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NEWS ALERT

Forum for Indian Science Diplomacy

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GLOBAL

Retrons display genome editing strengths

Researchers at Harvard University have created a new gene editing tool called Retron Library Recombineering (RLR). RLR is a simpler, more flexible gene editing tool that can be used for highly multiplexed experiments, which eliminates the toxicity often observed with CRISPR and improves researchers' ability to explore mutations at the genome level. RLR can randomly chop up a bacterial genome, turn those genetic fragments into single-stranded DNA in situ, and use them to screen millions of sequences simultaneously. More work remains to be done on RLR to improve and standardize editing rate. RLR's simple, streamlined nature could enable the study of how multiple mutations interact with each other, and generate a large number of data points that could enable the use of machine learning to predict further

mutational effects. RLR could potentially be combined with CRISPR to improve its editing performance, or could be used as an alternative in the many systems in which CRISPR is toxic.

Tailor-made therapy of multi-resistant tuberculosis

Globally, tuberculosis is the most common bacterial infectious disease leading to death. Efficacy tests are essential but time consuming for the effective treatment of multidrug-resistant tuberculosis (MDR-TB), due to changes in the genome, so-called mutations, which almost always occur at the same points in the genome. In order to accelerate the choice of the most effective antibiotics, scientists at the Research Center Borstel, have created a catalogue of mutations in the genetic material of tuberculosis bacteria that permits prediction of antibiotic resistances of the bacteria against all drugs. The genome of tuberculosis bacteria carries roughly 4.4 million of base pairs that store the information for about 4,000 genes. In ninety-nine percent of cases, the choice of drugs based on molecular predictions were correct. The molecular prediction methods are both cheap and fast and could enable patients to receive tailored MDR-TB treatment in the first week of their tuberculosis diagnosis.

Leather-like material created from silk proteins

Researchers at Tufts University School of Engineering were able to break down the fibers from silkworm cocoons into their protein components, and re-purpose the proteins to form the leather-like material. The silk-based leather can be printed into different patterns and textures, has similar physical properties to real leather, and can withstand the folding, piercing, and stretching typically used to create leather goods. The silk-based leather made at Tufts is derived from dissolving silk fibers, and manufacturing is water based, using only mild chemicals, conducted at room temperature, producing mostly non-toxic waste. The silk leather material can be fabricated using computerized 3D layering with the ability to create regular micropatterns that can tune the material's strength and flexibility, print macropatterns for aesthetics (e.g. a basket weave) as well as non-regular geometrical patterning to mimic the surface texture of real leather. The resulting materials, like leather, are strong, soft, pliable, and durable, and like natural leather, they are biodegradable once they enter the waste stream. The silk-leather products could be re-dissolved and regenerated into its gel-like stock matter to be re-printed into new products.

A long-lasting, stable solid-state lithium battery

A team from Harvard John A. Paulson School of Engineering and Applied Science (SEAS) has designed a stable, lithium-metal solid state battery that can be charged and discharged at least 10,000 times at a high current density. The researchers paired the new design with a commercial high energy density cathode material. They used a multilayer battery that sandwiches different materials of varying stabilities between the anode and cathode. This multilayer, multimaterial battery prevents the penetration of lithium dendrites by controlling and containing them.The first electrolyte (chemical name Li5.5PS4.5Cl1.5 or LPSCI) is more stable with lithium but prone to dendrite penetration. The second electrolyte, (Li10Ge1P2S12 or LGPS) is less stable with lithium but appears immune to dendrites. In this design, dendrites are allowed to grow through the graphite and first electrolyte but are stopped when they reach the second and from shorting the battery.The battery is also self-healing; its chemistry allows it to backfill holes created by the dendrites.

COVID-19

COVID-19 (WORLD)

3D 'lung-on-a-chip' model developed to test new therapies for COVID-19

Researchers from Harvard Medical School designed a 3D "lung-on-a-chip" model of the human lower lung that can be used to test many of the biological mechanisms and therapeutic agents, including anti-viral drugs for COVID-19 research. This new model was created with materials more representative of human alveolar tissue, which stimulated cell growth within the 3D spaces. Through genome sequencing, scientists observed that the alveolar lung model more closely resembled the human distal lung than previous 2D models have. This would allow researchers to study a broad range of pulmonary conditions, including various lung cancers and also how COVID-19 viral particles travel through airways and impact pulmonary cells.

