



भारत सरकार

GOVERNMENT OF INDIA



# विज्ञान TECH

National Technology Day 11 May 2026



TECH.  
संग्रह

*A Compendium Of  
technologies developed by  
Research Institutions across  
the Country*





प्रधान मंत्री  
Prime Minister

**MESSAGE**

It is heartening to learn about विज्ञान-Tech 2026 being organised on the occasion of National Technology Day on May 11. On this historic day in 1998, our scientists demonstrated their exceptional expertise through the successful nuclear tests and created a legacy that continues to inspire the nation. I convey my best wishes to all the scientific minds gathered for this occasion.

The coming together of 14 Ministries and Departments related to science, technology and research, for the first time, to celebrate this occasion collectively is laudable. Such initiatives foster a 'whole of government' approach, which is essential for nation-building in today's times.

Our scientific and research ecosystem has served the nation with great distinction. Whether during challenging times such as the COVID-19 pandemic, in landmark achievements like the Mars and Moon missions, or through breakthroughs in agriculture, there are numerous examples of India's scientific capabilities benefiting society. This occasion is an opportunity to celebrate these accomplishments and renew our resolve to achieve many more in the years ahead.

It is often said that today's research is tomorrow's science and today's science is tomorrow's technology. Every effort to advance the frontiers of research and strengthen self-reliance in science will greatly benefit future generations. Keeping this in mind, our government has undertaken several initiatives to promote research and development.

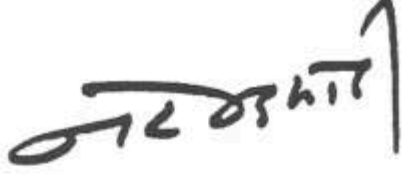
The Research Development and Innovation Scheme, with a corpus of Rs 1 lakh crore to nurture emerging and sunrise sectors, the establishment of the Anusandhan National Research Foundation and the launch of missions in areas such as deep ocean exploration, semiconductors, artificial intelligence and critical minerals are among the many steps taken in this direction. We remain committed to strengthening India's indigenous R&D ecosystem across diverse sectors.

In this journey, fostering collaboration among policymakers, scientists, researchers, industry leaders, startups and investors is of great importance. It is encouraging that विज्ञान-Tech 2026 is bringing together such stakeholders on a common platform. I am also confident that the exhibition showcasing achievements across various domains of science and technology will provide valuable insights into new opportunities for collaboration and innovation.

It is equally heartening to note that the compendium, 'TECH-संग्रह', is being released as a compilation of indigenous technologies aligned with key national development goals.

Heartiest congratulations to all the participating Ministries and Departments for undertaking this important initiative. May विज्ञान-Tech 2026 emerge as a model for future collaborative engagements and knowledge-sharing platforms.

Jai Vigyan, Jai Anusandhan.



(Narendra Modi)

New Delhi

वैशाख 20, शक संवत् 1947

10 May, 2026

## डॉ० जितेन्द्र सिंह

राज्य मंत्री (स्वतंत्र प्रभार),  
विज्ञान एवं प्रौद्योगिकी मंत्रालय;  
राज्य मंत्री (स्वतंत्र प्रभार) पृथ्वी विज्ञान मंत्रालय;  
राज्य मंत्री, प्रधान मंत्री कार्यालय;  
राज्य मंत्री कार्मिक, लोक शिकायत एवं पेंशन मंत्रालय;  
राज्य मंत्री परमाणु ऊर्जा विभाग तथा  
राज्य मंत्री अंतरिक्ष विभाग  
भारत सरकार



### Foreword

As India moves forward on the path to Viksit Bharat, cross-sectoral technological innovation will serve as a key enabler, positioning India as a self reliant and globally competitive economy.

I am pleased to learn that the programme *विज्ञान-Tech* anchored in a Whole-of-Government approach brings together 14 different Ministries/Departments of Government of India to showcase indigenous technologies spanning cross-cutting and deep-tech thematics. The Compendium 'TECH-संग्रह' being released during the programme features indigenous technologies across sectors ranging from bio-pharma to deep sea exploration, electronics, clean energy, semiconductors, agriculture, and space. This pioneering initiative, a significant step towards breaking institutional silos will be a stepping stone as we embark on the journey towards Viksit Bharat following the mantra of 'Vigyaan se Vikaas' reinforcing the partnership between science, society, and industry.

National Technology Day is as an ideal occasion for this joint commemoration, standing as a tribute to the scientists, engineers, innovators, and institutions whose efforts continue to advance innovation-led growth.

I congratulate all the Ministries that have come together for this collaborative initiative. I hope that this will act as precedence and as a model for future coordinated engagements and knowledge sharing platforms also.

(Dr. Jitendra Singh)

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अजय के. सूद

भारत सरकार के प्रमुख वैज्ञानिक सलाहकार

**Ajay K. Sood**

Principal Scientific Adviser to the Govt. of India



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### Message

Technology has been central to society since the dawn of human civilization, evolving steadily into the sophisticated digital systems we rely on today, with each breakthrough expanding our capabilities and reshaping societies, enabling new ways of living, working, and connecting.

The various Autonomous Institutes and Research Laboratories under Ministries and Departments of Government of India have played a significant role in positioning India as a technological powerhouse. They form the backbone of the nation's research and innovation ecosystem. These institutions not only drive knowledge creation and capacity building but also play a pivotal role in translating research into real-world applications that deliver societal and economic impact.

It is heartening that this Compendium 'TECH-संग्रह', featuring technologies developed in key thematic sectors including space, climate, energy, agri-food tech, deep-tech materials, electronics, semiconductors, cybersecurity and deep sea, developed in-house and that have been deployed already or are progressing well along the TRL scale, is being released during *विज्ञान-Tech* on National Technology Day-2026.

I appreciate the Department of Biotechnology for spearheading this initiative and look forward to our continued collective efforts to propel the nation to new heights through indigenous technology development.

(Ajay K Sood)

Date: 07<sup>th</sup> May 2026





डॉ. राजेश सु. गोखले  
Dr. RAJESH S. GOKHALE

सचिव  
भारत सरकार  
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### Message

It is a matter of great pleasure for Department of Biotechnology to be hosting '*विज्ञान-Tech*', a first-of-its-kind initiative which brings together multiple Ministries and Departments in a 'Whole-of-Government' approach.

It gives me great pleasure that this Compendium of in-house developed technologies '*TECH-संग्रह*' spanning key thematic sectors- Space and Geo-Spatial Technologies, Climate and Agri-food technologies, Biopharma and Health Technologies, Bioindustrial & green chemicals, Deep-tech materials and Advanced Engineering technologies, Electronics/ Semiconductors/Energy, Deep sea and atmospheric technologies, is being launched during '*विज्ञान-Tech*', commemorating National Technology Day.

As India advances toward the vision of Viksit Bharat, its R&D ecosystem is emerging as a sovereign engine of innovation—fueling deep-tech breakthroughs, catalysing industrial transformation, and enabling a sustainable, green and circular economy. A key pillar of this journey are the indigenous technologies developed in-house by autonomous institutes and research laboratories supported by the Government of India, and this Compendium highlights such technologies that are either already commercialized or progressing steadily along the TRL ladder towards deployment.

The Department of Biotechnology along with institutions under the Biotechnology Research and Innovation Council is a key contributor to this innovation led transformation, driving impactful advancements across healthcare, agriculture, and energy sectors.

I place on record my appreciation for the entire team at DBT and across all participating Ministries and Departments for their dedicated efforts in compiling this Compendium.

(Dr. Rajesh S. Gokhale)





सत्यमेव जयते

डॉ. (श्रीमती) एन. कलैसेल्वी  
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महानिदेशक, वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्  
**Dr. (Mrs.) N. Kalaiselvi**  
Secretary, DSIR and Director General, CSIR



### Message

It is a matter of great pride for the Council of Scientific and Industrial Research (CSIR) to participate in the National Technology Day 2026 celebrations being held at the National Institute of Immunology, New Delhi. National Technology Day is a significant occasion for the nation, commemorating India's technological achievements and reaffirming our collective commitment to science, innovation, and self-reliance.

The National Technology Day-2026 aptly captures the spirit of a "whole-of-government" approach, bringing together multiple Ministries and Departments to showcase indigenous technologies and institutional strengths.

CSIR has been at the forefront of advancing science-led innovation and translating research into impactful technologies for society and industry. From deep-tech materials and advanced engineering to biopharma, energy, climate, and agri-food technologies, CSIR's contributions span across key domains that are critical for India's growth and global competitiveness.

This compendium, being released during the National Technology Day programme, reflects the strength of India's public R&D ecosystem, highlighting technologies that are ready for deployment, partnerships, and commercialization. It also underscores the growing emphasis on lab-to-market translation, indigenous development, and collaborative innovation.

As India moves towards the vision of Viksit Bharat, institutions like CSIR will continue to play a pivotal role in fostering innovation, strengthening industry linkages, and delivering technology-driven solutions for national priorities.

I extend my best wishes to all participating organizations for bringing together such a comprehensive platform to celebrate India's technological capabilities.

May 04, 2026  
New Delhi

  
(N. Kalaiselvi)



भारत सरकार

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**Government of India**  
**Ministry of Science and Technology**  
Department of Scientific & Industrial Research  
Council of Scientific & Industrial Research

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## National Technology Day 2026: Vigyan-Tech

### Message of Secretary, DAE & Chairman, AEC for Printed Compendium

#### From Operation Shakti to a Viksit Bharat: Powering India's Technological Future

AJITKUMAR MOHANTY  
SECRETARY, DEPARTMENT OF ATOMIC ENERGY &  
CHAIRMAN, ATOMIC ENERGY COMMISSION

#### A Defining Moment, A Continuing Mission

National Technology Day marks one of the most defining moments in India's scientific journey. It commemorates, among other technological achievements, the success of Operation Shakti in 1998, a landmark that demonstrated India's technological strength, strategic capability, and the enduring spirit of self-reliance.

For the Department of Atomic Energy (DAE), this day is not merely a remembrance of the past achievement; it is a reaffirmation of a continuing mission to harness advanced science and deep-technology innovations for national development, societal well-being, and strategic strength.



#### Driving India's Clean Energy Future

As India advances towards the vision of Viksit Bharat, technology has emerged as the central driver of transformation. DAE has played a foundational role in this journey, building capabilities across the nuclear fuel-cycle, developing complex reactor technologies, and translating frontier research into scalable national solutions.

As announced by the Hon'ble Prime Minister Shri Narendra Modi ji, nuclear energy will play a pivotal role in India's commitment to achieving Net Zero. Through the Nuclear Energy Mission, DAE is strengthening the foundations of a clean, reliable, and sustainable energy future, delivering low-carbon power to fuel India's growth trajectory.

At the core of DAE's contributions lies India's nuclear power programme, one of the most comprehensive programmes in the world. It is driven by the expanding fleet of 700 MWe Pressurised Heavy Water Reactors (PHWRs), along with the successful first

criticality of the Prototype Fast Breeder Reactor (PFBR), which marks a decisive transition into the second stage of India's nuclear power programme. These achievements reflect decades of sustained indigenous effort and technological mastery.

