



CSIR NEWS

Newsletter of the Council of
Scientific & Industrial Research

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CSIR Seaweed Mission

Promoting Sustainable Coastal Livelihoods and Blue Economy



The CSIR Seaweed Mission is a science-driven initiative of the Council of Scientific and Industrial Research (CSIR) aimed at establishing seaweed cultivation as a remunerative, eco-friendly, sustainable, and scalable form of agriculture and creating new livelihood opportunities for fisherfolk and coastal

communities. Besides creating and strengthening the domestic value chain to capture the ecological, economic, and social potential of this sector, India's blue bio-economy should be strengthened.

Under this mission, CSIR conducted site identification, pre-feasibility studies, and cultivation trials at more than 80 coastal sites to assess



Seaweed (*Kappaphycus alvarezii*)

environmental suitability and commercial viability of seaweed farming. Based on scientific evaluation, 62 locations were identified as suitable for large-scale commercial cultivation of key species like *Kappaphycus alvarezii* and *Gracilaria edulis*.

Commercial farming models such as floating bamboo rafts, tube nets, and monoline systems were perfected under Indian conditions, providing stable production frameworks and reducing traditional challenges like grazing and seed loss. These technologies have enabled successful seaweed cultivation, contributing to enhanced income for coastal households.

The mission has catalysed the adoption of seaweed cultivation by ca. 50 Self-help Groups (SHGs) in Tamil Nadu alone, helping ca. 400 fisherwomen and youth engage in seaweed farming as a supplementary livelihood. Technology packages and cultivation know-how have been transferred to multiple companies for the commercialisation of seaweed products. Seaweed cultivation also supports broader government objectives under the Pradhan Mantri Matsya Sampada Yojana (PMMSY), which has sanctioned ₹198.17 crore towards cultivation infrastructure, seed banks, processing units, and skill development across coastal states.

Beyond livelihood impacts, seaweed farming presents climate-resilient income opportunities for coastal communities, with scientific studies showing potential monthly earnings of ₹25,000–₹30,000 through stable seaweed production and value-added applications. CSIR's integrated R&D has also developed tissue culture and spore-based seed production technologies, improving seed quality and supporting the sustained expansion of the seaweed value chain across India's coastline.

Beyond cultivation expansion, the CSIR Seaweed Mission has established India as a science-led hub for marine bioresource innovation through the development of climate-resilient strains, validated seaweed-based bio-stimulants for high-value crops, medicinal and aromatic plants, and diversified value-added products, including functional foods and nutraceuticals. By integrating advanced R&D, farmer-centric deployment, and policy support, the mission is creating a robust seaweed bioeconomy ecosystem. This aligns well with national priorities in climate resilience, coastal livelihood security, and sustainable marine resource utilisation.

Contributed by Science Communication and
Dissemination Directorate (SCDD), CSIR, New Delhi.
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RISE Conclave 2026 – Reinforces Research-Industry-Startup Synergy for Viksit Bharat 2047

Hon'ble Minister of S&T, Dr Jitendra Singh, underscores the pivotal role of startups in driving innovation and strengthening India's research–industry ecosystem.

The two-day Research-Industry-Startup-Entrepreneurship (RISE) Conclave 2026 concluded on 15 February 2026 at the Chennai Trade Centre, bringing together key stakeholders from academia, research institutions, industry, and the startup ecosystem. The conclave reaffirmed the Government's commitment to strengthening innovation-led growth and accelerating the translation of scientific research into societal and industrial applications in line with the vision of Viksit Bharat 2047.

RISE 2026 represents a unique confluence of Research, Industry, Startup, and Entrepreneurship — four critical pillars essential for transforming India into a developed nation by 2047. The Conclave was inaugurated on 14 February 2026 by the Hon'ble Minister of Science & Technology

and Earth Sciences, Dr Jitendra Singh, who underscored the pivotal role of startups in driving innovation and strengthening India's research–industry ecosystem. The Hon'ble Minister also inaugurated the Startup Expo and interacted with participating entrepreneurs.

A major highlight of the conclave was the Startup Expo, which featured more than 100 startups associated with technologies developed by CSIR laboratories, including CSIR-CLRI, CSIR-CECRI, and CSIR-SERC. The Expo showcased cutting-edge innovations across advanced materials, electrochemical technologies, infrastructure systems, sustainable manufacturing, and deep-tech solutions, demonstrating the growing impact of CSIR's technology transfer and commercialisation efforts.





RISE 2026 represents a unique confluence of Research, Industry, Startup, and Entrepreneurship – four critical pillars essential for transforming India into a developed nation by 2047.