Artificial Intelligence powers rapid COVID-19 Antibody Test

University of Utah researchers have developed a fast, easy-to-administer COVID-19 antibody test powered by artificial intelligence called NanoSpot.AI. All NanoSpot.AI test components are provided in a self-contained kit where droplets of blood are placed on three small spots in a ready-to-use card. One of the spots displays the test result while the other two confirm the test was properly run. Antibodies against SARS-CoV-2 are quickly apparent because the blood spot begins to separate within seconds when the test result is positive. A photograph of the card is then transmitted to an AI-based image analysis tool. The university has formed a partnership to fast track and develop this antibody test.

Low-cost biosensor test delivers results within four minutes

Researchers at University of Pennsylvania School of Medicine developed a fast and inexpensive diagnostic test for COVID-19 called RAPID 1.0 (Real-time Accurate Portable Impedimetric Detection prototype 1.0). The RAPID technology uses electrochemical impedance spectroscopy (EIS), which transforms the binding event between the SARS-CoV-2 viral spike protein and its receptor in the human body into an electrical signal. The signal allows the test to discriminate between infected and healthy human samples and it can be read through a desktop instrument or a smartphone. The team assessed the performance of RAPID using both COVID-19 positive and negative clinical samples, including samples of the highly contagious UK B117 variant, and found that RAPID was 87.1 percent accurate for nasal swab and 90 percent accurate for saliva samples. The test provides results in four minutes. The test can be performed at room temperature and the technology is affordable (costs $4.67 to produce) and scalable. The technology can also be used to detect other viruses and diagnose a variety of diseases such as the flu or sexually transmitted diseases.

Israel data shows two doses of Pfizer-BioNTech vaccine highly effective

The first national-level observational assessment of the effectiveness of the Pfizer-BioNTech vaccine in Israel showed that two doses of the vaccine provide more than 95% protection against COVID-19 infection, hospitalisation, and death, including among the elderly, at a time when the B.1.1.7 variant was the dominant strain. A single dose of the vaccine was associated with 58% protection against infection, 76% against hospitalisation, and 77% against death. However, challenges to controlling the pandemic remain, including uncertainty about the duration of immunity, the possible emergence of vaccine-resistant variants, and the need to increase vaccine coverage. More post-introduction vaccine effectiveness studies will be required. Timely reporting of vaccine effectiveness against variants of concern, the duration of protection across age groups and geographical settings, and the effectiveness of alternative dosing regime is crucial to provide data-driven immunisation policies.

Ultrasensitive antigen test detects SARS-CoV-2 and influenza viruses

Researchers at UC Santa Cruz have developed a novel chip-based antigen test that can provide ultrasensitive detection of SARS-CoV-2 and influenza A, the viruses that cause

COVID-19 and flu, respectively. The test uses an "antibody sandwich" approach where antibodies specific for the target antigen are attached to magnetic microbeads, so that any target antigen present in the sample sticks to the beads. After washing, a second antibody with the fluorescent marker attached is added, and it binds to any target antigen present on the beads. The fluorescent markers are attached to the antibodies by a spacer that can be cleaved by ultraviolet light, which releases the markers to flow through the detection chip where they are detected one by one. This ultrasensitive technique could eventually be developed as a molecular diagnostic tool for point-of-care use.

Worldwide network develops SARS-CoV-2 protocols for research laboratories

For the development of drugs or vaccines against COVID-19, research needs virus proteins of high purity. For most of the SARS-CoV-2 proteins, scientists at Goethe University Frankfurt and a total of 36 partner laboratories have now developed protocols that enable the production of several milligrams of each of these proteins with high purity, and allow the determination of the three dimensional protein structures. The laboratory protocols and the required genetic tools are freely accessible to researchers all over the world. As of now, it has been possible to produce and purify 23 of the total of almost 30 proteins of SARS-CoV-2 completely or as relevant fragments in the test tube and in large amounts.

COVID-19 (INDIA)

Antibody cocktail to treat COVID-19 granted approval

COVID-19 antibody drug cocktail developed by Roche and Regeneron has received emergency use authorisation (EUA) of the Central Drugs Standards Control Organisation for treatment of mild to moderate COVID-19 in India. The therapy is a cocktail of two antibodies Casirivimab and Imdevimab, which are synthetically manufactured copies of antibodies that the body produces after an infection. It has been shown to reduce hospitalizations in COVID-19 patients who are at a high risk of developing severe illness. The approval was based on the data that have been filed for the EUA in the U.S. and the scientific opinion of the Committee for Medicinal Products for Human Use (CHMP) in the European Union. The EUA will enable Roche to import the globally manufactured product batches to India where it has a partnership with Cipla to market as well as distribute the same.