### **Science for Society: From Lab to Land and Lab to Sky**

The impact of nuclear science extends far beyond electricity generation. In healthcare, DAE's innovations are enabling a new paradigm of affordable and accessible treatment. Technologies such as the Ruthenium-106 Eye Plaque for treatment of ocular cancer and ISOMED 2.0 for large-scale sterilisation of medical products are strengthening India's healthcare ecosystem with indigenous, high-impact solutions. In agriculture, radiation-based technologies are contributing to food security. Mutation breeding continues deliver improved crop varieties with higher yield and enhanced environmental tolerance, while integrated phytosanitary protocol is strengthening food preservation and reducing post-harvest losses. In environmental sustainability, DAE is delivering scalable solutions to pressing challenges. Technologies such as the hybrid granular Sequencing Batch Reactor and ultrafiltration membrane for water treatment and Rapid Composting Technology are enabling resource efficiency, reducing environmental impact, and supporting the transition towards a circular and sustainable economy.

In the domain of advanced engineering, DAE's work in deep-tech materials and high-end manufacturing systems, including laser additive manufacturing and precision-engineered components, is strengthening India's technological capabilities in critical and strategic sectors.

Asia's largest and the world's highest gamma-ray observatory, the Major Atmospheric Cherenkov Experiment (MACE) Observatory in the Dark Sky Reserve of Ladakh, is strengthening India's leadership in frontier astrophysics research.

### **AtmaNirbhar Innovation: Building Technological Sovereignty**

From mastering the nuclear fuel-cycle to developing advanced materials, reactors, and isotopes, India has built capabilities that position it among global leaders in high-technology domains. This technological sovereignty is central to AtmaNirbhar Bharat's strategic autonomy and long-term development.

### **Scientific Synergy for Development**

This day, the National Technology Day 2026, underscores the strength of India's collaborative innovation ecosystem. The "Whole-of-Government" approach brings

together diverse scientific Ministries and institutions, fostering convergence, synergy, and scale in technological development.

As we look ahead, the role of nuclear energy will become even more significant. With the expansion of nuclear capacity, development of next-generation reactor systems, and continued innovation in radiation technologies, nuclear energy will remain a key pillar in India's journey towards a sustainable and knowledge-driven future.

From the historic success of Operation Shakti to the dynamic momentum of today's Nuclear Energy Mission, India's technological journey reflects confidence, capability, and commitment.

***Technology is not merely an instrument of progress; it is the power that shapes the nation. Towards Net Zero. Towards technological self-reliance. Towards a Viksit Bharat.***

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डॉ. एम. एल. जाट

सचिव (डेयर) एवं महानिदेशक (भाकृअनुप)

**Dr. M. L. Jat**

SECRETARY (DARE) & DIRECTOR GENERAL (ICAR)

भारत सरकार  
कृषि अनुसंधान और शिक्षा विभाग एवं  
भारतीय कृषि अनुसंधान परिषद,  
कृषि एवं किसान कल्याण मंत्रालय, कृषि भवन, नई दिल्ली 110 001  
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DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION (DARE)  
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INDIAN COUNCIL OF AGRICULTURAL RESEARCH (ICAR)  
MINISTRY OF AGRICULTURE & FARMERS WELFARE  
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### MESSAGE

National Technology Day is a proud occasion to celebrate India's scientific achievements and to reaffirm our commitment to using science and technology for inclusive, sustainable and self-realizing development. It is also moment to recognize the vital role of agricultural research and innovation in strengthening the nation's food, nutrition, livelihood and environmental security.

The Indian Council of Agricultural Research (ICAR) along with its institutes, universities and partner organizations, has made significant contributions to agricultural transformation in India. From high-yielding, climate-resilient, and biofortified crop varieties to innovative natural resource management and engineering solutions, ICAR technologies are helping farmers address climate change, resource degradation, nutritional insecurity, and rising production costs.

Our work in post-harvest management and food processing promotes value addition, reduces losses, improves self-life and creates new opportunities for agri-based enterprises. Innovations in livestock, dairy, poultry and fisheries, including animal health, nutrition, diagnostics, and production systems, are strengthening rural livelihoods and agricultural economy.

Today, Indian agricultural research is also advancing in biotechnology, precision agriculture, digital agriculture, artificial intelligence, drones, climate-smart farming and smart mechanization. Equally important is the transfer of technology. Through ICAR's education, research and extension network, scientific knowledge is reaching farmers, students, entrepreneurs, start-ups, and industry partners. This lab-to-land connection is the strength of India's agrifood systems innovation.

As we move forward towards *Atmanirbhar and Viksit Bharat*, agrifood systems innovation will be vital in building a productive, profitable, sustainable, and globally competitive agrifood system sector.

On this National Technology Day- 'विज्ञान-Tech', let us renew our resolve to harness science and technology for the prosperity of our farmers, the resilience of our agriculture, and the sustainable development of our nation.

(M. L. Jat)

Dated the 07<sup>th</sup> May, 2026  
New Delhi





डॉ. राजीव बहल, एमडी, पीएचडी.  
DR. RAJIV BAHL MD, PhD



**icmr**  
INDIAN COUNCIL OF  
MEDICAL RESEARCH  
Starting 1912 Medical Research 1912

सचिव, भारत सरकार  
स्वास्थ्य अनुसंधान विभाग  
स्वास्थ्य एवं परिवार कल्याण मंत्रालय एवं  
महानिदेशक  
भारतीय आयुर्विज्ञान अनुसंधान परिषद  
**Secretary, Government of India**  
Department of Health Research  
Ministry of Health & Family Welfare  
**Director-General**  
Indian Council of Medical Research

### MESSAGE

Hon'ble Prime Minister Shri Narendra Modi has emphasized the importance of fostering a strong culture of innovation as a cornerstone for achieving the vision of *Viksit Bharat 2047* and advancing *Atmanirbhar Bharat*. In alignment with this vision, and recognizing the critical role of science and technology in strengthening healthcare systems, the Indian Council of Medical Research (ICMR) continues to promote research, innovation, and effective translation of knowledge into impactful public health solutions.

This compendium showcases a diverse portfolio of biomedical technologies developed and supported by ICMR, spanning vaccines, diagnostics, medical devices, and public health interventions. These contributions pertain specifically to innovations originating from ICMR institutes. These innovations reflect India's growing capabilities in indigenous research and its commitment to addressing national health priorities through affordable, accessible, and scalable solutions.

A key strength of ICMR's approach has been the focus on translational research and the effective management of intellectual property to facilitate technology transfer and commercialization. Several technologies featured here have already been deployed within national health programs, while others are in advanced stages of development, addressing critical gaps in disease detection, prevention, and control.

The progress reflected in this compendium underscores the importance of a whole-of-government approach, fostering collaboration between research institutions, industry, and other stakeholders. Such partnerships are essential for accelerating innovation, strengthening domestic manufacturing capabilities, and ensuring that the benefits of scientific advancements reach the last mile.

I am confident that this compendium will serve as a valuable resource for policymakers, industry, researchers, and entrepreneurs, and will further catalyse partnerships aimed at strengthening India's healthcare innovation ecosystem.

*Rajiv Bahl*  
(Dr. Rajiv Bahl)



मनोज जोशी  
सचिव  
**Manoj Joshi**  
Secretary



भारत सरकार  
औषध विभाग  
रसायन और उर्वरक मंत्रालय  
Government of India  
Department of Pharmaceuticals  
Ministry of Chemicals and Fertilizers

### MESSAGE

National Technology Day is a celebration of India's scientific excellence and technological achievements. It is a reaffirmation of our commitment towards building a self-reliant and innovation-driven nation. As we progress towards the vision of Viksit Bharat 2047, the role of science, technology, and innovation becomes ever more critical in shaping a resilient and globally competitive India.

The Department of Pharmaceuticals is actively contributing to this national vision by fostering a robust ecosystem for research, innovation and entrepreneurship in the pharmaceutical and medical technology sectors. The Scheme for Promotion of Research and Innovation in Pharma MedTech Sector (PRIP) is a significant step in this direction, aimed at strengthening industry-academia linkages, promoting high-quality research, and enabling the translation of innovative ideas into commercially viable technologies. Further, to greater impetus to the ecosystem for research and development in the sector, Government has announced the Bio-pharma SHAKTI Mission, in the Union Budget 2026–27 with an outlay of ₹10,000 crore over five years.

The National Institutes of Pharmaceutical Education and Research (NIPERs), as institutions of national importance, are at the forefront of this transformation. Through cutting-edge research in the areas of pharmaceuticals, biologics, and medical devices, as well as building a pool of skilled human resources, NIPERs are contributing meaningfully to India's aspiration of becoming a global leader in pharmaceuticals and MedTech.

On the occasion of National Technology Day 2026, select technologies and innovations emerging from NIPERs is being showcased. These innovations exemplify the spirit of Atmanirbhar Bharat and reflect the potential of India's scientific community to address pressing healthcare challenges and create solutions of global relevance. I encourage all stakeholders to actively participate by identifying and presenting their most impactful technologies, success stories, and translational research outcomes. Such initiatives will not only highlight our achievements but also inspire greater collaboration and innovation in the journey towards Viksit Bharat 2047.

I extend my best wishes to all researchers, scientists, and stakeholders for their continued contributions to strengthening India's pharmaceutical and MedTech ecosystem.

(Manoj Joshi)

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प्रो. अभय करंदीकर  
Prof. Abhay Karandikar



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**Secretary**  
**Government of India**  
Ministry of Science and Technology  
Department of Science and Technology



08<sup>th</sup> May, 2026

### MESSAGE

Technology Development and Innovation are being placed at the core of the national strategy for achieving sustainable growth, economic competitiveness, and self-reliance. Translational research and inclusive innovation are key drivers for Viksit Bharat 2047 by converting laboratory research into market-ready solutions and ensuring technology benefits to all the citizens. National Technology Day is not just about remembering a historical event, but represents India's journey towards becoming a global technology leader. विज्ञान-Tech 2026 is a celebration of India's scientific innovation and technological advancement through a whole-of-Government approach with the participation of 14 scientific ministries/departments showcasing deep-tech innovations across 7 thematic key sectors, representing a unified national effort towards strengthening India's R&D ecosystem, fostering innovation, and advancing technological sovereignty. This compendium comprising of more than 75 homegrown technologies and indigenous innovations, developed by various departments aim to bridge the gap between the laboratory and the market. It serves as a ready reference for industries, startups, and policymakers to identify technologies ready for commercialization and by showcasing these achievements; we aim to foster a culture of translational research that aligns with the goal of Viksit Bharat.

The Department of Science and Technology (DST) has always been the primary catalyst for scientific innovation and technological transformation. Over the time, from fundamental research, the Autonomous Institutions (AI's) of DST has increasingly pivoted towards technology development that addresses critical national needs in healthcare, clean energy, sustainable agriculture, and advanced materials. The compendium also comprises a curated collection of technologies developed by the AI's of DST, indicating India's growing competence in translating high-end research into tangible solutions for societal benefit. I congratulate the Scientists and Researchers of our AI's and those of other departments whose dedication is reflected in these pages. I hope this compendium encourage new partnerships and accelerates the deployment of these "Made in India" technologies for the greater good.