The Conclave featured a series of thematic sessions aimed at deepening collaboration across sectors. A panel discussion on Science Communication deliberated on the importance of effective outreach in fostering scientific temper and enhancing public engagement with research and innovation. A panel discussion on Academy–Institute–Industry Partnership highlighted collaborative frameworks to accelerate technology translation, commercialization, and industry-ready solutions, strengthening the national innovation ecosystem.

The programme also included industry talks by leading experts from diverse sectors, who shared insights on systems engineering, product development, engineered construction solutions, and entrepreneurial experiences. The discussions reinforced the critical importance of sustained



research–industry collaboration and the need for integrated innovation ecosystems to advance India’s scientific and technological capabilities.

In the valedictory session, the dignitaries Dr. P. Thanikaivelan, Director, CSIR-CLRI; Dr. N. Anandavalli, Director, CSIR-SERC, and Dr. K. Ramesha, Director, CSIR-CECRI felicitated awards to the winning teams of the participant startups and students. Dr. K. J. Sreeram, Outstanding Scientist and former Director, CSIR-CLRI, proposed a vote of thanks.

The successful conclusion of RISE Conclave 2026 marks a significant step towards fostering stronger partnerships among research institutions, industry, and startups, thereby promoting technology commercialization, entrepreneurship, and innovation-driven growth in alignment with national priorities.

Training-of-Trainers Workshop on Internet of Things (IoT) at CSIR-IMTECH

Haryana Education Minister, Hon'ble Shri Mahipal Dhanda, Highlights the Transformative Role of Emerging Technologies

In a significant step towards integrating cutting-edge technology into school education, Hon'ble Shri Mahipal Dhanda, Cabinet Minister for School Education, Higher Education, Archives, and Parliamentary Affairs, Government of Haryana, virtually inaugurated a five-day Training-of-Trainers Workshop on Internet of Things (IoT) at the CSIR-Institute of Microbial Technology (CSIR-IMTECH), Chandigarh, on 2 February 2026. Under the programme, 110 teachers working under the Haryana Govt underwent competency development in IoT, AI, Robotics, and 3D Printing under the Healthcare theme. The workshop, organised by CSIR-IMTECH in collaboration with the Haryana School Shiksha Pariyojna Parishad (HSSPP), is designed exclusively for Post Graduate Teachers (PGTs) and Atal Tinkering Lab (ATL) In-charges from government schools across the state.

Speaking on the occasion, Education Minister Shri Mahipal Dhanda highlighted the transformative role of emerging technologies and stated, "The Government of Haryana is fully committed to preparing our students and teachers for the technological future. Internet of Things, Artificial Intelligence, Robotics, and Cyber-Physical Systems (CPS) form the backbone of Industry 4.0 — the fourth industrial revolution that is reshaping manufacturing, agriculture, healthcare, and education worldwide." Sh Dhanda congratulated Dr Sanjeev Khosla, Director, CSIR-IMTECH, Dr Karthikeyan Subramanian, Dr Dibyendu Sarkar, Dr Balvinder Singh, Mr Chander Shekhar, the workshop coordinator, and the whole organising team at CSIR-IMTECH for hosting the series of workshops for the teachers of the Haryana Government.



Shri Mahipal Dhanda, Cabinet Minister for School Education, Government of Haryana, inaugurating the workshop

He also said that through these workshops, the Government of Haryana is taking a concrete step towards building a strong foundation of these technologies in Haryana government schools. This is not just about teaching tools; it is about developing scientific temper, problem-solving ability, and an innovation mindset among our students so that they can actively contribute to the vision of Viksit Bharat @2047 — a developed, self-reliant, and technologically advanced India by the time we celebrate 100 years of independence.

Over the next five days, the participants received intensive training from senior scientists and domain experts of CSIR-IMTECH, enabling them to effectively guide students in Atal Tinkering Labs (ATL) and science & technology activities.

Dr Karthikeyan Subramanian, Officiating Director, CSIR-IMTECH, welcomed the initiative and stated that "CSIR-IMTECH is proud to collaborate with the Haryana Education Department as the knowledge partner. By training teachers in IoT and allied technologies, we are creating a multiplier

“The Government of Haryana is fully committed to preparing our students and teachers for the technological future. Internet of Things, Artificial Intelligence, Robotics, and Cyber-Physical Systems (CPS) form the backbone of Industry 4.0,” said Education Minister Shri Mahipal Dhanda.



Dr Karthikeyan Subramanian, Officiating Director, CSIR-IMTECH welcoming Dr Mayank Verma, Joint Director, Department of School Education, HSSPP

effect — each trained teacher will inspire and mentor hundreds of students, helping build a strong foundation for innovation and scientific temper in Haryana’s government schools.”