Anti-COVID drug developed by DRDO granted approval for emergency use

A Defence Research and Development Organisation (DRDO) laboratory in collaboration with Dr. Reddy's Laboratories developed an anti-COVID-19 therapeutic drug 2-deoxy-D-glucose (2-DG). The drug accumulates in the virus infected cells and prevents virus growth by stopping viral synthesis and energy production. Phase II and Phase III clinical trials of the drug has been conducted last year on 110 and 220 patients respectively. The results have shown that this molecule helps in faster recovery of hospitalised patients and reduces supplemental oxygen dependence. Higher proportion of patients treated with 2-DG showed RT-PCR negative conversion more quickly. The Drugs Controller General of India granted permission for Emergency Use of this drug as adjunct therapy in moderate to severe COVID-19 patients. Being a generic molecule and analogue of glucose, it can be easily produced and made available in plenty in the country.

Bharat Biotech to conduct clinical trial of Covaxin in the age group of 2 to 18 Years

The National Regulator of the country, the Drugs Controller General of India (DCGI), after careful examination, has accepted the recommendation of Subject Expert Committee (SEC) and accorded permission to conduct the Phase II/III clinical trial of Covaxin (COVID vaccine)

in the age group 2 to 18 years, to its manufacturer Bharat Biotech International Ltd. (BBIL), Hyderabad. BBIL had proposed to carry out a Phase- II/III clinical trial of Covaxin in the age group of 2 to 18 years and the trial would be conducted in 525 healthy volunteers. In the trial, the vaccine would be given by intramuscular route in two doses at an interval of 27 days.

National Telemedicine Service (eSanjeevani) during the COVID-19Pandemic

The National Telemedicine Service of the Ministry of health and Family Welfare (MoHFW), eSanjeevani has served more than 5 million patients. Patient to Doctor remote consultation services were rolled out by the Union Ministry in April 2020 while the OPDs in the country were closed during the first lockdown. The eSanjeevani initiative is operational in 31 States/Union Territories in the country and daily around 40,000 patients across the country are using this contactless and risk-free modality of healthcare services delivery. The two modules of eSanjeevani are eSanjeevaniAB-HWC - the doctor to doctor telemedicine platform implemented at all the Health and Wellness Centres in the country and eSanjeevaniOPD, rolled out in 28 States/UTs. Over 3 million patients have been served through eSanjeevaniOPD.

INDIA – SCIENCE & TECHNOLOGY

New high-yielding and pest-resistant variety of soybean can help boost countrywide production

Indian Scientists have developed a high-yielding and pest-resistant variety of soybean called MACS 1407, suitable for cultivation in the states of Assam, West Bengal, Jharkhand, Chhattisgarh and North-Eastern states. It will be made available to farmers for sowing during the 2022 summer season. Scientists from MACS- Agharkar Research Institute (ARI), Pune, have used conventional cross breeding technique to develop MACS 1407 which gives 39 quintals per hectare making it a high yielding variety and is also resistant to major insect-pests like girdle beetle, leaf miner, leaf roller, stem fly, aphids, white fly and defoliators. Its thick stem, higher pod insertion (7 cm) from ground, and resistance to pod shattering make it suitable even for mechanical harvesting. It is suitable for rain-fed conditions of north- east India. 'MACS 1407' showed 17percent increase in yield over the best check variety and 14-19percent yield advantage over the qualifying varieties. It is highly adaptive to sowing from 20 June to 5 July without any yield loss. MACS 1407 require an average 43 days for 50percent flowering and take 104 days to mature from the date of sowing. It has white coloured flowers, yellow seeds and black hilum. Its seeds have 19.81percent oil content, 41percent protein content and show good germination ability.

Daikin and Gree share Global Cooling Prize

Teams led by Daikin and Gree have been named as joint winners of $2 million Global Cooling Prize, the international innovation competition to develop super-efficient and climate-friendly residential cooling solutions. Daikin proposed a system to ensure consistent room temperature and humidity using two specially adapted indoor units running on the low Global Warming Potential (GWP) refrigerant R1234ze(E). Chinese manufacturer Gree Electric Appliances proposed a hybrid solution with a new design of compressor using low GWP refrigerant R152a. R152a is an A2 flammable refrigerant with a GWP of just 124. The Global Cooling Prize was launched by a global coalition led by the Department of Science and Technology, Government of India, leading global research body the Rocky Mountain Institute (RMI) and Mission Innovation, a global initiative of 24 countries and the European Union to accelerate global clean energy innovation.