I extend my thanks to the Office of the Principal Scientific Adviser and the Department of Biotechnology for their pivotal role in organizing विज्ञान-Tech 2026.

(Abhay Karandikar)

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अध्यक्ष, अंतरिक्ष आयोग  
व  
सचिव, अंतरिक्ष विभाग  
Chairman, Space Commission  
&  
Secretary, Department of Space

### Message

It is my immense pleasure to convey warm greetings to the National Technology Day celebrations 2026 set to be held at New Delhi on 11<sup>th</sup> May, 2026. National Technology Day is a proud reminder of India's remarkable saga in science and technology, symbolising our capability to innovate, adapt, and lead through indigenisation. Over the decades, our nation has made significant strides in building self-reliant technological ecosystems, driven by the noble vision of *Atmanirbhar Bharat*.



The initiative of bringing out a compendium of indigenous technologies developed by various Science and Technology Departments across the country is really commendable. This compendium is a testament to the collective strength of our scientific institutions and the unwavering commitment of our researchers and engineers. The wide spectrum of technologies presented here reflects not only technical excellence but also a deep alignment with national priorities, ranging from strategic applications to solutions that enhance the quality of life of our citizens.

I am confident that this compendium will serve as an able resource for knowledge dissemination, collaboration, and inspiration for academia, industry, and young innovators.

I congratulate the organisers for this boundless effort and extend my best wishes for the grand success of the National Technology Day celebrations 2026.

06.05.2026

  
(Dr. V. Narayanan)

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एस. कृष्णन, आई.ए.एस.  
सचिव  
S. Krishnan, I.A.S.  
Secretary



इलेक्ट्रॉनिकी और सूचना प्रौद्योगिकी मंत्रालय  
भारत सरकार  
Ministry of Electronics &  
Information Technology (MeitY)  
Government of India

### MESSAGE

I am delighted to learn that the National Technology Day programme 'विज्ञान-Tech' is being organised on **11th May 2026** by the Department of Biotechnology at **BRIC-National Institute of Immunology, New Delhi**.

National Technology Day reminds us that transformative change begins in the laboratory. It is the sustained commitment of our researchers, scientists, and academics working across disciplines and institutions that has propelled India from a technology dependent nation to an emerging global force in deep-tech research and indigenous innovation. The convergence of participating Ministries and Departments on a single platform is itself a powerful statement: that research and development are no longer siloed functions but a unified national imperative.

MeitY's flagship initiatives UPI, Bhashini, National Supercomputing Mission, IndiaAI Mission, India Semiconductor Mission, and Digital India are transforming India's R&D landscape in significant ways. These missions are generating focused demand that are directly shaping the research agenda of national laboratories, academic institutions, and R&D-active industries positioning India firmly as a creator and exporter of transformative technologies, not merely a consumer. MeitY's R&D efforts across semiconductor materials and design, electronics system design, medical electronics, nanotechnology, AI, and next-generation communication is ensuring that investment in research yields products and solutions of direct national relevance.

The programme 'विज्ञान-Tech' provides precisely the kind of platform that our innovation ecosystem needs, where, researchers can validate ideas against real-world challenges, where start-ups can engage with institutional knowledge holders, and students can propel their careers at the intersection of fundamental science and applied technology.

I am confident that this event will catalyse new research partnerships, spark collaborative proposals, and reinforce India's resolve to become a leading contributor to the global knowledge economy. I convey my warmest regards and best wishes to the organisers, researchers, innovators, start-ups, and students participating in this landmark celebration.

  
(S. Krishnan)

Place: New Delhi  
Date: 7th May, 2026







डॉ. एम. रविचंद्रन  
Dr. M. Ravichandran

सचिव  
भारत सरकार  
पृथ्वी विज्ञान मंत्रालय  
पृथ्वी भवन, लोदी रोड, नई दिल्ली-110003

SECRETARY  
GOVERNMENT OF INDIA  
MINISTRY OF EARTH SCIENCES  
PRITHVI BHAWAN, LODHI ROAD, NEW DELHI-110003



### MESSAGE

Namaskar! Greetings from the Ministry of Earth Sciences.

As we are all aware, technology is a crucial driver and essential ingredient for national development. As India envisions a "Vikshit Bharat" by 2047, strengthening the R&D ecosystem is vital, and we must foster more innovation to propel India's growth journey. Innovation and technological advancement are fundamental to the country's progress.

On National Technological Day 2026, 14 science ministries and departments will come together to celebrate the contributions of India's national research ecosystem through a whole-of-government approach. The initiative, "Vigyan Tech," is a pioneering national initiative that will spotlight the transformative contributions of premier R&D labs across the country and showcase their technological capabilities in various fields. These institutions serve not only as centers of knowledge creation and capacity building but also as critical enablers of innovation translation.

The Ministry of Earth Sciences is committed to participating in efforts to showcase various innovative technologies developed for ocean exploration and atmospheric observations. As we strive to enhance India's blue economy, the need for advanced technologies for ocean observation and exploration has become increasingly urgent. It is essential to develop sustainable methods and technologies to harness both living and non-living resources from our oceans. Also, under the scenarios of climate change, weather patterns are changing significantly both spatially and temporally. To respond effectively, we require innovative technologies that enhance our ability to observe these changes and deepen our understanding of their impacts. Improved observational technology will facilitate more accurate weather forecasting across various time scales, helping us better prepare for and adapt to these shifts.

Technologies that are currently being demonstrated at Vigyan Tech highlight the exciting advancements in this field, with even more innovations on the horizon. We invite you to visit the expo to learn more about these developments and to contribute to the advancement of earth system science, particularly in the realm of ocean and atmospheric studies.

  
(M. Ravichandran)



अविनाश जोशी, भा.प्र.से.  
Avinash Joshi, IAS



### Message

सचिव  
भारत सरकार  
खाद्य प्रसंस्करण उद्योग मंत्रालय  
**Secretary**  
Government of India  
Ministry of Food Processing Industries

On the occasion of National Technology Day, we celebrate India's enduring spirit of innovation and reaffirm our collective commitment to technology-led, inclusive, and sustainable growth across sectors. The food processing sector, as a critical pillar of the economy, is increasingly leveraging advanced technologies—from artificial intelligence, IoT-enabled traceability, and precision processing to sustainable packaging, renewable energy integration, and biotechnology—to enhance efficiency, quality, and global competitiveness.

The Ministry of Food Processing Industries takes pride in the pivotal role played by the National Institute of Food Technology Entrepreneurship and Management (NIFTEM) at Kundli and Thanjavur. These premier institutions are at the forefront of bridging science, sustainability and entrepreneurship, while supporting national priorities of value addition, food safety, and nutrition security.

Both the NIFTEMs have developed several cutting-edge technologies and successfully transferred to industry demonstrating a robust lab-to-market ecosystem. These innovations are contributing significantly to reducing post harvest losses, strengthening agri-food value chains and enabling the development of nutritious, affordable and market-ready food products. These collaborations also highlight how innovation is empowering startups, promoting clean energy solutions and addressing evolving consumer demand for healthier food options.

Equally commendable is the role of both NIFTEMs in nurturing grassroots innovation and entrepreneurship, including women-led enterprises, through initiatives such as village adoption and capacity-building programmes. These efforts ensure that technology dissemination is inclusive and reaches the last mile.

As we move forward, the Ministry remains committed to fostering a dynamic innovation ecosystem by strengthening industry-academia partnerships, promoting emerging technologies and supporting startups and MSMEs. Together, we aim to build a resilient, future-ready, and Atmanirbhar food processing sector.

On this National Technology Day, we salute the contributions of our scientists, technologists, entrepreneurs and institutions who continue to transform ideas into impactful solutions for the nation.

*Avinash Joshi*  
(Avinash Joshi)



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## **Disclaimer**

*This document compiles technologies shared by various Ministries and institutions. Each technology description reflects information provided by the originating agency. The compendium does not independently validate these technologies. Readers should contact the respective Ministry or institution for the latest specifications, operational guidelines, or licensing details.*

The background features a light blue gradient with several large, semi-transparent blue circles of varying sizes. A pattern of small, light blue dots is scattered across the lower half of the image, becoming denser towards the bottom right. Two small white plus signs are positioned above and below the main text.

***BIOINDUSTRIAL & GREEN  
CHEMICALS***

Thematic Area: **Bio-industrial and green chemicals**

Category: **Biocatalysis**

# Enzyme Overexpression for Optimized Lignocellulosic Degradation

## Overview

Our patented engineered fungal enzyme technology delivers high-efficiency cellulase production for sustainable biomass conversion. Successfully scaled up to 15,000 L and validated by a 2G ethanol producer, the technology offers robust industrial performance with enzyme production costs below ₹350/kg, enabling cost-effective biofuel, bioprocessing, and green industrial applications.



## Functionalities



**Biofuels and Environment – Driving Green process for a sustainable future**



**Pulp and Paper – Involve processing, reduced environmental impact**



**Laundry and cleaning – stain removal, fabric care with sustainability.**

## Key Features

- Novel Recombinant indigenous fungal strain
- Low-cost advantage
- Potent Blend of major cellulases produced in a single-step fermentation

## Implementation Overview

Deployed	TRL	Training Requirement
No	6/7	15 Days

## Contact Details

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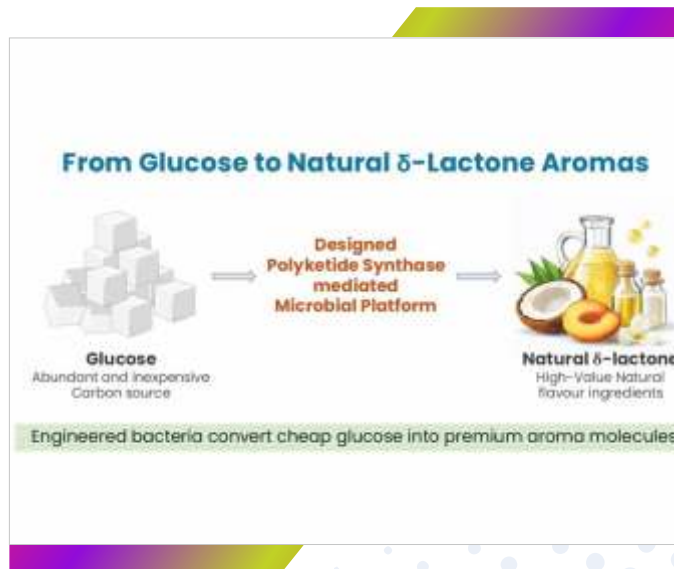
Thematic Area: **Bioindustrial and Green Chemicals**

Category: **Bio-based Chemicals**

# From Sugar to Natural Fragrances: A Scalable, Low-Cost Biotech Platform for Sustainable Aroma Production

## Overview

A first-in-class biomanufacturing platform uses engineered polyketide synthase (PKS) enzymes in microbial systems to convert low-cost glucose directly into natural  $\delta$ -lactone aroma compounds. This approach bypasses expensive fatty acid feedstocks and hazardous chemical synthesis, enabling scalable, cost-efficient, and sustainable production. Technology ensures consistent supply of high-value aroma ingredients, helping the flavor and fragrance industry meet rising global demand for natural, bio-based products at Lower costs.



