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NEWS ALERT

Forum for Indian Science Diplomacy

RIS Science Diplomacy News Alert is your fortnightly update on Indian and global developments in scientific research, technological advancements, science diplomacy, policy and governance. The archives of this news alert are available at http://fisd.in. Please email your valuable feedback and comments to science.diplomacy@ris.org.in

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GLOBAL

NTU develops Fabric that converts Body Movement into Electrical Energy

Scientists at Nanyang Technological University, Singapore (NTU Singapore) have developed a stretchable and waterproof 'fabric' that turns energy generated from body movements into electrical energy. A crucial component in the fabric is a polymer that, when pressed or squeezed, converts mechanical stress into electrical energy. It is also made with stretchable spandex as a base layer and integrated with a rubber-like material to keep it strong, flexible, and waterproof. They demonstrated the prototype which continues to function well and does not cause any performance degradation after washing, folding and crumpling, and it could maintain stable electrical output for up to five months, demonstrating its potential for use as a smart textile and wearable power source. The electricity-generating fabric developed by the NTU team is an energy harvesting device that turns vibrations produced from the smallest body movements in everyday life into electricity. The prototype fabric produces electricity in two ways: when it is pressed or squashed (piezoelectricity), and when it comes into contact or is in friction with other materials, such as skin or rubber gloves (triboelectric effect). To fabricate the prototype, the scientists first made a stretchable electrode by screen-printing an 'ink' comprising silver and styrene-ethylene-butylene-styrene (SEBS), a rubber-like material found in teethers and handlebar grips to make it more stretchable and waterproof.

New Pneumococcal Vaccine Developed

Researchers at Karolinska Institutet in Sweden have identified a new vaccine candidate against pneumococcal bacteria that can cause pneumonia, sepsis, and meningitis. The vaccine comprises nano-sized membrane vesicles produced by the bacteria and provides protection in mice. These vesicles contain proteins that help the bacteria to evade the host immune system. The researchers isolated such vesicles, called membrane particles, from cultivated pneumococcal bacteria. They found that immunization with these membrane vesicles protected mice from getting severe infections with pneumococci. Moreover, the mice developed protection not only against the pneumococcal strain/type from which the particles were isolated but also against other pneumococcal strains/types. They identified two proteins in the membrane particles, MalX and PrsA, both of which are essential for the main protective effect. Their vaccine candidate – membrane particles containing both these proteins – provide protection regardless of pneumococcal type. The results suggest that membrane particles can be used as a platform for producing vaccines against pneumococcal infections and perhaps other bacterial infections.

Nanostructured Fibres can Impersonate Human Muscles

Researchers at the University of Texas at Austin and Penn State University have created a new type of fiber that can perform like a muscle actuator, in many ways better than other options. These muscle-like fibers are simple to make and recycle. They are more efficient, flexible and able to handle increased strain. These fibers could be used in a variety of ways, including medicine and robotics. This kind of robotic arm could be used in an assistive exoskeleton to help people with weak arms regain movement and strength. Another potential application could

be a sort of "self-closing bandage" that could be used in surgical procedures and naturally degrade inside the body once the wound heals. The researchers found their fibers were 75 percent more efficient in terms of converting energy to movement, able to handle 80 percent more strain and could rotate with more speed and force than current actuators. And it can stretch to more than 900 percent of its length before it breaks.

