The vaccine BBV154 is an intranasal replication-deficient chimpanzee adenovirus SARS-CoV-2 vectored vaccine. The Phase 1 trial on healthy volunteers of age groups ranging from 18 to 60 years was found to be safe, immunogenic and well-tolerated and was able to elicit high levels of neutralizing antibodies in animal studies. The company has in-licensed technology from Washington University in St Louis, USA. Bharat Biotech's BBV154 Covid Vaccine is the first intranasal vaccine being developed in the country entering into late-stage clinical trials.

INDIA – SCIENCE & TECHNOLOGY

Guidelines for sharing of biological data released

Science and Technology Minister Jitendra Singh released a set of guidelines to provide a well-defined framework and guiding principle to facilitate sharing of biological information and specifically high-throughput, high-volume data generated by research groups in the country. The guidelines termed as the Biotech-PRIDE (Promotion of Research and Innovation through Data Exchange) do not deal with generation of

biological data but are a mechanism to share and exchange information and knowledge generated according to existing laws, rules, regulations and norms of the country. These guidelines will ensure data sharing benefits, maximize usage, avoid duplication, maximize integration, ownership information, better decision-making and equity of access. These guidelines will be implemented through the IBDC at the Regional Centre for Biotechnology supported by the Department of Biotechnology.

Natural fibre based surgical materials

Using natural fibres, researchers from the Cochin University of Science and Technology (Cusat), have developed a tissue engineering scaffold from herbally-based composite material made from microfibrils extracted from an Indian medicinal plant Changalamparanda and a biodegradable polymer - polycaprolactone. The material is supportive of healing bone defects by giving adequate support to augment bone defect repair. The fine-size fibres will strengthen the mechanical properties and will dissolve slowly giving time for the bone to heal. This will be helpful in cases where metal-based and other implants are used and later removed surgically. The porous structure aids easy transport of nutrients and specific cells towards the defects and accelerates the tissue regeneration process. Another research product from the department has been an X-ray visible antibacterial biodegradable surgical suture, developed from natural cellulosic fibres extracted from Agave Sisalana plant leaves. It has a customized coating of a biodegradable polymer. Its porous structure in which antibiotics can be loaded will be released very slowly, thus giving a medical healing to the suture which later dissolves into the body naturally.

Energy-efficient route to produce hydrogen from water

A team of researchers from Indian Institute of Technology, Bombay developed an innovative hydrogen manufacturing route which increases its production three times and lowers the energy required. The process involves electrolysis of water in the presence of an external magnetic field. The approach also provides the capability to retrofit any existing electrolyser (that uses electricity to break water into hydrogen and oxygen) with external magnets without drastic change in the design, leading to increased energy efficiency of Hydrogen production. The intermittent use of an external magnetic field provides a new direction for achieving energy-efficient hydrogen generation. This approach could pave the path towards environment-friendly hydrogen fuel production at a lower cost.

Advanced dressing material for treating diabetic wounds

A scientist from IIT Kanpur has developed an advanced dressing based on agarose, a natural polymer derived from seaweed agar, for treatment of infected diabetic wounds and patients suffering from chronic wounds, which will allow cost-effective dressings for chronic wound patients. The wound dressing has been developed by adding several additive molecules like iodine and citric acid. The dressing may be used as a single layer, bilayer, or multi-layered hydrogel films depending on the severity and type of wound. The dressing has been tested on rat model with a small-sized circular wound of diameter 5 mm with single layer dressing incorporated with only one active ingredient. The next step would be to test its efficacy in the treatment of large wounds in big animals like rabbits or pigs. The final stage will include clinical trials, the statement said after which the technology can be commercialized.