## Functionalities



Engineers polyketide synthase enzymes to enable targeted biosynthesis of  $\delta$ -lactone aroma compounds



Converts low-cost glucose directly into high-value aroma molecules via microbial fermentation



Eliminates need for fatty acid feeding thereby reducing raw material cost

## Key Features

- **Cost Disruption:** Significantly lowers raw material and processing costs methods
- **Platform Versatility:** Engineered PKS system adaptable to multiple aroma molecules
- **Scalable & Industry-Ready:** Compatible with existing fermentation infrastructure for rapid commercialization
- **Sustainable Manufacturing:** Reduced carbon footprint and minimal chemical waste generation

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	15

## Contact Details

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Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Biofuels**

# Agricultural Wastes into Fuel Blending Compound

## Overview

India generates a large quantity of agricultural residues (including rice straw), which are often mishandled through stubble burning in the field, causing environmental pollution and harm to human health. Through this technology cellulosic component of this biomass is being converted into a fuel additive compound, like levulinic acid ethyl ester (ethyl levulinate), via one-step chemical catalysis. This bio-based chemical is suitable to blend with diesel fuel to reduce dependence on fossil reserves and mitigate open-field burning issues.



## Functionalities



**Reduces the dependence on fossil fuels in automobile sector**



**Consumes the abundantly available agriculture wastes into fuel chemicals**



**Potential to reduce the stubble issues to mitigate the environmental issues**



**Sustainable fuel compound to offer a net-zero carbon effect.**

## Key Features

- **Scalable:** One-pot chemical digestion is scalable to produce tons of biofuel per day.
- **Sustainable:** Agri-waste conversion offers a sustainable fuel supply.
- **Net zero impact:** Bio-derived fuel establishes net zero carbon emissions.

## Implementation Overview

**Deployed**

No

**TRL**

6

**Training Requirement**

5 Days

## Contact Details

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Thematic Area: **Bio-industrial & Green Chemicals**

Category: **Food additives**

# Low Calorie Sweetener Xylitol Production

## Overview

The present approach uses an integrated bioprocess that includes pretreatment, fermentation by *M. caribbica* CP02, and crystallization to turn rice straw into high-value xylitol, a sweetener. The annual market sale of xylitol is anticipated to reach \$1.37 billion by 2026. It offers a sustainable alternative to chemical synthesis by using agriculture residues, reducing pollution, and enabling cost-effective xylitol production.



## Functionalities



**Biovalorization of rice straw into xylose-rich hydrolysate via optimized pretreatment.**



**Facilitates sterile fermentation run owing to self-isolated acidophilic (pH 3.5) and inhibitor tolerant yeast.**



**Insoluble BaSO<sub>4</sub> produced during pH adjustment has direct commercial value.**



**Recovers high-purity xylitol through easy crystallization step.**

## Key Features

- High xylose yield with minimal sugar loss
- Ultrasound-assisted crystallization enhances recovery efficiency
- Bioprocess can be implemented to valorize other agriculture residues as well

## Implementation Overview

Deployed	TRL	Training Requirement
No	5-6	10

## Contact Details

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Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Waste-to-Wealth**

# Green Plasticizers for Eco-Friendly Toy Products from Post-Consumer Polyethylene Terephthalate (PET) Plastic Waste

## Overview

The developed process non-recyclable PET waste into a high-value, non-phthalate plasticizer (DiocylTerephthalate, DOTP) used in flexible PVC applications. The technology is based on a process-intensified depolymerization–transesterification route employing a cost-effective proprietary catalyst to directly transform PET waste into DOTP with high selectivity and reduced reaction time (~6 h). The process has been scaled from laboratory scale to a 50 L pilot reactor (TRL-6) with >80% yield and incorporates side-stream recovery (e.g., ethylene glycol) to enable near-zero-waste operation. A technology package and basic design report for a 6000 MTPA commercial plant has also been developed, demonstrating strong industrial and economic viability.



## Functionalities



This technology enables the sustainable production of DOTP, a non-phthalate plasticizer used in PVC applications (Toys, Wire and cable insulation, flooring, automotive interiors, and synthetic leather)



It serves as a direct replacement for conventional plasticizers like DOP, DINP, and DPHP, offering comparable or improved performance while meeting stringent environmental regulations.

## Key Features

- One-pot catalytic depolymerization–transesterification process enabling direct conversion of waste PET into green plasticizer (DOTP) with high efficiency.
- Waste-to-Wealth (WoW) technology, transforming non-recyclable plastic waste into high-value industrial chemicals.
- Indigenous and scalable depolymerization technology developed for efficient chemical recycling of waste plastics.
- IP-protected sustainable process with strong potential for industrial deployment and commercialization.
- Closed-loop recovery of solvent and catalyst, improving process efficiency and reducing operational cost.

## Implementation Overview

### Deployed

Deployed: Pilot-scale demonstration of the technology has been successfully completed at the 50 L reactor scale at the CSIR-IICT facility, validating process feasibility and scalability. The process has been successfully validated at pilot scale (50 L) and a Basic Design Report (BDR) for a 6000 MTPA commercial plant has been prepared, indicating readiness for industrial scale-up. The technology utilizes abundantly available post-consumer PET waste as feedstock, ensuring raw material availability and cost advantage. In addition, the scalable process design, high product yield, closed-loop solvent recovery, and techno-economic feasibility make it highly attractive for large-scale industrial adoption and commercialization by plasticizer manufacturers and chemical industries.

TRL 6-7

Training Requirement 15-30 days

## Contact Details

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Thematic Area: **Bioindustrial and Green Chemicals**

Category: **CO<sub>2</sub> capture, utilization, and storage (CCUS) (Clean Energy and Climate Change)**

# Turning CO<sub>2</sub> and Water into Clean Fuel and Green Cement Using Magnesium: A Solution for Net Zero

## Overview

This technology enables the direct conversion of CO<sub>2</sub> and water into green hydrogen and green cement using magnesium or magnesium scrap under ambient conditions without external energy input. Successfully scaled from lab to pilot (TRL-6), it offers a cost-effective, carbon-negative solution for clean energy and sustainable construction. The approach benefits industries by reducing emissions, utilizing waste materials, and producing valuable fuels and products, supporting India's transition toward a circular and low-carbon economy.



## Functionalities

- Converts CO<sub>2</sub> and water into green hydrogen and valuable carbonates at ambient conditions
- Utilizes magnesium scrap as a low-cost, abundant, and sustainable reactive material
- Produces green cement and antacid-grade magnesium carbonates as value-added products
- Operates without external energy input (no heat, electricity, or light required)
- Scalable from laboratory to pilot-scale reactor systems (TRL-6 20 litre reactor-demonstrated)
- Enables carbon-negative processing by capturing and converting atmospheric or industrial CO<sub>2</sub>
- Compatible with industrial flue gas integration for real-world deployment scenarios

## Key Features

- Converts CO<sub>2</sub> and water into fuel and useful materials
- Works at room temperature and atmospheric pressure conditions
- Requires no external energy input or complex infrastructure
- Uses low-cost, abundant magnesium including industrial scrap
- Produces green hydrogen with high yield and efficiency
- Generates valuable green cement and antacid-grade carbonates
- Demonstrated scalability from lab to 20 Lit pilot plant systems
- Enables carbon-negative process reducing industrial CO<sub>2</sub> emissions

## Implementation Overview

### Deployed

Pilot-scale demonstrated (20 L reactor; 1 unit)

### TRL

6 (Prototype demonstration at mini-pilot scale)

### Training Requirement

2-4 weeks days for basic reactor operation and process handling

## Contact Details

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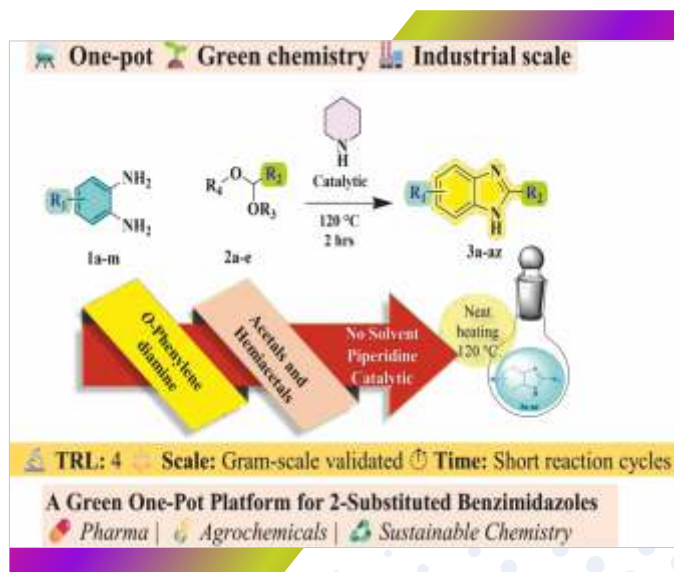
Thematic Area: **Bio-industrial and green chemicals**

Category: **Agrochemicals, APIs**

# A One-Pot Process for Preparation of 2-Substituted-1H-Benzo[d] Imidazole Derivatives

## Overview

A sustainable one-pot process for synthesizing 2-substituted benzimidazole derivatives using catalytic piperidine under mild conditions. The method offers high yields, reduced waste, and broad substrate scope. It enables cost-effective, scalable production of key pharmaceutical intermediates (e.g., clotrimazole) and agrochemical compounds, including CF<sub>3</sub>-functionalized derivatives, supporting green chemistry principles and industrial technology transfer. The methodology can be utilized to develop Agrochemicals, key starting materials to API, NCE development.



## Functionalities

- Development of an operationally simple, sustainable, and scalable one-pot condensation-cyclization protocol for rapid synthesis of benzimidazole scaffolds, including APIs/intermediates such as 2-Methylbenzimidazole (CAS: 615-15-6) and 2-Methyl-4-chlorobenzimidazole (CAS: 2818-69-1).
- Establishment of a broad substrate platform enabling efficient incorporation of CF<sub>3</sub> and other functional substitutions for synthesis of high-value derivatives such as 2-(Trifluoromethyl)-1H-benzo[d]imidazole (TFB) (CAS: 312-73-2), relevant for agrochemical applications.
- High-yield and process-efficient synthesis of structurally diverse benzimidazole derivatives, including 2-Phenylbenzimidazole (CAS: 716-79-0), with potential applications in pharmaceutical and specialty chemical sectors.
- Development of an industry-compatible and commercially scalable process for production of key starting materials (KSMs) and intermediates, including KSM for Chlormidazole drug synthesis (CAS: 3689-76-7), supporting pharmaceutical and agrochemical manufacturing.