Key dignitaries present included Dr Mayank Verma, Joint Director Haryana School Shiksha

Parishad Pariyojna, Ms Sonali Vohra, State Coordinator for Science under HSSPP, senior scientists from CSIR-IMTECH and workshop coordinator were present for the inaugural session. Dr Dibyendu Sarkar, Chief Scientist delivered the formal vote of thanks.



CSIR–NIIST Showcases Eleven Technology Transfers and Signs MoU at “Lab to Market” Event



CSIR–National Institute for Interdisciplinary Science and Technology (CSIR–NIIST), Thiruvananthapuram, organised “CSIR–NIIST Tech Connect: Lab to Market” at CSIR Headquarters, New Delhi, on 19 February 2026, marking a major milestone in technology translation and industry engagement. The event witnessed the transfer of 11 technologies and the signing of one Memorandum of Understanding (MoU), underscoring CSIR’s commitment to taking research outcomes from laboratories to industry and society.

Addressing the gathering, Secretary, Department of Scientific and Industrial Research (DSIR) and Director General, CSIR, Dr (Mrs) N Kalaiselvi, emphasised the importance of transitioning from conventional R&D to “R&D Innovation,” where research begins with market needs and moves backward to design impactful

solutions. She underlined that research institutions must focus not only on knowledge generation but also on translation, validation, scalability, and commercialisation to ensure societal benefit.

Highlighting the growing synergy between CSIR laboratories and industry partners, Dr N Kalaiselvi noted that technology transfer is no longer a peripheral activity but a core institutional mandate, aligned with national priorities of self-reliance, sustainability, and nutrition security. Dr Kalaiselvi lauded CSIR–NIIST’s expanding innovation ecosystem, including its focus on interdisciplinary research areas such as biosciences, bioengineering, Ayurveda research, artificial intelligence, and sustainable materials.

DG, CSIR, highlighted the establishment of the CSIR–NIIST Innovation, Technology and Entrepreneurship Hub, aimed at fostering startups, SMEs, and industry collaborations in areas

DG, CSIR, Dr N Kalaiselvi, emphasised the importance of transitioning from conventional R&D to “R&D Innovation,” where research begins with market needs and moves backward to design impactful solutions.

including sustainable packaging, spice incubation, coir and rubber technologies, and green hydrogen-enabled bio-manufacturing. She noted that strengthening external cash flow, increasing non-governmental revenue sources, and significantly scaling up technology transfer volumes reflect a strategic shift towards translational research and commercialisation-driven growth.

Among the major technologies transferred was a high-protein, low glycaemic index rice enriched with micronutrients, including iron, folic acid, and Vitamin B12. Developed to address anaemia and diabetes concerns, the rice varieties demonstrated enhanced protein content and reduced glycaemic index while retaining cooking and sensory properties. Another key transfer included a novel instant coffee foam technology capable of sustaining foam at high temperatures without milk addition.

In addition, a low-sodium salt technology with significant sodium reduction was introduced, with an MoU signed for further collaborative research and scale-up. Several other technologies, including cardanol polyol-based polyurethane dispersions, osmotic dehydration processes, ready-to-cook vegetable mixes, fruit roll technologies, composting bio medium (JAIVAM), and vegan leather, were also transferred to industry partners.

In his address, Director, CSIR-NIIST, Thiruvananthapuram, Dr C Anandharamakrishnan, described the event as a “festival of technology transfers,” reflecting NIIST’s strategic decision to expand its national footprint and enhance industry

visibility. He highlighted the institute’s significant performance indicators, including a sharp rise in external revenue generation, technology transfer volumes, industry projects, CSR projects, and research output.

Director CSIR-NIIST explained that the institute consciously shifted its approach from traditional R&D to R&D innovation, where product design is guided by market demand, and technologies are continuously refined post-transfer. He also elaborated on the science and development journey behind key technologies such as protein-enriched rice, foam-stabilised instant coffee, and sodium-reduced salt, emphasising the importance of industry collaboration in scaling laboratory breakthroughs.

Chairman & Managing Director, National Research Development Corporation (NRDC), Commodore Amit Rastogi (Retd), highlighted the renewed synergy between CSIR and NRDC in strengthening technology commercialisation. He noted that over the past two years, NRDC has commercialised a substantial number of CSIR technologies and generated significant royalty and premium revenue. He outlined NRDC’s expanded role beyond conventional licensing, including the creation of incubation infrastructure, technology readiness level assessment (NETRA), design clinics, system engineering support, financial assistance up to ₹1 crore for technology development, seed funding support, and IP facilitation. He also spoke about NRDC’s plans for a National Technology Translation Organisation and an AI-enabled technology exchange platform to enhance visibility and conversion of research outputs into market-ready products.