New Nanoparticles Aid Sepsis Treatment in Mice

Researchers from the University of Wisconsin-Madison, have developed a new nanoparticle-based treatment that delivers anti-inflammatory molecules and antibiotics.The new system saved the lives of mice with an induced version of sepsis meant to serve as a model for human infections, and is a promising proof-of-concept for a potential new therapy, pending additional research.The new nanoparticles delivered the chemical NAD+ or its reduced form NAD(H). The team developed a couple of nanoparticles that can directly transport and release NAD(H) into the cell, while preventing premature drug release and degradation in the bloodstream.The nanoparticles designed by the team can be used to co-deliver NAD(H) and antibiotics. Tests were done of the NAD(H)-loaded nanoparticles in multiple mouse models. The nanoparticle treatment performed much better than using NAD(H) alone. These animal studies demonstrated that the NAD(H) nanoparticles can help maintain a healthy immune system, support blood vessel function and prevent multiorgan injury. This technology may pave the road for the development of a new clinical therapy for sepsis that could also be applied in other inflammation-related scenarios, such as COVID-19 treatment. An additional benefit of this therapy is the ability to treat infection with lower amounts of antibiotics, which reduces their overuse.

Nano-Sensors Detect Pesticides on Fruits

Researchers at Karolinska Institutet in Sweden have developed a tiny sensor for detecting pesticides on fruit in a few minutes. The technique uses flame-sprayed nanoparticles made from silver to increase the signal of chemicals. These nano-sensors could help uncover food pesticides before consumption. Sensors can detect pesticide residues on apple surfaces in a short time of five minutes without destroying the fruit. They also seek to explore if the nano-sensors can be applied to other areas, such as discovering biomarkers for specific diseases at the point of care in resource-limited settings.

Traditional South Asian Medicine Effective Against Type 2 Diabetes

Researchers at the University of Nottingham have found that several traditional medicines commonly used in South Asia, are effective in maintaining blood sugar levels in patients with type 2 diabetes. They conducted an in-depth review to show that these medicines are effective in blood sugar control in people with type 2 diabetes. Other beneficial effects, such as on body weight, blood pressure, cholesterol, and other diabetes-related parameters were also shown. As part of this review, the team searched a range of sources, including 18 electronic databases. Two hundred and nineteen articles were included in the review, which represented 199 randomised controlled trials (21,191 participants) and 98 Ayurvedic medicines. The current evidence suggests the benefits of a range of Ayurvedic medicines in improving glycemic

control in type 2 diabetes patients. Given the limitations of the available evidence and to strengthen the evidence base, high-quality randomised controlled trials should be conducted and reported.

COVID-19

COVID-19 (WORLD)

Molecular Basis of Long COVID Symptoms

Researchers led by NYU Grossman School of Medicine have found that well after the initial viral infection was over, the most profound biological changes occur in the olfactory system, made up of the nasal cavity, the specialized cells lining it, and the adjacent brain region in the olfactory bulb. The new study reveals how the sustained immune reaction in olfactory tissue affects brain centers that govern emotion and cognition. It showed that hamsters previously infected with SARS-CoV-2 develop a unique inflammatory response in olfactory tissue. This study benchmarked how the response to SARS-CoV-2 in hamsters compared to influenza A, the virus responsible for the 'swine flu' pandemic in 2009. Specifically, the study found that while the two viruses generated a similar response in the lungs, only SARS-CoV-2 triggered a chronic immune response in the olfactory system that was still evident one month post-viral clearance.

COVID-19 (INDIA)

India sees Fresh COVID Surge

According to the official data released by the Union Health Ministry on June 8, daily coronavirus infections in India surpassed 5,000 for the first time in 93 days, bringing the total number of COVID-19 cases to 4,31,90,282, with 28,857 active cases. Researchers from IIT Kanpur had predicted that a fourth wave of COVID-19 will likely come around June 22 and will last at least for four months. It was a statistical study which said that the curve will reach its peak from August 15 to 31st. The cumulative doses administered in the country so far under the nationwide COVID-19 vaccination drive has exceeded 194.43 crore.

COVID-19 Vaccine for Animals

Haryana-based Indian Council of Agricultural Research-National Research Centre on Equines developed India's first homegrown COVID-19 vaccine for animals. Anocovax is an inactivated SARS-CoV-2 Delta vaccine for animals. It neutralises both the Delta and Omicron variants of the coronavirus. The vaccine contains inactivated SARS-CoV-2 (Delta) antigen. It uses Alhydrogel as an adjuvant and is safe for dogs, leopards, lions, mice, and rabbits. Initial studies could not correctly predict if animals, especially pets, could contract COVID-19. Studies have since found that pets can contract the virus from their owners through close contact. But there is no evidence that humans can get COVID-19 from their pets.