## Key Features

- Green, eco-friendly process with minimal waste generation
- Mild conditions with low catalyst loading and high efficiency
- Broad substrate scope enabling versatile industrial applications

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	4

## Contact Details

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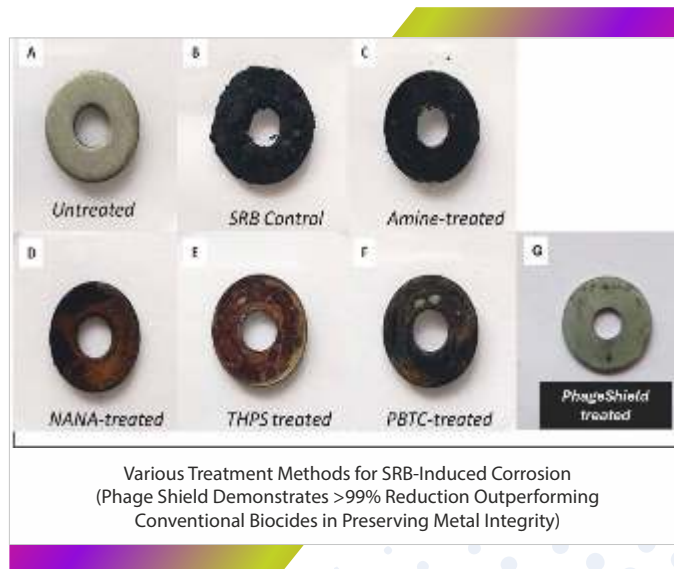
Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Oil & Gas Infrastructure and Industrial Corrosion Control Systems**

# “Phage Shield” – An eco-friendly biocidal solution for controlling corrosion-causing sulfate-reducing bacteria

## Overview

Phage Shield is an eco-friendly biocidal formulation designed to control sulfate-reducing bacteria responsible for corrosion in oil pipelines and industrial systems. By combining bacteriophages with enhanced biocidal action, it reduces infrastructure damage, lowers maintenance costs, and minimizes the use of hazardous chemical biocides. The technology supports safer, sustainable, and efficient industrial operations across oil, gas, and wastewater sectors.



## Functionalities



**Targets and eliminates sulfate-reducing bacteria in industrial systems**



**Reduces microbial-induced corrosion in pipelines and equipment**



**Enhances efficiency of wastewater and oil processing systems**

## Key Features

- Eco-friendly alternative to chemical biocides
- Phage-based targeted action against sulfate-reducing bacteria
- Reduces maintenance cost and enhances infrastructure lifespan

## Implementation Overview

Deployed	TRL	Training Requirement
No	7	7 days

## Contact Details

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Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Bioenergy / Waste-to-Energy / Renewable Fuels (Compressed Bio-Gas)**

# ARI Process for Enhanced Anaerobic Digestion and Biogas Generation from Rice Straw

## Overview

A novel anaerobic-fungi-based process that converts rice straw into biogas without thermochemical pretreatment. The technology produces a bio-complex of live anaerobic fungi, lignocellulolytic enzymes and pre-treated lignocellulose that can be added to existing biogas digesters to enhance methane yields from >450 to 550–570 L/kg VS. It addresses rice-straw burning, supports the SATAT/CBG mission, and creates additional revenue for biogas plants and farming communities across India.



Figure: Laboratory scale anaerobic reactor - 45 litre capacity

## Functionalities

- Converts rice straw and other lignocellulosic agricultural residues into high-yield biogas without thermochemical pretreatment
- Enhances methane yields in existing biogas digesters from > 450 to 550–570 L/kg VS at > 10% solid loading
- Produces a sellable bio-complex containing live anaerobic fungi, lignocellulolytic enzymes and pre-treated lignocellulose
- Enables continuous large-scale anaerobic fungal cultivation using a four-tank configuration without contamination

## Key Features

- No thermochemical pretreatment – cuts energy and chemical costs
- Bio-complex addable to existing digesters – no plant retrofit
- Continuous, contamination-free anaerobic fungal cultivation at industrial scale
- Digestate reusable as nutrient-rich biofertilizer for farming communities

## Implementation Overview

### Deployed

No, pilot demonstrations completed; licensed.

### TRL

6

### Training Requirement

30 days

## Contact Details

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Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Health Care (Fish)**

# CIFRI ARGCURE® - an effective formulation for control of ectoparasites in finfish

## Overview

CIFRI ARGCURE® reduces the infection of ectoparasites in finfish. The polymeric micelles loaded with antiparasitic bioactive molecules easily reach the target sites, affecting the biological function of the parasites. Advantages of this product are low dose requirement, environmentally safer and highly effective against the ectoparasites.



CIFRI ARGCURE is a registered trademark with trademark no. 4614213, under class 5, and patent filed with application no. 202031042037.

## Functionalities



Antiparasitic formulation utilizing EPA grade specialty polymers as carriers



Effective against a wide range of ectoparasites, including Argulus sp.



Spontaneously forms a stable emulsion (micelle size 100-300 nm) after application to targeted water bodies



Reduced dosage of application (40 mL/acre meter depth) and improved environmental safety (no petroleum solvent)

## Key Features

- Environmental safety-No petroleum solvents are used and applied at low doses
- Efficacy- Effective control (>80%) of Argulus infection in fin fish

## Implementation Overview

### Deployed

3 Eastern States (West Bengal, Odisha and Bihar) of India

### TRL

9

### Training Requirement

3 days

## Contact Details

### The Director

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Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Soil Science**

# Zinc Loaded Bentonite Polymer Based Controlled Release Formulations for Perpetual Zinc Supply

## Overview

Usually, Zn are applied to soil through  $ZnSO_4$  in the farmers' field to alleviate the deficiency of Zn in crops. The use efficiency of Zn applied through conventional source is about less than 2%. Therefore, Zn loaded bentonite polymer-based formulations were synthesized in order to develop slow-release fertilizers with the ultimate objective of enhancing use efficiency of applied Zn for alleviating its deficiency in crop as well as increasing productivity.



## Functionalities



Zinc supplied through Zn-NCPC at  $1 \text{ kg Zn ha}^{-1}$  is equally effective as that of  $ZnSO_4$  applied at  $5 \text{ kg Zn ha}^{-1}$ .



In heavy-textured and problematic soils, Zn-NCPC is more economical and outperforms  $ZnSO_4$  fertilizer.



Seed coating of Zn-NCPC shows greater Zn use efficiency ( $\sim 13\%$ ) compared to soil application of  $ZnSO_4$ .

## Key Features

- Novel slow-release zinc fertilizer for soil application
- Seed coating can be done in wheat, maize and chickpea
- Zinc use efficiency can be increased up to 10%

## Implementation Overview

### Deployed

yes -Five (5) days

### TRL

7 (Field validation completed)

### Training Requirement

NA

## Contact Details

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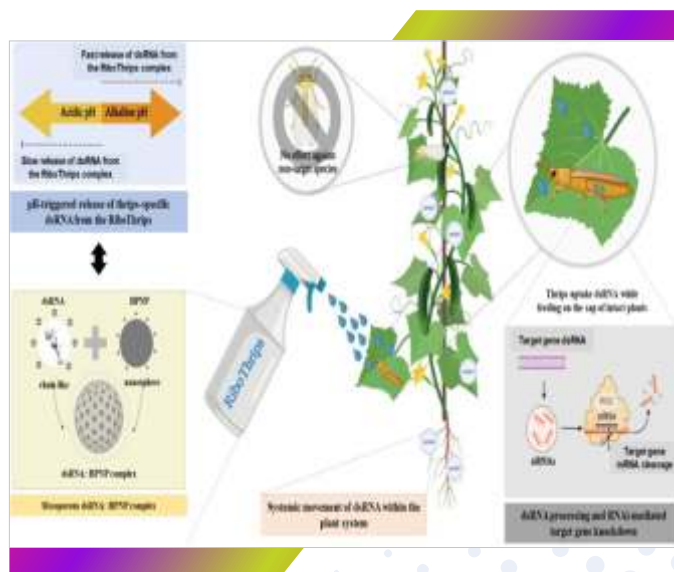
Thematic Area: **Bioindustrial & Green Chemicals**

Category: **dsRNA bioformulation**

# RiboThrips: Sprayable biopolymeric nano-conjugated double-stranded RNA formulation for in-planta systemic protection against thrips

## Overview

A sprayable biopolymeric nano-conjugated dsRNA formulation (RiboThrips) offers a sustainable solution for thrips management. This innovative bioformulation uses biodegradable polymeric nanoparticles (BPNPs) to deliver thrips-specific dsRNA, leading to pest suppression. The formulation provides enhanced environmental stability, controlled release, and over 28 days of persistency with increased cellular penetration and systemic plant translocation of dsRNA. It is highly species-specific, safe to non-target organisms, and matches the efficacy to chemical insecticide. With long shelf-life (>1 year) and scalability, it favors regenerative agriculture & supports farmers livelihood.



## Functionalities



**Sprayable dsRNA bioformulation enables targeted gene silencing for effective thrips control in legumes, vegetables and ornamental crops.**



**Provides sustained protection against thrips via slow-release, systemic movement, and plant-mediated delivery.**



**Eco-friendly alternative to insecticides, ensuring safety to non-target organisms and the environment.**



**Scalable and customizable for other insect pests, diseases and nematodes.**

## Key Features

- Enhanced environmental stability ensures prolonged efficacy and systemic dsRNA delivery.
- Slow, pH-responsive dsRNA release enables sustained protection and reduced applications.
- Improved foliar stability protects dsRNA from environmental degradation over time.
- Enhanced cellular uptake enables systemic movement and efficient plant-to-insect transfer.
- Stable across wide temperature, pH, and nuclease exposure conditions.
- Species-specific action ensures safety to pollinators, beneficials, and humans.

## Implementation Overview

### Deployed

Transferred to ATGC Biotech Pvt Ltd, Hyderabad on non-exclusive basis for commercial level production and field deployment.

### TRL

9

### Training Requirement

NIL

## Contact Details

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Advanced Centre for Plant Virology, Division of

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ICAR-Indian Agricultural Research Institute (IARI),

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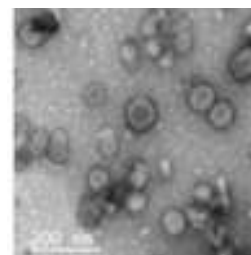
Email: amal4ento@gmail.com,

Mobile Number: +91-9873077353

Thematic Area: **Bioindustrial & Green Chemicals**

Category: **Sustainable pest management**

# Nanoemulsion composition for pest management



## Overview

The housefly, *Musca domestica*, and mosquito *Aedes aegypti* are major disease vectors affecting humans and livestock, spreading pathogens and causing economic losses. Overuse of synthetic insecticides has led to resistance and environmental risks. Plant-derived essential oils, especially from *Trachyspermum ammi*, show promise as safer alternatives. Nanoemulsion formulations enhance their stability and efficacy, offering an eco-friendly, cost-effective strategy for controlling these pests. It can be used in households, poultry / animal sheds or solid waste management yards



## Functionalities



Nanoemulsion formulation stability is better than conventional EC formulation



Nanodroplets have better coverage on target area than bulk emulsion



Reduces exposure to pesticides in household, poultry and animal sheds

## Key Features

- Plant derived parts nanoemulsion are safer to use in target area
- Nanosize droplets avoids coagulation hence better coverage in target area

## Implementation Overview

Deployed	TRL	Training Requirement
One	8	4 days

## Contact Details

**Dr. Kesavan Subaharan**  
Principal Scientist & Head  
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Thematic Area: **Biopharma and Health Technologies**

Category: **Public Health biolarvicide**

# Biolarvicide for Mosquito Control (Bti technology)

## Overview

The mosquito biolarvicide is based on a bacterium, *Bacillus thuringiensis* var. *israelensis* (VCRC B17; MTCC 5596). The uniqueness of this bacterium is that it kills only larvae of mosquitoes transmitting diseases like Malaria, Filariasis, Japanese encephalitis, Dengue, Chikungunya and Zika and no other insects. The mosquito toxin acts like stomach poison and makes the larvae die within 10-30 min. upon ingestion. This biolarvicide is eco-friendly as it is safe to aquatic insects, honeybees, birds and mammals.