The event also witnessed active participation from industry leaders, researchers, and media, reinforcing CSIR-NIIST’s vision of building a robust lab-to-market pipeline. With the transfer of 11 technologies and one MoU exchange, the programme demonstrated CSIR’s strengthened focus on industry connect, innovation-led growth, and national impact.

Source: PIB

Dr N Kalaiselvi Launches Sisal Mission and Demonstration of Geopolymeric Concrete Road



On 2 February 2026: Hon'ble Dr N Kalaiselvi, Director General, CSIR and Secretary, DSIR, addressed the scientists and staff of CSIR-Advanced Materials and Processes Research Institute (CSIR-AMPRI), Bhopal, through an online interaction.

In his welcome remarks, Prof. Thallada Bhaskar, Director CSIR-AMPRI, extended a warm welcome to the Hon'ble DG, CSIR, and teams from CSIR-CFTRI, CSIR-CBRI, and CSIR-CRRI associated with the Sisal Mission. He highlighted the institute's commitment to advancing materials and process technologies for societal benefit and presented the recent progress and strategic vision of CSIR-AMPRI. He also expressed gratitude to the DG, CSIR, for her continuous support and guidance.

During the programme, Dr N Kalaiselvi inaugurated the Centralised Testing Facility 'TEJASVI' (Technical Evaluation and Joint Analysis

System for Virtual Integration) and the FE-SEM Facility. She also launched the demonstration stretch of Roller Compacted Geopolymeric Concrete Road and participated in the naming ceremony of the institute's auditorium as "TARA – Prof. TC Rao Auditorium," conducted in online mode.

The Hon'ble DG released the quarterly newsletter of CSIR-AMPRI, 'SAMVARDHAN', and inaugurated the Think Tank for Transformation (T3) Club. An MoU was also exchanged between CSIR-AMPRI and Mrs Mona Dharamsey from Infosys Foundation for the "Implementation and Demonstration of Makeshift Hospital/Housing Technology," involving the establishment of an 8-bed prefabricated hospital for rapid deployment during epidemic outbreaks and post-disaster rehabilitation.



Dr Kalaiselvi commended CSIR-AMPRI for its remarkable transformation and rapid progress, appreciating both past and present leadership for revitalising the institute.

Dr Kalaiselvi launched several digital initiatives, including the Unified Portal for CSIR-AMPRI (Surya), the Guest House Booking System, and the Dispensary Management Portal (Arogya). The Sisal Plantation initiative under the 'Sisal Mission' was also formally launched at CSIR-AMPRI, with participation from CSIR-CFTRI, CSIR-CBRI, and CSIR-CRRI in online mode.

In her address, Dr Kalaiselvi commended CSIR-AMPRI for its remarkable transformation and rapid progress, appreciating both past and present leadership for revitalising the institute. She lauded several technologies developed at CSIR-AMPRI, including Raman technology, cement-free concrete, 3D printing infrastructure, sisal fibre technologies, and innovative parali-based mobile stands distributed across CSIR laboratories.

She emphasised the importance of large-scale demonstrations for impactful technologies,

particularly cement-free concrete solutions, and encouraged the wider adoption of sisal plantations across CSIR laboratories to foster fibre-based innovations and value-added product development. She described the collective effort as the beginning of a broader Sisal Movement within CSIR.

She described this Sisal movement as a feast to witness multiple laboratories jointly showcasing sisal plantation activities. She encouraged that the Sisal plantation movement should be widely promoted across CSIR laboratories to initiate sisal fibre plantations, generate value-added products, and enhance fibre-based technologies. She marked the occasion as the beginning of Sisal Mission.

Further, she encouraged expanded CSR collaborations with industry partners such as Infosys and suggested joint initiatives with CSIR-CSIO and CSIR-CEERI under the CIE theme. She conveyed her best wishes to CSIR-AMPRI and expressed satisfaction with the institute's growth trajectory.

Finally, she expressed her extreme happiness with the laboratory's progress. She aspired to hear many more success stories from the laboratory and called upon one and all to strengthen the Director in these endeavors.

The programme concluded with a vote of thanks by Dr Mohd Akram Khan, Scientist G, followed by the National Anthem.

INSA and NIScPR Sign MoU to Advance Science Communication and Policy Research

Indian National Science Academy (INSA) and the National Institute of Science Communication and Policy Research (CSIR-NIScPR) signed a Memorandum of Understanding (MoU) on 10 February 2026 at INSA, New Delhi, to promote collaborative activities on science communication and evidence-based science policy research and strengthen evidence-based policymaking in India.

The programme began with welcome remarks by Dr Brajesh Pandey, Executive Director, INSA. Dr Akhilesh Gupta, Former Senior Advisor, Department of Science and Technology (DST), outlined the genesis and rationale of the MoU and emphasised the importance of sustained institutional collaboration for advancing evidence-based STI policy research.