INDIA–SCIENCE & TECHNOLOGY

Microbial Fuel Cell to Generate Energy from Wastewater

Researchers at the Indian Institute of Technology Guwahati have developed a microbial fuel cell (MFC), a bio-electrochemical device that can generate 'green energy' by treating wastewater. The device offered a dual benefit - generation of bioelectricity and waste management - by converting chemical energy contained in organic substances into electrical energy through microbes. The device could be used for obtaining clean energy from municipal wastewater economically. MFC is a bio-electrochemical reactor system that utilises electrons liberated in the biochemical oxidation of organic substrates catalysed by anaerobic microbes.

Gene Research Facility Set Up

The Indian Institute of Science Education and Research (IISER) Pune, has established a national facility for gene function in health and disease for scientific research on rats, mice, and rabbits. The department of biotechnology funds the facility that will engage in breeding, genotyping, maintenance, and supply of laboratory animals to researchers. The technological expertise includes sperm and embryo cryopreservation and in-vitro fertilisation, and stereotaxic surgery. The facility will strictly adhere to animal ethics and adopt best practices in handling.

New-age Bandage Developed

Researchers at the Indian Institute of Technology-Bombay have developed an affordable bandage which blends natural healing with polymers in a dual-layer structure for improved wound healing. The team from the Powai institute have developed a bi-layered bandage with anti-bacterial, antioxidant and anti-inflammatory properties. The science of wound-healing is advancing continually with the use of bioactive agents, nanoparticles, anti-oxidant age agents, growth factors, polymers and more. The researchers have validated the wound-healing properties of the dermal patches with multiple lab tests. When tested on rat models, they showed improved healing in comparison to other commercially available dressings. Next, the researchers plan to test it on diabetic and other chronic wounds.

IN BRIEF

Closed-loop Additive Manufacturing Fueled by Upcycled Plastic

Researchers at the Oak Ridge National Laboratory have developed an upcycling approach that adds value to discarded plastics for reuse in additive manufacturing, or 3D printing. The readily adoptable, scalable method could globally reduce plastic waste and cut carbon emissions tied to plastic production.The team upgraded acrylonitrile butadiene styrene, or ABS, a popular thermoplastic into an upcycled version that has enhanced strength, toughness and chemical resistance, making it attractive for fused filament fabrication (FFF) to meet new and higher performance applications.The team converted the ABS into a vitrimer, using widely available medical compounds that are mixed in a single step under mild conditions, followed by curing with heat. Results show the upcycled ABS achieved approximately

double the toughness and strength of standard ABS, with enhanced solvent resistance. The recovered upcycled ABS can be reused again and again for FFF with minimal loss of properties. It can also be combined with mixed and standard ABS, and directly printed as a blend.

Artificial Intelligence Chip Built

MIT engineers have designed a stackable, reconfigurable artificial intelligence chip, comprising of alternating layers of sensing and processing elements, along with light-emitting diodes (LED) that allow for the chip's layers to communicate optically. The chip can be reconfigured, with layers that can be swapped out or stacked on, for instance to add new sensors or updated processors. The team's design is currently configured to carry out basic image-recognition tasks. It does so via a layering of image sensors, LEDs, and processors made from artificial synapses -- arrays of memory resistors, or "memristors," that the team previously developed, which together function as a physical neural network, or "brain-on-a-chip." Each array can be trained to process and classify signals directly on a chip, without the need for external software or an Internet connection. The optical communication system consists of paired photodetectors and LEDs, each patterned with tiny pixels. Photodetectors constitute an image sensor for receiving data, and LEDs to transmit data to the next layer. The team fabricated a single chip, with a computing core measuring about 4 square millimeters which could correctly identify clear images of each letter - M. I. and T. Researchers plan to add more sensing and processing capabilities to the chip, and they envision the applications to be boundless.