The commercialized Biolarvicide is available in the market  
(Product link at Amazon: <https://www.amzn.in/d/OfZ6irly>)

## Functionalities



This biolarvicide is highly effective against larvae of *Culex*, *Anopheles* and *Aedes* mosquitoes.



It can be produced in a cost effective and environmentally friendly manner using locally available agriculture based raw materials.



exhibits extreme safety to associated aquatic non-target organisms, agriculturally important insects and mammals.

## Key Features

- Technology is based on an indigenous bacterium suitable for the Indian climatic conditions
- Easy to apply on breeding habitats and can control larvae for up to 2 weeks with a single application
- The strain used in the technology is recognized by the CIB&RC as an Indian standard for Bti and named as 'Indian Standard' [ISBTI2021 (ICMR-VCRC)]

## Implementation Overview

Deployed	TRL	Training Requirement
Yes. Licensed to 21 commercial firms	8 - 9	10 days

## Contact Details

**Dr. I. Geetha**  
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ICMR-National Institute for Vector Control  
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Email: [geethaglory@gmail.com](mailto:geethaglory@gmail.com);  
[directorvcrc@gmail.com](mailto:directorvcrc@gmail.com)

M/s. Amit Biotech Pvt. Ltd., West Bengal, supplies the Bti Product to NVBDCP, Directorate of Health Services, Port Blair, South Andaman, Andaman and Nicobar UT

The background features a light blue gradient with several large, semi-transparent blue circles of varying sizes. A pattern of small, light blue dots is scattered across the lower right portion of the image. Two small white plus signs are positioned above and below the main text.

***BIOPHARMA & HEALTH  
TECHNOLOGIES***

Thematic Area: **Biopharma and Health Technologies**

Category: **Personal Protective Equipment**





# “Kisan Kavach®” An anti-pesticide protective suit for farmers

## Overview

Kisan Kavach® is a protective suit developed to safeguard farmers from pesticide exposure during spraying operations. Made from a specialized anti-pesticide fabric, it neutralizes harmful chemicals upon contact while remaining breathable, washable and reusable. Designed for comfort and ease of use, it requires no special training and ensures farmers' safety. Kisan Kavach® technology will have an impact by reducing the pesticide-toxicity associated healthcare burden.



## Functionalities

-  Protects farmers from toxic pesticide exposure through skin and inhalation
-  Deactivates a wide range of pesticides and insecticides upon contact
-  Provides breathable, comfortable, washable, and reusable protective wear
-  Reduces pesticide-induced toxicity and health risks for agriculture workers

## Key Features

- **Protective** - Prevents direct contact with toxic forms of pesticides
- **User-Friendly** – Worn like regular clothing without special training
- **Support** –post-commercialization 24x7 guidance provided by Sepio Health Pvt. Ltd.

## Implementation Overview

Deployed	TRL	Training Requirement
> 1000	9	1 hour

## Contact Details

BRIC-Institute for Stem Cell Science and Regenerative Medicine (inStem) & Sepio Health Pvt Ltd (info@sepio-health.com)  
UAS-GKVK Post, Bellary Road, Bengaluru 560065  
www.sepio-health.com

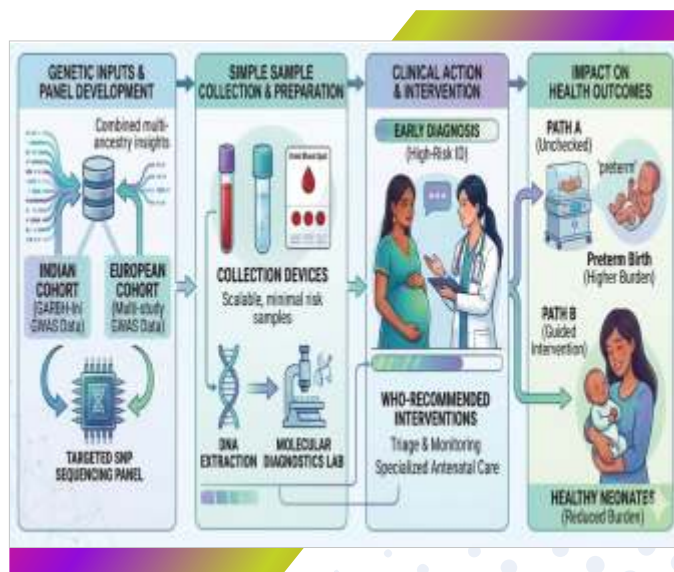
Thematic Area: **Biopharma and Health Technologies**

Category: **Health Risk Assessment**

# SNP Panel for Predicting Genetic Risk of Preterm Delivery

## Overview

A sequencing panel comprising of selected common genomic variants which can predict risk of preterm delivery in women has been developed. The Single Nucleotide Polymorphism (SNP) panel can be sequenced using genomic DNA from blood, dried blood spots or saliva. This panel can be used in antenatal clinics to triage women at high genetic risk of preterm birth, to provide personalized antenatal medical care, neonatal care and post-natal follow up further reducing neonatal and post-natal mortality and complications



## Functionalities



Easy to use in clinics



Can use DNA from biospecimens like blood, saliva or dried blood



Triaging of women at risk will reduce risk of preterm deliveries

## Key Features

- Inexpensive sample collection, transport and sequencing
- Potential to be a point of care in gynaecological consults
- Supporting reduction of neonatal health care burden globally

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	3	NA

## Contact Details

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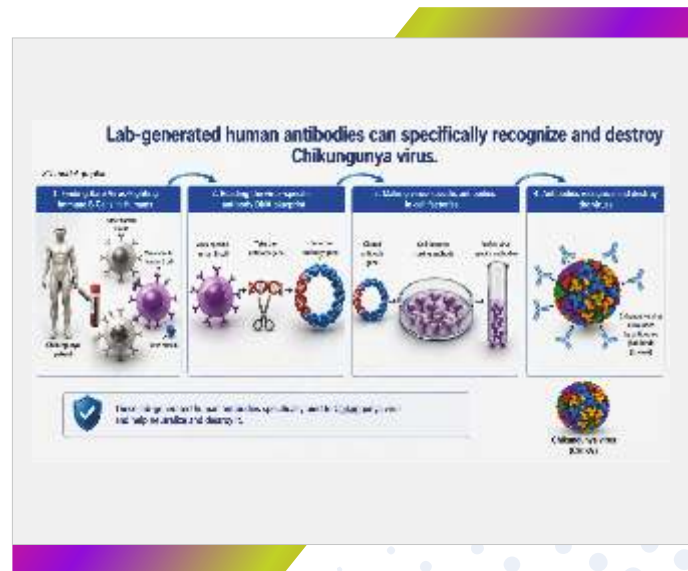
e-mail: am1@nibmg.ac.in

Thematic Area: **Biopharma and Health Technologies**  
Category: **Therapeutics**

# Monoclonal Antibodies Against Chikungunya Virus

## Overview

A rapid, high-throughput antibody discovery platform based on antigen-specific single B-cell sorting technology has been developed. Human monoclonal antibodies against chikungunya virus have been successfully identified. The platform combines human antibody discovery, antibody gene recovery, recombinant antibody production and functional validation for viral neutralization. Such platforms are critical for providing solutions to the continuing burden of viral diseases in India and other endemic regions.



## Functionalities



Platform supports therapeutic antibody discovery and characterization against any antigen



Rapid identification of dengue-specific human monoclonal antibodies



High-throughput platform accelerates antibody discovery timelines



Human-derived antibodies minimize immunogenicity and improve safety

## Key Features

- Fully human antibodies identified from chikungunya patient and exposed individual
- Ultrapotent neutralization of chikungunya virus
- Preclinical efficacy shown in mouse footpad swelling model

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	4-5	5-6 days

## Contact Details

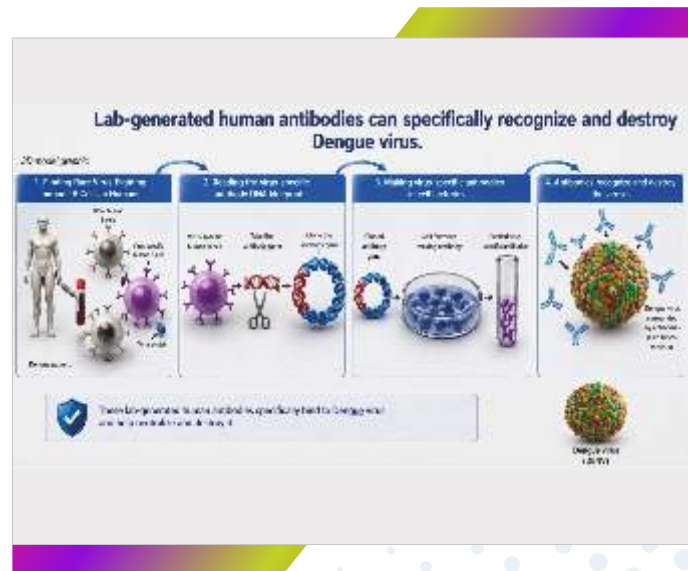
**Dr. Anmol Chandele and Dr. Sanjeev Kumar**  
Group Leaders  
ICGEB-Emory Vaccine Program, International  
Centre for Genetic Engineering and  
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Email: anmol@icgeb.res.in; sanjeev@icgeb.res.in

Thematic Area: **Biopharma and Health Technologies**  
Category: **Therapeutics**

# Broadly Neutralizing Human Monoclonal Antibodies to Dengue Virus

## Overview

A rapid, high-throughput antibody discovery platform based on antigen-specific single B-cell sorting technology has been developed. Human monoclonal antibodies against dengue virus have been successfully identified. The platform combines human antibody discovery, antibody gene recovery, recombinant antibody production and functional validation for viral neutralization. Such platforms are critical for providing solutions to the continuing burden of viral diseases in India and other endemic regions.