Dr Geetha Vani Rayasam, Director, CSIR-NIScPR, highlighted the complementarity between the two organisations and noted that the partnership would enable both institutions to leverage their respective strengths in science communication,

Dr Geetha Vani Rayasam, Director, CSIR-NIScPR, highlighted the complementarity between the two organisations and noted that the partnership would enable both institutions to leverage their respective strengths in science communication, policy research, and academic engagement to create meaningful impact in STI policy research.

policy research, and academic engagement to create meaningful impact in STI policy research. Prof. Anurag Agrawal, Vice President (Policy), INSA, underlined the importance of designing effective



policies to guide India towards a sustainable and future-ready science and innovation ecosystem.

Prof. Shekhar C Mande, President, INSA, reflected on the shared legacy of the two institutions and described the collaboration as particularly significant in the present era of rapid scientific and technological transformation. He emphasised the need for strong policy foundations to guide STI development in the broader context of societal well-being and human survival.

Dr VK Saraswat, Hon'ble Member, NITI Aayog, congratulated both institutions on the partnership and stressed the importance of policy frameworks that support the responsible and human-centric adoption of disruptive technologies. He highlighted the role of pilot studies, digital twins, and similar

tools in assessing policy effectiveness and strengthening implementation mechanisms.

MoU aims to promote collaborative policy research studies, joint publications, pilot projects, capacity-building initiatives, outreach programmes, and stakeholder consultations. It will also facilitate engagement with government institutions, international organisations, think tanks, researchers, and young scholars to strengthen India's STI policy ecosystem.

Through this partnership, INSA and CSIR-NIScPR reaffirm their shared commitment to advancing robust, inclusive, and forward-looking STI policies through collaborative research, knowledge exchange, and dialogue at national and global levels.

CSIR-AMPRI and NATRAX, Indore Inks MoU for Cooperation and Collaboration in Areas of Mutual Interest

NATRAX is a State-of-the-Art Automotive Testing and Certification Centre, operating under the National Automotive Board (NAB), Ministry of Heavy Industries, Government of India. It is one of India's largest and most advanced proving grounds, serving as a one-stop solution for vehicle development, R&D, certification, and homologation for both domestic and global automotive, tyre, and component industries. NATRAX is spread over 2,960 acres. Planned under the Automotive Mission Plan 2006–2016, it is designated as the Centre of Excellence in Vehicle Dynamics. It has 14 different types of specialised test tracks for comprehensive testing and evaluation of vehicles in varying terrains and stringency along with various laboratory set ups. The centre has built capabilities for electric vehicle and component testing, along with ADAS

testing. NATRAX is notified under CMVR Rule 126 as a homologation and certification agency. It is also accredited for testing and certifying safety equipment's like steel crash barriers.

CSIR-AMPRI (CSIR-Advanced Materials and Processes Research Institute), a premier national laboratory under CSIR, is engaged in the research, development and engineering of advanced materials, processes and products for industrial and societal applications. AMPRI carries out R&D in lightweight materials, nanomaterials, smart and functional materials, and waste-to-wealth technologies, with strong emphasis on materials for automotive, infrastructure, energy and rural sectors. Over the years, the institute has developed several indigenous technologies, patents, processes and products that are transferred to industry for

This partnership reflects a shared commitment to advancing environmentally responsible technologies and practices.

commercialisation and societal benefit. AMPRI is equipped with state-of-the-art facilities for materials synthesis, processing, characterization, and modelling, enabling it to support end-to-end development of materials, components, and processes.

CSIR-AMPRI and NATRAX will collaborate on developing sustainable materials and technologies, including waste-to-value engineering products, impact-absorbing crash aids, and e-waste recycling solutions for automotive applications, along with knowledge exchange and capacity building

towards establishing a Centre of Excellence in Sustainability. This partnership reflects a shared commitment to advancing environmentally responsible technologies and practices.

“We look forward to path-breaking collaboration in advancing waste-to-wealth automotive products and infrastructure,” said Dr Manish Jaiswal, Director, NATRAX. “This MoU is an opportunity to serve the nation in coherence,” said Dr Thallada Bhaskar, Director, CSIR-AMPRI.

MoU was signed between CSIR-AMPRI, Bhopal, and NATRAX Indore on 10/01/2026 by Dr Manish Jaiswal, Director NATRAX, and Dr Thallada Bhaskar, Director, CSIR-AMPRI, in the presence of Mr Manoj Kumar Madholia, Director (Auto), and officials from both organisations for cooperation and collaboration in areas of mutual interest for the national development.