Rapid Test for Deadly Infections in Livestock, Starting with Pigs

Researchers at McMaster University have developed a new form of rapid test to detect infections in farm animals, responding to the rising threat of dangerous outbreaks. The prototype has been proven effective in detecting a devastating diarrheal infection in pigs first identified in Canada in 2014, and can be adapted to test for other pathogens, and in other animals.The test works by mixing a small saliva sample with a chemical reagent and applying the blend to a small microchip reader, which is in turn attached to a smartphone, which displays the results in minutes.The animal test, once it becomes widely available, is expected to be a valuable tool for identifying and isolating outbreaks in farm settings, and for limiting the possibility of animal-to-human transmission of infections.

New Molecule that Kills Hard-to-Treat Cancers

University of Texas at Dallas researchers have found a new molecule that kills a broad spectrum of hard-to-treat cancers, including triple-negative breast cancer, by exploiting a weakness in cells not previously targeted by other drugs. The novel compound called ERX-41 did not kill healthy cells, but it wiped out tumor cells regardless of whether the cancer cells had estrogen receptors, and it killed the triple-negative breast cancer cells better than it killed the ER-positive cells.The researchers discovered that ERX-41 binds to a cellular protein called lysosomal acid lipase A (LIPA), overproduced in cancer cells. By binding to LIPA, ERX-41 jams the protein processing in the endoplasmic reticulum, which becomes bloated, leading to

cell death. The researchers fed the compound to mice with human forms of cancerous tumors, and the tumors got smaller. The molecule also proved effective at killing cancer cells in human tissue gathered from patients who had their tumors removed.They also found that ERX-41 is effective against other cancer types with elevated endoplasmic reticulum stress, including hard-to-treat pancreatic and ovarian cancers and glioblastoma, the most aggressive and lethal primary brain cancer. Patents have been issued on ERX-41 and related compounds, which have been licensed to the Dallas-based startup EtiraRX and clinical trials of ERX-41 are planned.

Superworms Capable of Munching through Plastic Waste

Researchers at the University of Queensland have found a common species of worm Zophobas morio, with an appetite for polystyrene could be the key to plastic recycling on a mass scale. The worm can eat through polystyrene, thanks to a bacterial enzyme in their gut. The worms fed a diet of just polystyrene not only survived, but even had marginal weight gains. The worms are like mini recycling plants, shredding the polystyrene with their mouths and then feeding it to the bacteria in their gut. The breakdown products from this reaction can then be used by other microbes to create high-value compounds such as bioplastics.

RESOURCES & EVENTS

MOU for Global Health

The Department of Biotechnology (DBT) and the Bill & Melinda Gates Foundation have renewed the Memorandum of Understanding (MoU) to support innovative approaches for developing new preventions, therapies and interventions needed to solve health (human and animal), food and nutritional inequities on 7th June 2022 in New Delhi. Under this joint partnership, in the last 10 years, programs in diverse areas under maternal and child health, nutrition, sanitation, infectious disease, and data science approaches have been undertaken. The program has also brought together and leveraged the best of the nation's researchers and innovators with international best-practices to address some of the grand challenges that society faces. Through the renewed MoU, the partnership will articulate and implement new strategic direction and to continue awarding and administering a suite of programs in the larger field of public health, tailored to fulfill the strategic needs and requirements of the country and then the rest of the world.

Geospatial Self Certification Portal Launched

The Department of Science and Technology (DST) launched the Self Certification Portal for conveying adherence to provisions of Geospatial Guidelines by individuals, companies, organisations, and government agencies, in what can be described as a significant step towards liberalisation of the geospatial industry in India. The launching of the Self-Certification portal DST aims to remove restrictions and make data more easily accessible for all. Making geospatial data accessible to all would help to process acquired data and use the same to develop required applications and solutions. Developed in collaboration with the NIC, the portal is expected to substantially reduce the time it takes for Geospatial enterprises,

researchers, universities, and innovators to receive permissions and approvals in order to carry out geospatial-related operations.