Biodegradable Yoga mat from water hyacinth

A team of girls from the North East Centre for Technology Application and Reach, Assam has

developed a biodegradable and compostable yoga mat called 'Moorhen Yoga mat' from water hyacinth in an effort to reduce the excessive growth and accumulation of water hyacinth in freshwater lakes. The biodegradable and compostable mat has been developed through fiber processing and hand-weaving. The steps involved collection of water hyacinth, drying using solar dryers for about three days, and weaving. The women wove water hyacinth using traditional Assamese loom with the help of different combinations of techniques, materials and tools to develop a high quality, comfortable and biodegradable mats. In future technology intervention could increase the production rate and the mat would be introduced to the world market as a unique product. This innovation can contribute towards environmental conservation and sustainability of freshwater lake and also boost local livelihood and can be applied in other countries.

Biotech startup claims breakthrough in early-stage cancer detection

Scientists at Singapore-based molecular diagnostic startup Tzar Labs and Mumbai-based Epigeneres Biotechnology have developed a non-invasive, blood-based diagnostic tool called HrC that can detect as well as classify solid tumors, hematological malignancies and sarcomas, based on their stage. A clinical study on 1,000 participants, led to two major outcomes – i) peripheral blood of cancer patients had large numbers of VSELs (Very Small Embryonic-Like Stem Cells) than those without cancer and ii) Oct4a expression of a transcription factor within the cell, was varying according to the cancer stages in the patient. Based on these findings HrC scale can detect cancer, predict and monitor treatment outcome and can also serve as an early biomarker. There is still significant work needed backed by larger study before it can be translated into an accepted diagnostic test.

Innovative, Low Cost charging infrastructure for Electric Vehicles

The DST, the Office of the Principal Scientific Advisor to the Government of India, in close co-ordination with NITI Aayog team and manufacturers of electric vehicles and charging devices has developed a low-cost AC Chargepoint (LAC) infrastructure for electric two and three wheelers. A target price of less than Rs. 3500 ($50) has been set for a smart AC charge point operated with a smartphone. LAC allows up to 3 kW of power to be drawn for charging e-scooters and e-autorickshaws. The user's smartphone will communicate with the LAC via low-power Bluetooth and link up to a back-end where transaction payments and analytics are enabled. The user's smartphone can be used for multiple accounts and payment options. The new standards for LAC will be ratified by the Bureau of Indian Standards. The LAC device is intended to be highly scalable and deployed in any place where a 220V 15A single phase line is available.

IIT develops portable tech-traditional eco-friendly mobile cremation system

Researchers at Indian Institute of Technology, Ropar have developed a prototype of a moveable electric cremation system which claims to be using first of its kind technology that involves smokeless cremation despite using wood. It is eco-friendly and uses half of the wood otherwise required for the cremation. It is based on wick-stove technology in which the wick when lighted glows yellow. This is converted into smokeless blue flame with the help of a combustion air system installed over the wicks. The incinerator heats up at 1044 degree Celsius which ensures complete sterilization and requires less cooling time due to absence of refractory heat storage. It has stainless steel insulation on both sides of the cart for no heat loss and less wood consumption.

IN BRIEF

Fiber-optic ultrasonic imaging probe for nanoscale disease diagnostics

Scientists at the University of Nottingham have developed an ultrasonic imaging tool called 'phonon probe', which can be deployed on the tip of a hair-thin optical fibre and inserted into the human body to visualise cell abnormalities in 3D. It uses two lasers that emit short pulses of energy to stimulate and detect vibrations in a specimen. One of the laser pulses is absorbed by a layer of metal, a nano-transducer which is fabricated on the tip of the fibre; a process which results in high-frequency phonons (sound particles) getting pumped into the specimen. Then a second laser pulse collides with the sound waves. By detecting these collided laser pulses, the shape of the travelling sound wave can be recreated and displayed visually, which encodes information about the stiffness of a material, and even its geometry. The resolution of the phonon probe in two dimensions is 1 micrometre, and in the third dimension (height) it provides measurements on the scale of nanometres. Beyond clinical healthcare, phonon probes can be used in precision manufacturing, metrology, 3D bio-printing and tissue engineering.

Cellphone converts into powerful chemical detector

Scientists from Texas A&M have developed an extension to ordinary cellphone cameras to be used as portable microscopes and heart rate detectors. The cellphone detectors were developed using fluorescence spectroscopy to measure the fluorescent light emitted by a sample and Raman spectroscopy to detect molecules, such as DNA and RNA that do not fluoresce or emit light at very low intensities.The system includes an inexpensive diode laser as a light source, oriented at right angles to the line connecting the sample and the cellphone camera. The right-angle arrangement prevents back reflected light from entering the camera. The researchers used the cellphone detector to study a variety of samples such as ethanol, acetone, isopropyl alcohol, and methanol. They recorded the Raman spectra of solid objects, including a carrot (carotene pigment) and a pellet of bacteria.The sensitivity of the system was compared to the most sensitive industrial Raman spectrometers available and the ratio of signal to noise for the commercial instrument was about 10 times higher than the cellphone system. This inexpensive and accurate tool can be used for detecting chemicals, drugs, biological molecules, and pathogens.