## Functionalities



Platform supports therapeutic antibody discovery and characterization against any antigen



Rapid identification of Chikungunya human monoclonal antibodies



High-throughput platform accelerates antibody discovery timelines



Human-derived antibodies minimize immunogenicity and improve safety

## Key Features

- Three antibodies were discovered from dengue patient samples
- Antibodies demonstrated broad and potent viral neutralization
- All four dengue serotypes neutralized including clinical isolates
- Antibodies will soon be tested in preclinical animal models

## Implementation Overview

Deployed	TRL	Training Requirement
No	4-5	5-7 Days

## Contact Details

**Dr. Anmol Chandele and Dr. Sanjeev Kumar**  
Group Leaders

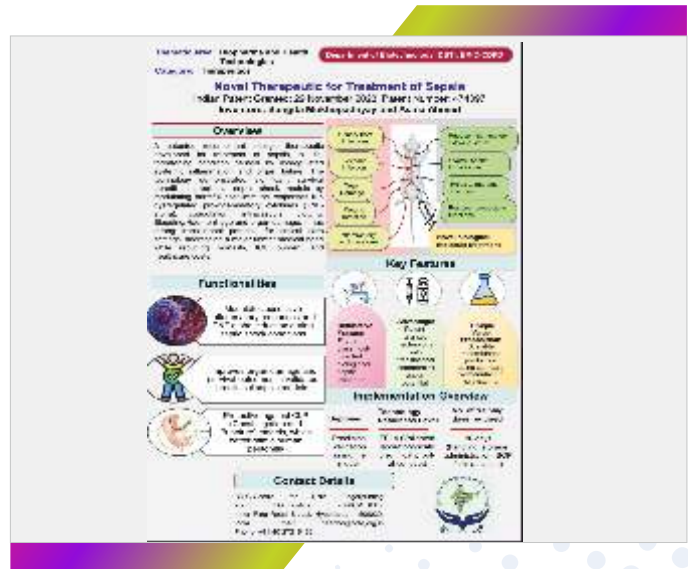
ICGEB-Emory Vaccine Program, International  
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Phone: +91-11-26741358  
Email: anmol@icgeb.res.in; sanjeev@icgeb.res.in

Thematic Area: **Biopharma and Health Technologies**  
Category: **Therapeutics**

# A Novel Therapeutic for Treatment of Sepsis

## Overview

A patented recombinant biologic therapeutic developed for treatment of sepsis, a life-threatening condition caused by dysregulated systemic inflammation and organ failure. This biological molecule treatment demonstrated significant survival benefit in preclinical septic shock models by modulating harmful host immune responses like dysregulated pro-inflammatory cytokines (TNF-alpha), coagulation, intravascular clotting, Bleeding/Haemorrhage and organ damage. It has strong translational potential for critical care settings, addressing a major unmet medical need while reducing mortality, ICU burden, and healthcare costs.



## Functionalities



**Key Function:** Modulates excessive inflammatory responses and TNF-alpha induction during septic shock conditions.



**Key Use:** Improves organ damage and survival outcomes in validated preclinical sepsis models.



**Operational Capability:** Protective against CLP (Cecal Ligation and Puncture) models, which better mimic human peritonitis and support adjunct therapy alongside standard intensive care management

## Key Features

- **Distinctive Feature:** First-in-class host-directed biologic for sepsis treatment.
- **Advantage:** Patent-granted technology with translational commercialization potential. Patent number 474397, dated 29.11.2023.
- **Unique Value Proposition:** Scalable recombinant production using standard

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	30 Days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**  
Category: **Therapeutics**

# Recombinant Proline-Proline-Glutamate Protein-based Vaccine and Method of Development Thereof

## Overview

This innovation identifies the PPE2 protein as one of the critical drivers of TB-associated insulin resistance. By disrupting adipose tissue functions and cAMP-PKA-HSL axis, PPE2 impairs glucose homeostasis. This discovery will enable targeted interventions for TB-associated diabetes and high-value targets for subunit vaccine. TB patients will be benefited from a PPE2-based subunit vaccine, to prevent metabolic damage, improve glucose turnover, and offer a dual-action approach for preventing TB and its metabolic complications.



## Functionalities



**Key Function:** Modulates adipose physiology by triggering the cAMP-PKA-HSL axis to induce systemic insulin resistance.



**Key Use:** Serves as a subunit vaccine candidate to prevent TB-induced diabetic complications and hyperglycemia.



**Operational Capability:** Facilitates targeted therapeutic intervention by identifying and neutralizing specific mycobacterial factors causing fat loss.

## Key Features

- **Distinctive Feature:** Identifies PPE2 protein as the primary driver of TB-induced hyperglycemia.
- **Advantage:** Offers a subunit vaccine approach to prevent TB-associated diabetic complications.
- **Unique Value Proposition:** Bridges the gap between infectious disease treatment and metabolic health (diabetes).

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	60 days

## Contact Details

BRIC-Centre for DNA Fingerprinting and  
Diagnostics (BRIC-CDFD)  
Inner Ring Road, Uppal, Hyderabad – 500039  
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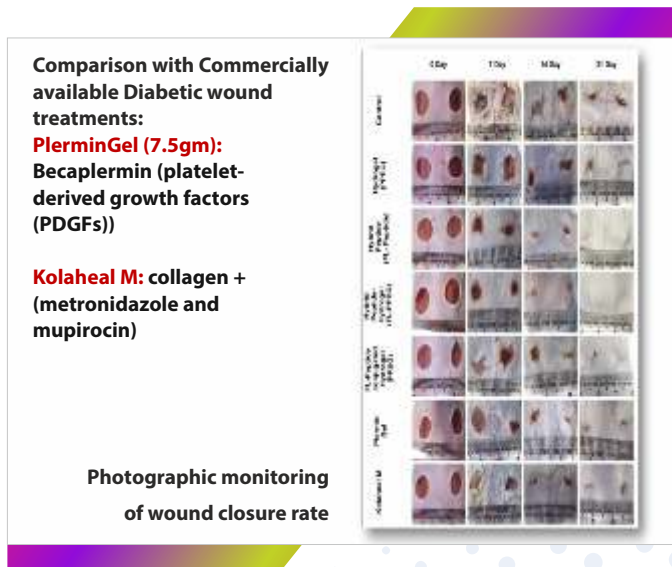
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

# Synthetic Hybrid Peptide Carrying Sprayable Hydrogel Delivery System for Chronic Wound Healing and Skin Regeneration

## Overview

To address challenges associated with incomplete healing of chronic wounds, a novel hybrid peptide-based hydrogel system for skin regeneration was developed. The technology demonstrated promising therapeutic efficacy in both in-vitro and in-vivo diabetic wound healing studies. Comparative evaluation with commercially available wound care products indicated superior or comparable healing performance of the developed hybrid peptide-hydrogel system. The platform offers a biocompatible, user-friendly, and potentially cost-effective approach for management of chronic and diabetic wounds.



## Functionalities



Therapeutic platform for treatment and management of chronic wounds, including diabetic wounds.



Promotes effective and complete wound healing with reduced scarring.



User-friendly formulation suitable for application as hydrogel spray or ointment.



Biocompatible system designed to support safe wound healing and tissue regeneration.

## Key Features

- Reduced likelihood of allergic reactions due to biocompatible formulation.
- Maintains a moist wound environment, with optional requirement for additional dressings.
- Demonstrated effective healing potential even with single-dose application.
- Refrigerated storage compatible for maintaining product stability.

## Implementation Overview

Deployed

No

TRL

4

Training Requirement

-

## Contact Details

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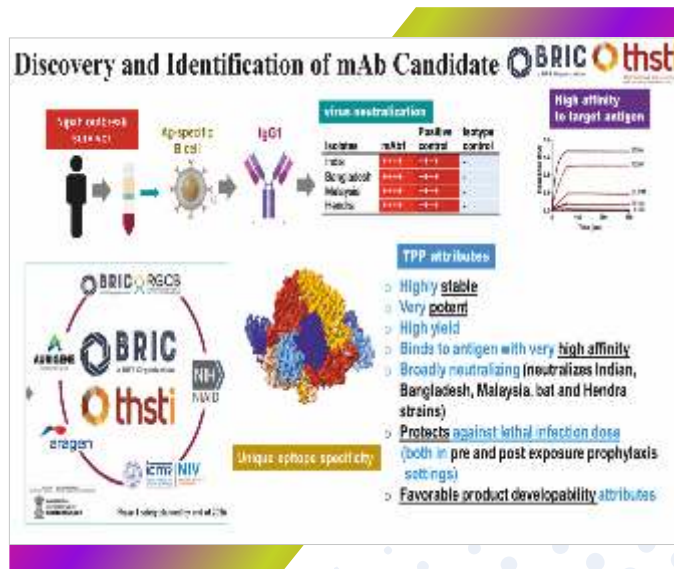
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**





# Monoclonal Antibodies Against Nipah Virus

## Overview

Novel monoclonal antibodies have been developed against Nipah Virus Infection, demonstrating strong preclinical efficacy and high molecular stability, with significant potential for therapeutic and diagnostic applications against the virus. Following successful completion of Stage 1 involving stable cell line development, the project has progressed to Stage 2, which focuses on production scale-up and optimization of upstream and downstream bioprocesses for consistent pilot-scale manufacturing of the monoclonal antibodies.



## Functionalities

-  Development of novel monoclonal antibodies for therapeutic and diagnostic applications against Nipah Virus Infection.
-  Demonstrated strong preclinical efficacy with potential for improved treatment and prevention strategies.
-  Stable cell line-based production platform for reliable antibody generation.
-  Scalable manufacturing process through optimization of upstream and downstream bioprocess workflows.

## Key Features

- Highly stable monoclonal antibody molecules with strong translational potential.
- Successful completion of stable cell line development.
- Pilot-scale manufacturing optimization currently underway.
- Platform suitable for future scale-up and standardized Biopharmaceutical production.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	-

## Contact Details

**Dr Jayanta Bhattacharya**

Dean

BRIC-THSTI

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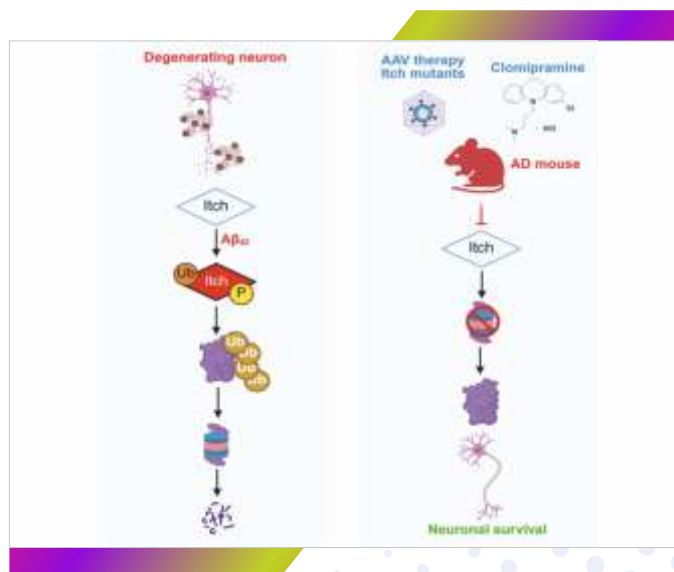
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

# Targeting an Enzyme for treating Alzheimer's Disease (AD): Repurposing the Anti-OCD Drug Clomipramine and a Gene Therapy Strategy

## Overview

Alzheimer's Disease is associated with progressive memory loss and cognitive decline, with limited affordable therapeutic options currently available. Our studies demonstrated that the E3 ubiquitin ligase Itch is aberrantly activated in experimental models of AD, identifying it as a potential therapeutic target. To address this, a two-pronged therapeutic strategy was developed involving: (a) Adeno-Associated Virus (AAV)-mediated delivery of loss-of-function Itch mutants into the AD mouse brain, which significantly improved cognitive function, and (b) repurposing of the clinically approved anti-OCD drug Clomipramine, an inhibitor of Itch, which markedly ameliorated AD-associated memory and cognitive deficits in AD mouse models. The approach offers a promising, cost-effective, and translational pathway for development of novel therapeutics for Alzheimer's Disease.