75th World Health Assembly

The 75th World Health Assembly held its in-person session from 22-28 May 2022 in Geneva. Breakthroughs were achieved on the organization's financing and preparation for future health threats. In line with this year's theme, Health for Peace and Peace for Health, the Assembly saw several pivotal moments related to health and conflict.The Assembly voted on a resolution put forward by Ukraine condemning Russia's military aggression against Ukraine, including attacks on health care facilities, with 88 Member States voting in favor, while 12 voted against and 53 abstained. Member States expressed deep concern about the knock-on effects of conflicts, especially the spread of infectious disease, increasing climate vulnerabilities, and global food insecurity and malnutrition, to which the African continent is particularly susceptible. Running uncontested, WHO's Director-General Dr. Tedros Adhanom Ghebreyesus was reelected to a second five-year term, ending August 2027. Member States agreed to increase assessed contributions, to constitute 50 percent of WHO's base budget by 2030-2031, up from the present 16 percent.WHO's assessed contributions will increase by $600 million before 2030. A Member State task group will be set up to oversee ongoing reforms to WHO's transparency, efficiency, accountability, and compliance efforts. An amendment to the International Health Regulations (IHR) was adopted by consensus to make the IHR a more agile legal instrument, while a Member State-led Working Group on IHR, will continue deliberating on changes to the regulations over the next two years. WHO's Executive Board met on May 30 and agreed to establish a Standing Committee on Health Emergency (Pandemic) Prevention, Preparedness and Response to enhance oversight of WHO's work in emergencies — regularly monitoring and assessing performance and helping ensure a faster, more efficient response when a Public Health Emergency of International Concern is declared.

SCIENCE POLICY AND DIPLOMACY

India & Germany Seek to Align Scientifically Important Priority Areas

Secretary, Department of Science and Technology (DST) Dr. S Chadrasekhar stressed on aligning the priority areas with the scientific importance of India and Germany at an online webinar conducted as part of the outreach activity to promote recently launched call for proposals for International Research & Training Group between DST and DFG. The priority areas include Sustainable Energy Technologies (generation, conversion, and storage), Environment and Clean Technologies, Biobased Economy, Bio-based materials for different applications, Food & Agri Technologies, Affordable Healthcare (including Pharmaceuticals and Biomedical Instrumentation), Technologies for Advanced Manufacturing and Integration of AI and Machine Learning in all domains. Over 80 participants from Universities and institutions from both countries were present in this online webinar of IRTG.

EU Science Ministers Agree on Research Assessment Reform

EU Science Ministers on June 10 2022 signed an agreement backing research assessment reform in Europe, alongside conclusions on open science, international cooperation and Horizon Europe missions, putting more weight into the quality of research outcomes rather than qualitative indicators such as journal impact factors and number of citations. The ministers also adopted a stance on the principles guiding the EU's international cooperation in research and innovation, highlighting the importance of freedom, gender equality, research excellence and protection and enforcement of intellectual property rights. The Council conclusions include a separate statement condemning ussia's continuing war in Ukraine. They noted that the EU should rely more on science diplomacy to ensure researchers work with partners in countries where basic principles and values for fair international cooperation are being followed. Science diplomacy would also help linking research and innovation policies and overarching policy goals.

Stockholm+50 Conference

Fifty years after the landmark 1972 UN Conference on the Human Environment, a conference Stockholm+50 reviewed the state of the human environment and collectively brainstormed on how to move forward. The meeting featured an interactive series of free-flowing dialogues focused on three key themes: achieving a healthy planet and prosperity for all; a sustainable and inclusive recovery from the COVID-19 pandemic; and implementation of the environmental dimension of sustainable development. The main outcome from the meeting was a series of recommendations focused on the right to a healthy and sustainable environment, changing our economic system, accelerating implementation of existing commitments, rebuilding trust, and strengthening multilateralism. Stockholm+50 took place from 2-3 June 2022 in Stockholm,Sweden. Over 4,000 people, including several Heads of State and Government and more than 60 ministers, participated in the conference, over 50 side events, and the Action Hub.