Silicon multiplexer chip for next generation communications

Researchers from Japan and Australia have produced a new multiplexer made from pure silicon for terahertz-range communications in the 300-GHz band.The new terahertz multiplexers, which are economical to manufacture, will be extremely useful for ultra-broadband wireless communications. The devices use a novel optical tunneling process and can potentially support aggregate data rate of 48 gigabits per second (Gbit/s). The modulation scheme employed in the team's study is quite basic; terahertz power was simply switched on-and-off to transmit binary data. More advanced techniques are available. The new multiplexer can be mass-produced, just like computer chips, but much simpler. It could enable applications in 6G and beyond, as well as the Internet of Things, and low-probability-of-intercept communications between compact aircraft such as autonomous drones.

Citrus derivative makes transparent wood 100 percent renewable

In 2016, transparent wood was developed by researchers at KTH Royal Institute of Technology, Sweden as an innovative structural material for building construction. It lets natural light through and can even store thermal energy. Now, the researchers have successfully tested limonene acrylate, a monomer made from limonene from citrus peel waste to create the polymer that restores delignified wood's strength and allows light to pass through. The new composite offers optical transmittance of 90 percent at 1.2 mm thickness and remarkably low haze of 30 percent. The material is intended for structural use and shows high mechanical performance: with a strength of 174 MPa (25.2 ksi) and elasticity of 17 GPa (or about 2.5 Mpsi). The new material could have many applications, such as smart windows, wood for

heat-storage, wood that has built-in lighting function. The team is exploring the nanotechnology possibilities even further.

'Molecular glue' makes perovskite solar cells dramatically more reliable

A research team from Brown University has made a major step toward improving the long-term reliability of perovskite solar cells, using a "molecular glue" that keeps a key interface inside cells from degrading. The treatment dramatically increases cells' stability and reliability over time, while also improving the efficiency with which they convert sunlight into electricity. Perovskites are a class of materials very good at absorbing light, easy to manufacture and cost far less than silicon cells, but making the cells more stable and reliable has remained challenging. The team found that a formulation of self-assembling monolayers (SAM) with silicon atom on one side, and iodine atom on the other, could strengthen the perovskite light-absorbing layer. SAM increased the toughness of the interface by about 50 percent, and dramatically increased the functional life of the perovskite cells six fold. The SAMs actually improved the cell's efficiency by a small amount.The SAMs can be made from readily available compounds and are easily applied with a dip-coating process at room temperature.

New graphite-based sensor technology for wearable medical devices

Researchers from Trinity College Dublin have created the next generation sensing technology using G-Putty, an innovation from Trinity in which silly putty is infused with graphene, making the material's electrical resistance extremely sensitive to slight deformations. The team's printed sensors are 50 times more sensitive than the industry standard and outperform other comparable nano-enabled sensors in relation to their flexibility, making them suitable for wearable electronics and medical diagnostic devices. By creating and testing inks of different viscosities, the team found that they could tailor G-Putty inks according to printing technology and application. This development is a step forward for wearable diagnostic devices, which can be printed in custom patterns and comfortably mounted to a patient's skin to monitor a range of different biological processes.

Metal free recyclable batteries developed

A team of researchers from the U.S. have developed a new metal-free battery production moving away from cobalt. This new battery technology platform is completely metal free and utilizes a polypeptide organic radical construction. The all-polypeptide organic radical battery composed of redox-active amino-acid macromolecules can be degraded on demand in acidic conditions to generate amino acids, other building blocks and degradation products. The development marks significant progress toward sustainable, recyclable batteries that minimize dependence on strategic metals. It also opens opportunities to power wearable or implantable electronic devices and also to easily recycle the new batteries.

3D bioprinting used to create nose cartilage

Researchers from University of Alberta discovered a way to use 3D bioprinting technology to create custom-shaped cartilage for use in surgical procedures. The researchers used a specially designed hydrogel (a material similar to Jell-O) that could be mixed with cells harvested from a patient and then printed in a specific shape captured through 3D imaging. Over a matter of weeks, the material cultured in a lab, become fully functional cartilage. The research is ongoing and the team is now testing whether the lab-grown cartilage retains its properties after transplantation in animal models and aims to move the work to a clinical trial

within the next two to three years. This technology would enable surgeons to safely restore the features of skin cancer patients living with nasal cartilage defects after surgery.