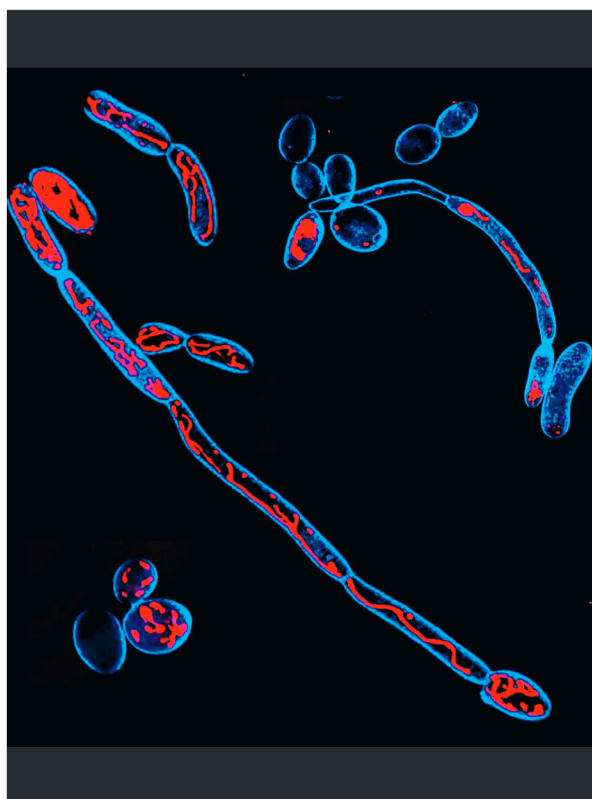
Scientists uncover metabolic ‘switch’ that helps fungi turn deadly

Fungal infections are quietly becoming one of the most dangerous and underestimated threats of our time. Often overshadowed by viruses and bacteria, fungi are now responsible for a growing number of severe infections worldwide, contributing to rising hospitalisations and deaths. At the same time, fungal diseases are devastating crops, reducing yields, and worsening food insecurity — making this a dual crisis for both public health and agriculture. Yet, our ability to fight back is weakening. Antifungal medicines are far fewer than antibiotics, can be toxic, and even their efficacy in treating fungal infections is declining rapidly due to antimicrobial resistance. Doctors and scientists are beginning to face a frightening reality: the pipeline of effective antifungal treatments is shrinking, even as the threat expands.

In this urgent global context, researchers from the laboratory of Dr Sriram Varahan from CSIR-Centre for Cellular and Molecular Biology (CSIR-CCMB), Hyderabad, have uncovered a striking new insight into how fungi become dangerous in the first place — and how we might stop them.

A remarkable “superpower” of fungi is their ability to change their shape. Fungi exist in predominantly two shapes: yeast (oval in shape, about 5 microns in diameter) and filamentous (~20-100 microns long). The yeast forms travel from one place to another, looking for niches to anchor itself. Once it finds that, it starts to filament and takes over the region. When fungi enter host cells present in our bodies, it is primarily in its yeast form. In the host, it faces a shortage of nutrients, differences in temperatures, and encounters other microbes. All of these trigger the fungi to form filaments. The filamentous forms of fungi are difficult to clear out for the immune cells of our bodies, as well as for medicines.

In this urgent global context, researchers from CSIR-CCMB have uncovered a striking new insight into how fungi become dangerous in the first place – and how we might stop them.



Yeast and filamentous forms of fungi

For decades, scientists have largely known the genes governing signalling pathways and regulatory mechanisms inside the fungal cell that instruct it to change shape. However, this new work reveals that the true driver of shape-shifting does not lie only in gene networks, but also in the fungus's internal power supply — its metabolism.

New study finds fungi's sugar metabolism controls infection-driving shape shift

"By looking at fungi through a metabolic lens, we uncovered what can be described as a previously hidden biological "short circuit". We discovered a crucial connection between the process by which cells break down sugar to generate energy (called glycolysis) and the production of specific sulfur-containing amino acids," said Dr Varahan. Put simply: when fungi consume sugars rapidly, sugar breakdown also runs at high rates. This influences whether the cell can produce certain sulfur-based amino acids that are necessary for triggering invasive growth. Thus, fungal shape-shifting is not only programmed by genes — it is also fuelled and controlled by how the fungi process nutrients.

To prove this, the team performed laboratory experiments in which sugar breakdown was slowed in the fungus. In these conditions, fungi remained trapped in a harmless, oval (yeast) form, unable to transition into the more invasive shapes associated with infection. But when supplied with sulfur-containing amino acids from outside, the fungi rapidly regained their ability to change shape. This dramatic "rescue" demonstrated that these nutrients act like an essential on/off switch — without them, morphogenesis stalls; with them, the invasive transformation can restart.