G7 Ministers Recommit to SDGs, Joint Action on Climate, Environment, Energy

Development ministers from the seven leading industrial nations – Germany, Canada, France, Italy, Japan, the UK, and the US, and from the EU – reaffirmed their commitment to the goals of the 2030 Agenda for Sustainable Development, the Addis Ababa Action Agenda (AAAA), and the Paris Agreement on climate change amidst the "multiple crises endangering safety, well-being and prosperity across the world." The Group of 7 (G7) environment ministers committed to phase out coal-fired power generation and achieve "predominantly decarbonized" electricity sectors by 2035. In a 23-page communiqué, the Group of 7 (G7) development ministers recognize the simultaneously occurring setbacks caused by conflict, climate change, environmental degradation, biodiversity loss, poverty, food and energy insecurity, and the COVID-19 pandemic, among other crises, and commit to protecting open, inclusive international cooperation that leaves no one behind. In a 39-page climate, energy, and environment ministers' communiqué, the ministers recognize the importance of achieving the 2030 Agenda in its entirety, and commit to leveraging the synergies between climate and biodiversity action, the clean energy transition and environmental protection, to enable long-term transformative change. The G7 development ministers met from 18-19 May 2022, and

the climate, energy, and environment ministers from 26-27 May in Berlin, Germany. The G7 German Presidency will convene the G7 Leaders' Summit from 26-28 June 2022

Countries Take First Steps Towards Plastic Pollution Treaty

UNEA resolution 5/14 titled, 'End plastic pollution: Towards an international legally binding instrument,' mandates the process to develop an international treaty to address plastic pollution. A meeting of the ad hoc open-ended working group (OEWG) to prepare for the intergovernmental negotiating committee (INC) to develop an international legally binding instrument (ILBI) on plastic pollution, including in the marine environment, convened in hybrid mode from 30 May to 1 June 2022, in Dakar, Senegal,. The meeting sought to establish a foundation for the work of the INC by addressing two core issues: the rules of procedure governing the INC's work and decision making; and the INC's meeting schedule. Delegates were able to agree on a tentative timetable for the meetings of the INC over the next two years, with only five negotiating sessions planned.

RIS and GSEJ Invite Papers for Science Diplomacy Review Special Issue

The Science Diplomacy Review (SDR) is a peer-reviewed and open access journal published by the Forum for Indian Science Diplomacy (FISD) based at Research and Information System for Developing Countries (RIS), an autonomous independent policy research think tank with India's Ministry of External Affairs. SDR's special issue titled '***New Dimensions of Science Diplomacy for the Twenty-First Century***' will be published in collaboration between RIS and the Centre for Global Science and Epistemic Justice (GSEJ) at the University of Kent, UK. We invite contributions that unpack the idea of 'science diplomacy' through examinations on past and emerging experiences. Authors may submit full length research articles (4,000-5,000 words) as well as shorter articles and commentaries (1,500-3,000 words). Papers that focus on non-state actors and/or from the Global South perspectives, and papers with novel research methods are particularly welcome. The last date for submission of the full paper is 2 August 2022. The details are available at http://fisd.in.

We welcome your comments and valuable suggestions. Please write to us for receiving publications, updates and notices regarding seminars, conferences etc.

NOTE TO OUR READERS AND STAKEHOLDERS:

The Science Diplomacy Programme at RIS has been sending you the fortnightly issuesof Scienc Diplomacy Alerts regularly. We request your cooperation to review the Alerts and improve it content. For this purpose, please complete the form at https://forms.gle/o4d869FxaM9t3KNw7 and submit it. Your support and cooperation is appreciated.

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