Molecular tweezers to attack antibiotic resistant bacteria

A team of researchers from Israel, U.S. and Germany have developed a new 'molecular tweezers' to combat antibiotic-resistant bacteria. The tweezers target biofilm, a thin layer of fibers that protects the bacteria. By gripping the fibers and destroying the protective layer, the tweezers impair the bacteria without directly attacking it, which prevents resistance from occurring. The molecular tweezers were tested on the Staphylococcus aureus bacteria. The success of the study indicates an innovative direction of antibiotic treatments against pathogenic bacteria and may open up new ways to fight antibiotic-resistant bacteria.

New weapon in the fight against gastrointestinal disease in informal settlements

Monash University researchers have validated a way to successfully detect a diverse range of bacteria (pathogens) that cause diarrhoeal disease in informal settlements. They evaluated for the first time the laboratory method called the TaqMan Array Card (TAC) against the gold standard method, standard quantitative polymerase chain reaction (qPCR) and found that the TAC is faster and cheaper than qPCR, while delivering comparably precise results and simultaneously detecting over 30 different enteropathogens. This would enable better understanding and monitoring the pathways through which people become sick, and help target those pathways with effective water management interventions that could ultimately lead to better health.

An enzyme system for the hydrogen industry

Scientists from Technical University of Munich (TUM) have succeeded in embedding hydrogenase enzymes in protective redox polymers to construct a fuel cell, in which oxygen is reduced by the enzyme bilirubin oxidase from the bacterium Myrotheciumverrucaria, while the hydrogenase embedded in the polymer film oxidizes the hydrogen from the bacterium desulfovibriodesulfuricans, generating electricity in the process. The system can also be used for the reverse reaction, producing hydrogen by consuming electrons. The team is working on improving the stability of the hydrogenases at higher power densities. Furthermore, the technology can also be used for other highly-active but sensitive catalysts for energy conversion and electrosynthesis, including carbon dioxide-reducing enzymes that can use electricity to produce liquid fuels or intermediate products from carbon dioxide.

Nanotech improves cystic fibrosis antibiotic by 100,000-fold

Researchers at the University of South Australia have improved the effectiveness of the Cystic Fibrosis (CF) antibiotic Tobramycin by up to 100,000-fold.They enhanced the Tobramycin with a biometric, nanostructured, lipid liquid crystal nanoparticle (LCNP)-based material, testing it on a new lung infection model to showcase its unique ability to penetrate the dense surface of the bacteria and kill the infection. The technology improves the performance of Tobramycin without increasing the toxicity of the drug. The technology is currently entering pre-clinical trials and hopes to be on the market in the next five years. It could have wider applications.

Jab free dengue virus vaccine developed

The University of Queensland developed a dengue virus vaccine candidate with promising results in animal model testing. The researchers have engineered a vaccine candidate by using a chimeric virus (by merging the Binjari and dengue viruses) to build the basis of the vaccine. The particles exactly mimic the surface of their dengue counterpart, which induces a strong, authentic and protective immune response. The vaccine is applied to the skin via the high-density microarray patch (HD-MAP), which allows to achieve potent neutralising antibody responses using a fraction of a typical dose delivered by injection. The vaccine produced a protective immune response in dengue-infected mice. The ongoing pre-clinical studies would be expanded to all four variants of dengue virus. Further this technology can be adapted to other viruses, like Zika virus, West Nile virus and Japanese encephalitis virus.

RESOURCES AND EVENTS

TRIPS waiver for COVID-19: WTO chief calls for revised proposal

WTO Director General Ngozi Okonjo-Iweala has urged the proponents of the proposal for temporary waiver of certain provisions of TRIPS agreement for prevention and treatment of COVID-19 to submit a revised document "as soon as possible" so that text-based negotiations can begin. She warmly welcomed the statement of US Trade Representative Katherine Tai expressing willingness to engage with proponents of a temporary waiver of the TRIPS agreement to help in combating the COVID-19 pandemic. In October 2020, India and South Africa submitted a proposal suggesting a waiver for all World Trade Organization (WTO) members on the implementation of certain provisions of the agreement in relation to the prevention, containment or treatment of COVID-19.The proposed relaxations in the norms of the agreement are aimed at ensuring quick and affordable access to vaccines and medicines for developing countries. The proposal of India and South Africa has received support from more than 120 countries. The EU too has stated that they are ready to discuss the patent waiver issue. The Biden administration has backed the initiative by India and South Africa to temporarily waive patent rules on COVID-19 vaccines. The co-sponsors of the proposal have requested the chair of the TRIPS Council, Ambassador of Norway, to consider holding a meeting open to all members in the second half of May to discuss the revised proposal before the formal TRIPS Council meeting scheduled for early June.