Metabolic connection has disease relevance

The team studied a strain of *Candida albicans*, a leading cause of fungal diseases worldwide, lacking a key sugar breakdown enzyme and found that it became "metabolically crippled." The fungi showed a weakened ability to undergo morphogenesis, as well as struggled to survive attacks from immune cells called 'macrophages'. These immune cells form the body's first line of defence. In mouse



This discovery could open a promising new path in antifungal treatment strategies. Scientists may be able to disrupt the metabolic processes that fungi rely on for their survival.

infection studies, this altered strain caused much milder disease compared to normal fungal strains. In effect, disrupting fungal metabolism reduced its capacity to adapt, evade immunity, and establish infection.

This discovery could open a promising new path in antifungal treatment strategies. Scientists may be able to disrupt the metabolic processes that fungi rely on for their survival. Dr Varahan opined that "since these pathways are fundamental for fungal growth and shape-shifting, they may represent an 'Achilles' heel' that is harder for fungi to escape through resistance".

At a time when drug-resistant fungal infections are rising globally, these findings highlight a powerful idea: to stop fungal infections, we may need to cut off the energy and nutrients that enable fungi to transform into harmful forms. By targeting metabolism, we may be able to outsmart these shape-shifting invaders and develop safer, more effective antifungal therapies — protecting both human health and food security.

This work was funded by the Indian Council of Medical Research, Anusandhan National Research Foundation, Council of Scientific and Industrial Research, and DBT/Wellcome Trust India Alliance, India.

Link to the paper: <https://doi.org/10.7554/eLife.109075.3>

International Symposium on Human-Centred AI and Energy Security

CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR), New Delhi, organised an International Symposium on “Human-Centred AI and Sustainable Development: Holistic Pathways for Energy Security” as an official pre-summit event of the India-AI Impact Summit 2026 at Vivekananda Hall, CSIR-NIScPR, Pusa. The day-long symposium brought together leading experts from India and abroad to deliberate on people-centric artificial intelligence approaches for securing sustainable and inclusive energy futures.

The inaugural session featured a welcome address and opening remarks by Dr Geetha Vani Rayasam, Director, CSIR-NIScPR, who set the context for the symposium. Emphasising the need for safe and trusted AI, Director, CSIR-NIScPR, mentioning about the India AI Impact Summit 2026

by the Government, she said that this international symposium is part of the official pre-summit events leading up to that conclave. She added that the aim of this symposium is to enable wide-ranging consultation and bring forth concrete ideas and solutions that may help the Government shape human-centred, safe and trusted AI frameworks for sustainable development and energy security.

The Chief Guest, Dr Ashutosh Sharma, Former President, Indian National Science Academy (INSA) and Institute Chair Professor, Indian Institute of Technology Kanpur, delivered the inaugural address, remarked that there are both “lights and shadows” of AI technologies and that society urgently needs informed discussions on human-centred AI. He emphasised that AI must be an enabler, not a replacement, creating new opportunities to serve those objectives which we were unable to serve earlier.





Dr Nadia Asheulova, Director, Institute for the History of Science and Technology, Russian Academy of Sciences, observed that the Indian philosophical tradition has always been remarkably open to the multiplicity of forms of consciousness and intelligence, offering a rich backdrop for thinking about human-centred AI today. She underlined that both India and Russia face complex challenges in transitioning to renewable energy systems — challenges that are not merely technical, but deeply social and institutional. The real task, she noted, is not simply to develop more powerful AI systems, but to ensure that these systems serve the democratisation of intelligence, expanding opportunities for creative and intellectual participation across the entire population.

Dr Vivek Singh, Senior Adviser, NITI Aayog, addressed the gathering as Guests of Honor, noted that the rise of deep learning models underpinning large language models is a welcome development, as these technologies are rapidly becoming ubiquitous. He emphasised that India-centric data

Dr Ashutosh Sharma, Former President, INSA, emphasised that AI must be an enabler, not a replacement, creating new opportunities to serve those objectives which we were unable to serve earlier.

is unique and must be effectively integrated into these systems, adding that India has consciously chosen a balanced approach towards AI — one that embraces innovation while safeguarding societal interests. He reassured that reskilling and up-skilling will enable people to work alongside AI and unlock new forms of productive and meaningful employment. The session concluded with a formal vote of thanks by Dr Kasturi Mandal of CSIR-NIScPR.

The Keynote Session on “AI-Driven Pathways to Energy Security and Sustainable Development” focused on ethical, inclusive and people-centric AI paradigms and global perspectives on AI-enabled energy transitions. Chaired by Prof. Indranil Manna, Vice Chancellor, BIT Mesra, the session included keynote interventions from Prof. Uday B Desai, Vice-President, Indian National Academy of Engineering; Dr K Ramesha, Director, CSIR-CECRI, Karaikudi; and Prof. Andrey V Rezaev, Tashkent State University of Economics, Uzbekistan, who discussed technology frontiers, systems-level challenges and collaborative opportunities in AI for energy systems.