Indigenous Aircraft Carrier (IAC) 'Vikrant' completes first sea trial

Indigenous Aircraft Carrier (IAC) 'Vikrant' has successfully accomplished its first sea

trials on 4-8 Aug 21 from Kochi. Trials progressed as planned and system parameters proved satisfactory. The carrier would continue to undergo series of sea trials to prove all equipment and systems prior to handing over the vessel to the Indian Navy in 2022. The vessel is being built at Cochin Shipyard Limited (CSL), with more than 76 percent indigenous content. It is 262 m long, 62 m at the widest part and height of 59 m including the superstructure. Displacing 37500 tons, it has a maximum speed of 28 knots, and endurance of 7500 nautical miles. There are 14 decks in all, including five in the superstructure. The ship has over 2,300 compartments, designed for a crew of around 1700 people, having gender-sensitive accommodation spaces for women officers. The ship with high degree of automation for machinery operation, ship navigation and survivability, has been designed to accommodate an assortment of fixed wing and rotary aircraft.

Carbon-based wrapper increases shelf life of fruits

Indian scientists have developed a composite paper made of graphene oxide loaded with preservatives that can be used as wrappers to help extend the shelf-life of fruits. The wrapper releases the preservative only when needed and can be reused. The activated graphene oxide-loaded molecules are loaded with preservatives and cast into a paper for fruit wrapping. When the fruit over-ripens or gets infested by pathogens, the acidity increases and triggers the release of preservatives to protect the fruit from decay. Otherwise, the preservative stays within the carbon wrapper. The team allowed the carbon matrix to incubate with the preservative. After the incubation for 24 hours at room temperature, the resultant was washed several times to remove extra preservatives. Finally, this carbon-preservative composite was cast into paper. This novel product can benefit farmers and the food industry by extending the shelf-life of fruits. It can benefit many developing countries.

Soft Robotic Actuators from Waste Onion Peels

Scientists from the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru have developed soft robotic actuators with enhanced photomechanical capacity, using porous carbon nanoparticles (PCNs) from waste onion peels. The actuators can act as efficient traps for illuminating low-power near-infrared (NIR) light and can convert a control signal into mechanical motion with applications such as bio-medical, military, and remote space operations. The actuators achieved large magnitude (multi-mm) actuation with fast (sub-second) responses. The team also found with an additional ultrathin (30 nm) gold layer, the actuation magnitude could be more than doubled, and more importantly, bidirectional photo-controlled face-sensitive movement was realized. As a novel application-oriented demonstration of the process, the team fabricated a near-infrared-driven electrical switch, which could activate LED circuits and could be used for other similar applications.

Low-cost flexible tactile sensors developed

A researcher from IIT Bombay has developed low-cost soft, flexible, and wearable sensors that can be used for diagnosis of pulse rate variability in humans. They fabricated these tactile (pressure and strain) sensors using low-cost polyurethane foam and nanomaterial-based inks that can coat several substrates. Reduced graphene oxide (rGO) was used as the sensing material. The sensors have been tested for their different levels of strains like micro and large scale motion monitoring and have potential applications in robotics, biomedical devices, skin electronics, minimal invasive surgery and identification of tumour or cancerous cells.

Innovative technology generates hydrogen directly from agricultural residue

Sentient Labs, an R&D innovation lab (incubated by KPIT Technologies with initial technical inputs) and MACS-Agharkar Research Institute (ARI), have developed the world's first technology that generates hydrogen directly from agricultural residue for use in fuel cell-powered vehicles. This hydrogen generation technology uses agricultural residue rich in cellulose and hemicellulose content – in likes of paddy, wheat, or maize residue. The process uses microbial culture for the direct generation of hydrogen from agricultural residues. It further generates methane, which is utilized for producing additional hydrogen by steam methane reformation. This process can avoid the burning of bio-mass generated in large measure in the Indian countryside and generate organic manure and CO₂, which finds applications in various industries. A pertinent sustainability aspect of the innovation is that it leads to a circular economy.

India's first Cattle Genomic Chip developed

India's first Cattle Genomic Chip for the conservation of pure varieties of indigenous cattle breeds like Gir, Kankrej, Sahiwal, Ongole etc. has been released. This indigenous chip was developed by the scientists of National Institute of Animal Biotechnology (NAIB), Hyderabad. This is one of the largest 'cattle chip' of the world and has 11,496 markers (SNPs) of indigenous breeds. To further the use of this chip in generating phenotypic and genotypic correlations, NIAB has entered into a collaborative agreement with National Dairy Development Board. This will enable both the institutes to undertake research for generating information for low incidence SNP chips for any important trait detection, like high milk yield or heat tolerance etc. and will eventually help in elite bull selection and improvement of productivity characters of Indian cattle.