EU's artificial intelligence rules and innovation

The EU has proposed AI regulation, the first of its kind in the world. It will need to be adopted by the European Parliament and EU member states. The draft 108-page policy is an attempt by EU officials to regulate an emerging technology that is already threatening to transform industries. The draft rules set limits around the use of AI in a range of activities, from self-driving cars to hiring staff and school admission decisions – areas considered "high risk" because they could threaten people's safety or fundamental rights.The proposed EU rules do make an exception to allow police forces to use surveillance tech if they are fighting serious crime.The proposal also wants to prohibit AI systems that cause harm to people by manipulating their behaviour, opinions or decisions.

CSIR-CMERI transfers its Oxygen Concentrator Technology to two MSMEs

CSIR-CMERI transferred its Oxygen Concentrator Technology virtually to two MSMEs - C and I Calibrations Pvt. Ltd, Kota, Rajasthan and SA CORP, IMT Manesar, Gurgaon so that they can manufacture the product for its reach to the masses. Both the enterprises are planning to manufacture 4000 to 5000 units per month and further scale up its production. CMERI would also extend help towards low cost manufacturing of the product. The initial cost for

developing the prototype would be around Rs.40,000-45,000 due to the sudden surge in the cost of raw material, but it is expected that the cost would come down with mass scale production.

IBM Unveils World's First 2 Nanometer Chip Technology

IBM has unveiled a breakthrough in semiconductor design and process with the development of the world's first chip with 2 nanometer (nm) nanosheet technology in which each transistor is made up of three stacked horizontal sheets of silicon, each only a few nanometers thick and completely surrounded by a gate. Demand for increased chip performance and energy efficiency continues to rise, especially in the era of hybrid cloud, AI, and the Internet of Things. IBM's new 2 nm chip technology helps advance the state-of-the-art in the semiconductor industry, addressing this growing demand. It is projected to achieve 45 percent higher performance, or 75 percent lower energy use, than today's most advanced 7 nm node chips. The potential benefits of these advanced 2 nm chips could include: better energy efficiency and faster performance in cellphones and data processing devices. The new 2 nm chips, likely to go into production in 2024, could transform the entire semiconductor and IT industry and accelerate the growth of the global chip industry. The 2 nm design uses IBM's nanosheet technology and will allow the 2 nm chip to fit up to 50 billion transistors on a chip the size of a fingernail.

Colonial Pipeline cyberattack causes supply disruptions

On May 7, a cyberattack forced Colonial Pipeline to close down operations and freeze IT systems. Colonial Pipeline is one of the largest pipeline operators in the United States and provides roughly 45 percent of the East Coast's fuel, including gasoline, diesel, home heating oil, jet fuel, and military supplies. The FBI confirms that the Darkside ransomware is responsible for the compromise of the Colonial Pipeline network. The Cybersecurity and Infrastructure Security Agency (CISA), together with the FBI, issued an alert warning organizations that DarkSide affiliates have recently been targeting organizations across various critical sectors including manufacturing, legal, insurance, healthcare, and energy. Best practices and cybersecurity recommendations were also provided. During the attack, over 100GB in corporate data was stolen in just two hours. DarkSide is a Ransomware-as-a-Service (RaaS) group that offers its own brand of malware to customers on a subscription basis. The malware, once deployed, steals data, encrypts systems using Salsa20 and RSA-1024 encryption protocols, and executes an encoded PowerShell command to delete volume shadow copies. Other cyberattacks in the past have targeted Florida's drinking water system, power supply in Ukraine, On 13 May, U.S. President Biden signed an executive order to improve federal cybersecurity.

SCIENCE POLICY AND DIPLOMACY

Saudi Arabia and India announce space cooperation

The King Abdulaziz City for Science and Technology (KACST) and Indian Space Research Organisation (ISRO) have signed a Memorandum of Understanding for space cooperation. The implementation of the space cooperation has been assigned to Saudi Space Commission (SSC). SSC Chairman Prince Sultan bin Salman and ISRO Director K. Sivan held a virtual conference last month to discuss the MoU further. At the conference, both parties discussed their partnership in research, science, expert training, technology, and cooperation in space exploration missions.