The afternoon Technical Session on “Artificial Intelligence: Equity, Integrity, and Inclusivity”, chaired by Prof. Anirban Chakaraborti, JNU emphasised interdisciplinary research, data-driven decision-making, and responsible innovation frameworks to ensure AI technologies contribute meaningfully to society and sustainable development. Dr Vipin Kumar, CSIR-NIScPR spoke about the opportunities and challenges of AI for energy security, highlighting the need for reliable data ecosystems and policy-aligned innovation. Dr Lidia Borrell, Science Europe highlighted research ecosystems, international collaboration, and open science practices for AI-driven sustainability. Mr Amit Shukla, EasyGov discussed AI in governance and public-service delivery for inclusive development. Anastasia A Ivanova (St Petersburg State University, Russia) on democratization of medical expertise in the age of AI, and Prof. Reeta Sony (JNU) on the legal and IPR framework for AI.

In Technical Session II on “Human-Centred AI and Sustainable Development”, chaired by Prof. Andrey V Rezaev (Tashkent State University of Economics, Uzbekistan), the discussions turned to ethical dilemmas, energy transition and systemic risks. He also talked about human-centred approach. Dr Natalia Tregubova (St Petersburg State University) spoke on key considerations and ethical dilemmas of human-centred AI in promoting sustainable development, Prof. Ramesh Narayanan (IIT Delhi) addressed

energy transition in the emerging paradigm of technology, Dr Avinash Kshitij, CSIR-NIScPR analysed AI’s dual impact on energy security, outlining both opportunities for optimisation and innovation, and risks related to energy demand, infrastructure and policy readiness. Mr Mukesh Pund, CSIR-NIScPR presented emerging AI paradigms, discussing how next-generation technologies, research ecosystems and data-driven innovation are shaping the future of artificial intelligence.

A high-level Panel Discussion on “AI pathways towards Energy Security – Opportunities and Challenges” was chaired by Dr Akhilesh Gupta (INSA), with Dr Naresh Kumar (CSIR-NIScPR) as Co-Chair and Dr Alexander M Stepanov (St Petersburg State University) as Moderator. Panellists Dr Charu Verma (CSIR-NIScPR), Dr Amit Kumar (RIS), Sh Ashutosh Maurya (NIC), Dr Venkat Rama Reddy Kuntala (IIT Jodhpur), Dr Valentin S Starikov and Dr Pavel P Lisitsyn (both from St. Petersburg State University), Prof. Anirban Chakaraborti (JNU) and Dr Vinayak (CSIR-NIScPR) shared multidisciplinary insights on policy, technology, institutional readiness and international cooperation to harness AI for secure and sustainable energy systems. The discussion highlighted the opportunities and challenges of integrating AI into energy systems, emphasising responsible deployment, cross-disciplinary research, and multi-stakeholder cooperation for sustainable energy transitions. The panel concluded that AI-powered solutions, supported by robust research ecosystems and aligned policies, will play a pivotal role in shaping a secure and sustainable energy future.

The Valedictory Session, chaired by Dr Natalia Tregubova, captured the key takeaways of the day’s deliberations. Dr Kasturi Mandal presented a succinct “Summary of Key Insights and Recommendations”, followed by Concluding Remarks by the Director, CSIR-NIScPR, emphasising the institute’s continued commitment to advancing human-centred AI and science-informed policy for sustainable development and energy security.

APPOINTMENTS

Dr Arup Ghosh Takes Charge as Director of CSIR-CSMCRI

Dr Arup Ghosh has assumed charge as Director of CSIR-Central Salt & Marine Chemicals Research Institute (CSIR-CSMCRI), Bhavnagar. A distinguished scientist, Dr Ghosh is widely recognised for his pioneering contributions in seaweed research, including sustainable cultivation, bioactive compound extraction, and applications in food, pharmaceuticals, and environmental management. His findings in the field of seaweed research have found commercial applications. Dr Ghosh is the recipient of many national and international fellowships and awards. His expertise has significantly advanced India's leadership in marine biotechnology and resource utilization.

CSIR-CSMCRI stands at the forefront of innovation in salt & marine chemicals, advanced membrane technologies, and seaweed-based research. Its pioneering work in desalination, bioactive compounds, and renewable energy solutions has positioned the institute as a leader in sustainable resource utilisation. With Dr Ghosh's



appointment, CSIR-CSMCRI enters a new era of innovation, focusing on cutting-edge R&D, industry collaboration, and societal outreach. The institute community welcomed his appointment and expressed confidence in achieving new milestones in scientific excellence and societal impact under his leadership.

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