IN BRIEF

New material offers solution to convert waste heat into energy.

A team of scientists from Northwestern University and Seoul National University in Korea has developed a high-performing thermoelectric material in a practical form that can be used in device development. The material developed is purified tin selenide in polycrystalline form, which outperforms the single-crystal form in converting heat to electricity, making it the most efficient thermoelectric system on record. Its efficiency of waste heat conversion, reflected by a number called ZT, was approximately 3.1 at 783 Kelvin. Its thermal conductivity was ultralow, lower than the single-crystals. Potential areas of application for the thermoelectric material include the automobile industry, heavy manufacturing industries and places where large combustion engines operate continuously.

Dissolvable smartwatch makes for easier electronics recycling.

Researchers have developed a two-metal nanocomposite for circuits that disintegrates when submerged in water. They developed a smartwatch with multiple nanocomposite-printed circuit boards inside a 3D printed poly (vinyl alcohol) case. The outer package held up to sweat, but once the whole device was fully immersed in water, both the polymer case and circuits dissolved completely within 40 hours. All that was left behind were the watch's components, such as an organic light-emitting diode (OLED) screen and microcontroller, as well as resistors and capacitors that had been integrated into the circuits. This method can be used to produce transient devices with performance matching that of commercial models, which could go a long way toward solving the challenges of small electronics waste.

New nanomaterial to derive clean fuel from the sea

Researchers at the University of Central Florida have designed a nanoscale material that can efficiently split seawater into oxygen and hydrogen - a clean energy fuel. The researchers developed a thin-film material with nanostructures on the surface made of nickel selenide with added or “doped” iron and phosphorus. This combination offers the high performance and stability that are needed for industrial-scale electrolysis and also addresses the issues that threaten efficiency enabling high efficiency and long-term stability for more than 200 hours. This development will open a new window for efficiently producing clean hydrogen fuel from seawater.

Flexible, wearable X-ray detector without heavy metals

Researchers created a proof-of-concept of heavy-metal-free metal-organic frameworks (MOF) for a flexible X-ray detector and imager. In X-ray imaging, radiation detectors which go under the body part being imaged are rigid panels that contain harmful heavy metals. The researchers created wearable X-ray detector prepared from nontoxic MOFs layered between flexible plastic and gold electrodes for high-sensitivity sensing and imaging. Their proof-of-concept device is promising for the next generation of radiology imaging equipment and radiation detection when wearable or flexible devices are needed.

Artificial Intelligence to develop drug candidate for kidney fibrosis

Insilico Medicine’s AI-powered drug discovery platform has delivered a preclinical candidate for kidney fibrosis, which has the desirable pharmacological properties, pharmacokinetic profile, and demonstrated highly promising results in in-vitro and in-vivo preclinical studies. The company leveraged its PandaOmics (target discovery platform) to develop the target hypothesis for kidney fibrosis, and used Chemistry42 to generate compounds with drug-like properties. The compound markedly inhibited the development of fibrosis and significantly improved myofibroblast activation which are critical for tissue repair and wound healing. This process of designing new drugs for new diseases is much quicker and requires much less cost than traditional methods. Insilico Medicine is working to advance this program to clinical trials.

More, purer RNA at lower cost

Researchers at the University of Massachusetts Amherst have developed a new process for making RNA which is purer, more copious and likely to be more cost-effective than any previous process enabling development of next-generation RNA therapeutic drugs. The process involves first increasing the salinity of the solution in which the RNA is generated, which inhibits the runaway production of RNA that leads to impurity. In this process, an enzyme called T7 RNA polymerase is “tethered” to a microscopic magnetic bead alongside a DNA promoter template—a specific sequence of DNA that codes for a specific RNA. Once the polymerase and DNA promoter interact, they produce RNA whose purity is ensured by the surrounding saline solution. This method can be more than ten times better at producing pure RNA than current processes. The team is trying to scale up the production of RNA and make the process continuous.