India-UK virtual summit strengthens STI cooperation

Negotiators from the European parliament and EU member states reached an agreement on the European Climate Law that will include the EU's commitment to reaching climate neutrality by 2050, reducing net greenhouse gas emissions by 'at least 55%' by 2030, compared to 1990 levels. That objective will therefore also become a legal obligation for the EU and its member states. A 15-member European Scientific Advisory Board will be set up to advise policymakers on the alignment of EU policies with the bloc's climate neutrality goal. Beyond 2050, EU negotiators agreed to strive towards reaching negative emissions. The 2050 climate goal will remain an objective for the EU to attain as a group, rather than for individual countries. The agreement will now be vetted by legal experts and submitted for a final approval from the European Council and the Parliament.

India participates in Arctic Science Ministerial meeting

India participated in the 3rd Arctic Science Ministerial (ASM3) - the global platform for discussing research and cooperation in the Arctic region (8-9 May, 2021). Dr. Harsh Vardhan, Union Minister of Science and Technology, Health and Family Welfare, and Earth Sciences, shared India's vision and long-term plans for research, work, and cooperation in the Arctic region with the stakeholders. The country would deploy open ocean mooring devices in the Arctic for long-term monitoring of upper ocean variables and marine meteorological parameters. The NISER (NASA-ISRO Synthetic Aperture Radar) satellite mission, in collaboration with the USA, will conduct global measurements of the cause and consequences of land surface changes using advanced radar imaging. India's contributions to the Sustained Arctic Observational Network (SAON) would continue. It was acknowledged that improving the understanding of physical processes and quantifying the impact of Arctic ice melt on the Indian summer monsoon was very important.Since 2013, India enjoys 'Observer' status in the Arctic Council with twelve other countries (Japan, China, France, Germany, UK, Italy, Switzerland, Poland, Spain, Netherlands, Singapore, and South Korea). India's engagement with the Arctic dates back to 1920 with the signing of the Svalbard Treaty in Paris. Since July 2008, India has a permanent research station in the Arctic called Himadari at NyAlesund, Svalbard Area in Norway. It has also deployed a multi-sensor moored observatory called IndARC in the Kongsfjorden fjord since July 2014.

India and EU strengthen ties

India and the European Union (EU) agreed to advance the implementation of the actions set out in the EU-India Roadmap 2025 and foster new synergies to jointly contribute to a safer, greener, cleaner, more digital, resilient and stable world. To boost the partnership, India and the EU have agreed to work together based on a shared commitment to democracy, fundamental freedoms, rule of law and multilateralism. Three key thematic areas were pointed out for cooperation - i) foreign policy and security; ii) COVID-19, climate and environment; and iii) trade, connectivity and technology. Further, closer cooperation on combating the COVID-19 pandemic and economic recovery, tackling climate change, and reforming multilateral institutions were also discussed. India and the EU also announced dedicated dialogues on WTO issues, regulatory cooperation, market access issues and supply chain resilience, demonstrating the desire to deepen and further diversify economic engagement. Both the parties launched an ambitious and comprehensive 'Connectivity Partnership' which is focused on enhancing digital, energy, transport, and people-to-people connectivity. They also agreed to enhance bilateral cooperation on digital and emerging technologies such as 5G, AI, Quantum and High-Performance Computing including through the early operationalization of the Joint Task Force on AI and the Digital Investment Forum. The leaders acknowledged the importance of a free, open, inclusive and rules-based Indo-Pacific and agreed to closely engage in the region, including in the context of India's Indo-Pacific Ocean's Initiative and the EU's new strategy on the Indo-Pacific.

President Biden issues Executive Order on Cybersecurity

In view of persistent and increasingly sophisticated malicious cyber campaigns that threaten the U.S., President Biden issued an Executive Order on cybersecurity to strengthen standards and requirements for cybersecurity. Service provider contracts for ICT services will be strengthened with better information sharing and investigation of cyber incidents. The approach to cybersecurity will be modernized, by adopting security best practices; Zero Trust Architecture; securing cloud services and access to cybersecurity data, and investing in technology and personnel. A cloud-service governance framework will be developed. Agencies shall adopt multi-factor authentication and encryption for data. Software Supply Chain Security will also be enhanced to resist attack, prevent tampering, and ensuring that products function securely, and as intended, with a priority on addressing critical software. A Cyber Safety Review Board will be setup, to review significant cyber incidents, threat activity, vulnerabilities, mitigation activities, and agency responses. Standardized response processes will be adopted towards incidents. Measures will be adopted to improve detection of Cybersecurity vulnerabilities and incidents, as well as investigation and remediation capabilities.

RIS-FISD programme invites contributions for the next (July 2021) issue of its peer reviewed journal Science Diplomacy Review. For more details, see the call for paper: http://fisd.in/sites/default/files/Science Diplomacy Review_Call for Papers_July 2021 Issue_F.pdf

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