Polymer coating accelerates fuel production

Researchers from the University of Tsukuba describe porous tin (Sn) catalysts coated with polyethylene glycol (PEG) to facilitate transformation of carbon dioxide into industrial fuel (formate). The formate production rate of PEG-coated Sn was 24 times higher than that of a conventional Sn plate electrode, and no byproducts were detected

(>99 percent yield of formate). Modeling this reaction using theoretical computations confirmed the benefits of PEG shuttling carbon dioxide to the Sn center and explained the accelerated formate production. This technique can be used to develop systems that efficiently recycle carbon dioxide into useful compounds, like formate, which can power fuel cell devices that produce green electricity.

[‘Frameshifting’ therapy for mast cell cancers reduces size, spread](#)

A team of researchers from NC State and the National Institutes of Health (NIH) used a technique known as exon skipping to produce the frameshift mutation, which can be a potential new treatment for mast cell cancers. This process reduces the number of mast cells by ‘mutating’ the messenger RNA (mRNA) before it can deliver instructions for manufacturing the gene responsible for cell proliferation. The frameshifting changes the pre-mRNA so that the mature mRNA is degraded and any protein produced from its instructions is altered and inert. In a mouse model, frameshifting directed at the c-KIT gene reduced mast cell tumor size and prevented infiltration into other organs. The other advantage to this technique is that it solves the problem of degradation evasion, proteins produced by the frameshifted c-KIT mRNA are inert, or non-functional, so even if they get produced, they cannot cause more harm.

[Scientists develop chain mail fabric that can stiffen on demand](#)

Scientists from NTU Singapore and Caltech, United States, have developed a new type of ‘chain mail’ fabric that is flexible like cloth but can stiffen on demand. The lightweight fabric is 3D-printed from nylon plastic polymers and comprises hollow octahedrons (a shape with eight equal triangular faces) that interlock with each other. When encased in a plastic envelope and vacuum-packed, it turns into a rigid structure that is 25 times stiffer or harder to bend than when relaxed. The scientific concept behind the variable-stiffness fabric is called “jamming transition”. This next generation fabric paves the way for lightweight armour that can harden to protect a user against an impact, protective gear for athletes, and exoskeletons that can help the elderly to stand, walk and carry objects.

[Monoclonal antibody prevents malaria in small NIH trial](#)

One dose of a new monoclonal antibody discovered and developed at the National Institutes of Health safely prevented malaria for up to nine months in people who were exposed to the malaria parasite. The results were from a small, carefully monitored clinical trial conducted by the National Institute of Allergy and Infectious Diseases (NIAID) which tested whether a neutralizing monoclonal antibody called CIS43LS could safely provide a high level of protection from malaria in adults following careful, voluntary, laboratory-based exposure to infected mosquitoes in the United States. The results indicate that just one dose of the experimental antibody can prevent malaria for 1 to 9 months after infusion. Further research will determine whether monoclonal antibodies can also be used for the seasonal control of malaria in Africa.

RESOURCES AND EVENTS

[Australia frames rules for social media providers](#)

The Australian government has prepared a set of draft rules for social media companies

to adhere to if they want to provide a service. Failure to comply with reporting requirements could lead to the provider being fined AU\$555,000 (for companies) and AU\$111,000 (for individuals). The draft rules ([pdf](#)) also build in encryption removal requirements Australia's eSafety Commissioner will have sweeping new powers under the Online Safety Act 2020., including oversight of new set of Basic Online Safety Expectations (BOSE) that sets out a series of demands for big tech. Under the proposed Draft Online Safety (Basic Online Safety Expectations) Determination 2021, the service provider is expected to take reasonable steps to ensure safe use by end-users. The rules mandate that if the service uses encryption, the provider of the service will take reasonable steps to develop and implement processes to detect and address material or activity on the service that is or may be unlawful or harmful. The government has prepared a consultation paper and is accepting submissions until 15 October 2021. The Australian move could be a precedent for other countries.

[Climate change widespread, rapid, and intensifying](#)

The latest Intergovernmental Panel on Climate Change (IPCC) Report states that many of the changes observed in the climate are unprecedented and some of the changes are irreversible over hundreds to thousands of years. However, strong and sustained reductions in emissions greenhouse gases could limit climate change and stabilize temperatures over 20-30 years. The IPCC Working Group I report, “Climate Change 2021: the Physical Science Basis” was approved by 195 member governments and is the first installment of the IPCC's Sixth Assessment Report (AR6), which will be completed in 2022. The report states that unless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, warming could grow from 1.1 degrees C at present to exceed 1.5°C or even 2°C, with warming more than twice as high in the Arctic. Due to global warming, there will be increasing heat waves, longer warm seasons and shorter cold seasons, more intense water cycles and sea level rise. Further warming will amplify permafrost thawing, and the loss of seasonal snow cover, melting of glaciers and ice sheets, and loss of summer Arctic sea ice. In addition there will be changes to the ocean, more frequent marine heatwaves, ocean acidification, and reduced ocean oxygen levels. The Working Group I report takes into account the most updated physical understanding of the climate system and climate change, bringing together the latest advances in climate science. The Summary as well as additional materials and information are available at <https://www.ipcc.ch/report/ar6/wg1/>

[Researchers start new investigation into Long COVID Core Outcome Set](#)

The World Health Organization (WHO) recently called on countries to prioritize recognition, rehabilitation and research for the consequences of COVID-19, and the collection of standardized data on post COVID-19 conditions that should be used for people living with Long COVID. For the development of a core outcome set (COS) and post COVID-19 conditions, an international group of experts have developed a programme of research together with WHO, ISARIC (International Severe Acute Respiratory and emerging Infection Consortium), and patient partners. The project Post-COVID Condition Core Outcomes, will start by surveying people living with Post-COVID-19 conditions, assess what outcomes matter and build a plan in two phases. The first phase will focus on what outcomes should be measured and the second phase will focus on how to measure these outcomes. This plan is being globally publicized in its early stages so that research and patient communities are aware, and to avoid unnecessary duplication of work.

[NITI Aayog Releases Handbook to Guide EV Charging Infrastructure in India](#)

NITI Aayog has released a handbook titled ‘The Handbook for Electric Vehicle

Charging Infrastructure Implementation’ to guide state governments and local bodies to frame policies and norms towards setting up charging networks for electric vehicles (EV). The Handbook provides a systematic and a holistic approach for adoptions by implementing authorities and other stakeholders involved in planning, authorization and execution of EV charging infrastructure. It presents an overview of the technological and regulatory frameworks and governance structures needed to facilitate EV charging. It focuses on the present needs of charging infrastructure development while considering the evolving nature of the sector. The handbook also highlights regulatory measures that can further ease the process of installing charging infrastructure.

SCIENCE POLICY AND DIPLOMACY

[Science academies provide recommendations on pandemic preparedness to G20 states](#)

In the run-up to the summit of the G20 states on October 30 and 31, 2021, in Rome, Italy, the science academies of these countries (Science20 Dialogue), including the German National Academy of Sciences Leopoldina, have published the joint statement “Pandemic preparedness and the role of science”. It contains recommendations – based on the experience of the response to COVID-19 – for improved pandemic preparedness in the future. With the joint statement, the science academies of the G20 states are providing important inputs for the summit. In their joint statement, the academies recommend the creation of a global network of surveillance for disease outbreaks based on jointly agreed criteria. The academies recommend robust policies and platforms for the collection and global sharing of detailed data and epidemiological surveillance of directly transmitted respiratory diseases and bacterial infections in the context of the observed increase in antibiotic resistance. They also called for distributed manufacture and delivery of diagnostics, medicines, vaccines, medical supplies and equipment. The joint statement can be downloaded from: www.leopoldina.org/en/s20

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