## Functionalities



Repurposing of Clomipramine for targeting the E3 ubiquitin ligase Itch in Alzheimer's Disease.



Improvement of memory and cognitive deficits in AD mouse models through drug-based and AAV-mediated therapeutic approaches.



Development of a cost-effective therapeutic strategy that may function independently of amyloid- $\beta$  plaque clearance.



Validation of Itch as a promising therapeutic target for treatment of Alzheimer's Disease.

## Key Features

- Clomipramine is clinically approved, globally available, and cost-effective.
- Existing clinical safety, dosage, and pharmacological data support translational potential.
- Potential for accelerated clinical development with reduced cost and lower developmental risk.

## Implementation Overview

Deployed	TRL	Training Requirement
No	4-5	-

## Contact Details

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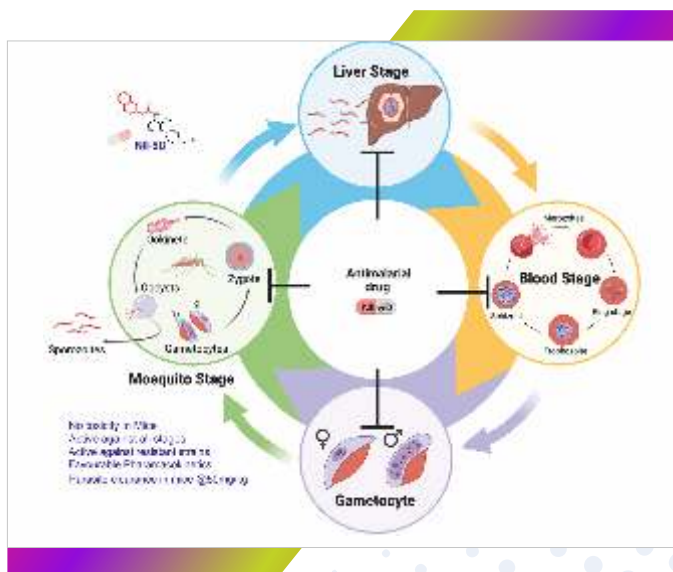
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

# A Unique Anti-Malarial Compound with High Therapeutic Potential that is Effective Against All Stages of the Parasite Lifecycle

## Overview

NII-5D is a novel single chemical entity with potent multistage antimalarial activity capable of targeting the blood, liver, and mosquito stages of the malaria parasite lifecycle, representing a significant advancement toward malaria elimination. The compound demonstrates a high therapeutic index of 1560 with no observed toxicity in preclinical evaluations, indicating strong safety and efficacy potential. The technology is expected to benefit populations at risk of malaria infection, particularly individuals residing in endemic regions, travelers, pregnant women, young children, and patients requiring treatment for confirmed or suspected malaria infections.



## Functionalities



A multi-target, all-stage antimalarial; synergistic activity with artesunate



Effective against both drug-resistant and wild-type malaria parasites



A small synthetic molecule that is easy to manufacture and deploy globally, with a reduced likelihood of resistance development.

## Key Features

- A magic bullet endowed with potent, selective, multistage anti-plasmodial activity.
- SAR optimized, dual pharmacophore compound with very high specificity.
- Favorable pharmacokinetics works against resistant and field strains.

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	-

## Contact Details

Dr. Agam P. Singh  
Staff Scientist-VII

BRIC- National Institute of Immunology  
Aruna Asaf Ali Marg, New Delhi, PIN-110067  
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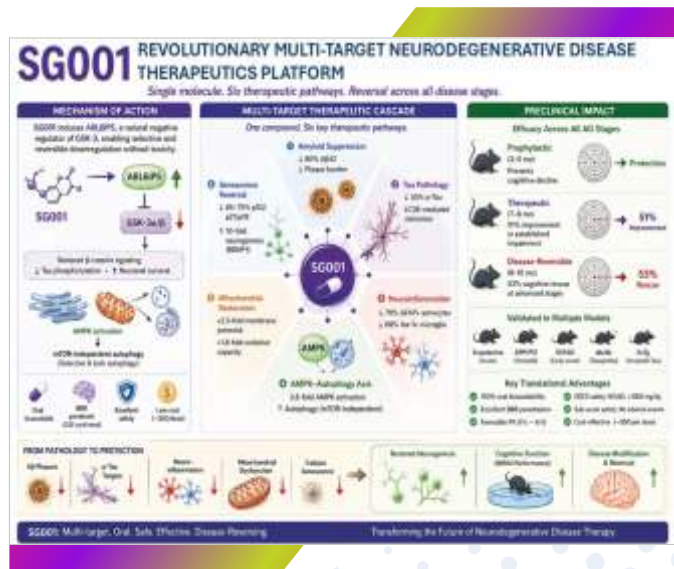
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

# SG001: A Revolutionary Multi-Target Neurodegenerative Disease Therapeutics Platform

## Overview

SG001 is a first-in-class small-molecule therapeutic that modulates total GSK-3a/b via ARL6IP5 induction, enabling selective and reversible pathway regulation without toxicity. It simultaneously targets amyloid burden, tau pathology, autophagy, neuroinflammation, mitochondrial dysfunction, and cellular senescence. SG001 demonstrates robust efficacy across multiple Alzheimer's disease models, including advanced-stage disease reversal, with excellent BBB penetration, oral bioavailability, and safety, representing a paradigm shift from single-target to multi-pathway disease-modifying therapy.



## Functionalities



Selectively downregulates GSK-3 via ARL6IP5 induction without off-target toxicity



Reduces amyloid, tau pathology, neuroinflammation, and cellular senescence simultaneously



Restores mitochondrial function, autophagy, and neurogenesis to improve cognition

## Key Features

- First ARL6IP5-mediated GSK-3 modulation strategy for neuroprotection
- Multi-target therapeutic addressing six core neurodegenerative disease pathways
- Oral, BBB-penetrant, cost-effective, and disease-reversible therapeutic candidate

## Implementation Overview

Deployed	TRL	Training Requirement
No	4-5	3-5 Days

## Contact Details

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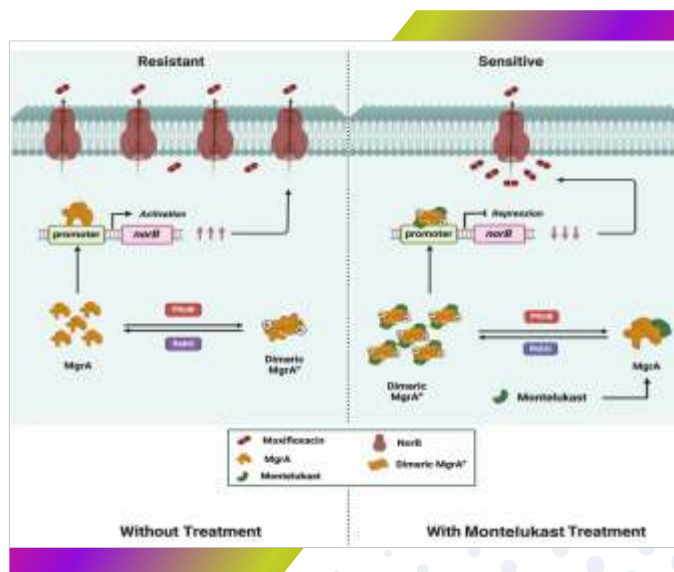
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

## A Combinatorial Formulation to Inhibit Multidrug-Resistant *Staphylococcus aureus*: A cost-effective drug repurposing approach leveraging an FDA-approved efflux pump inhibitor to combat MRSA infections

### Overview

*S. aureus* is considered as a high priority pathogen by both WHO and ICMR. One of the major reasons for the development of multidrug resistant *S. aureus* (MDR-SA) is the expression of efflux pumps. This invention repurposes Montelukast, an FDA-approved leukotriene receptor antagonist used in asthma management, as a potent efflux pump inhibitor (EPI) against MDR-SA. Identified from a screen of 774 FDA-approved drugs, Montelukast interacts with the master regulator MgrA, suppresses the NorB efflux pumps and thus synergistically enhances the MDRSA's sensitivity towards antibiotics. The formulation shows a combination of Montelukast with antibiotics offers a low-cost, clinically translatable anti-MDR-SA strategy.



### Functionalities



Enhances intracellular accumulation of antibiotics by inhibiting major efflux pumps NorA, NorB, and AbcA in multidrug-resistant *Staphylococcus aureus* infection.



Targets and modulates the master regulator MgrA, leading to transcriptional repression of the NorB efflux pump.



Demonstrates synergistic activity with antibiotics such as norfloxacin, moxifloxacin, and cefotaxime against MDR-SA strains.



Significantly reduces bacterial burden in murine MRSA skin infection models when combined with antibiotic therapy.

### Key Features

- Repurposes the FDA-approved drug Montelukast with established safety and pharmacological profiles.
- Exhibits high-affinity binding to MgrA with a novel mechanism involving dimerization and phosphorylation-mediated efflux suppression.
- Non-cytotoxic to mammalian cells and lacks intrinsic antibacterial activity, supporting safe combinatorial use.
- Cost-effective drug repurposing strategy validated through both in vitro studies and in vivo MRSA infection models.

### Implementation Overview

Deployed	TRL	Training Requirement
No	3	No

### Contact Details

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Bhubaneswar-751023, Odisha, India

Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

# Exosome-Based Bioactive Bone Graft Platform for Advanced Regenerative Healing

## Overview

An exosome-based bone graft technology has been developed utilizing bioactive vesicles derived from stem cells to promote bone regeneration, angiogenesis, and immune modulation. The non-cellular, off-the-shelf therapeutic platform overcomes limitations associated with conventional bone grafting approaches by providing a safer and biologically active regenerative solution. Designed for scalability and cost-effective deployment, the technology has significant potential for orthopedic and dental applications, particularly in improving accessibility and patient recovery outcomes across both urban and rural healthcare settings. The technology has been licensed to Polyorbit Private Limited for further commercialization.



## Functionalities



Delivers bioactive exosomes to stimulate osteoblast proliferation and bone tissue regeneration



Enhances angiogenesis and vascularization for improved healing at defect sites



Modulates immune response to create a favorable regenerative microenvironment



Enables scalable, GMP-compliant manufacturing for consistent quality and affordability

## Key Features

- Non-cellular approach ensuring safety, stability, and easier regulatory approval
- Bioactive formulation promoting faster, efficient bone regeneration and repair
- Eliminates risks linked to autografts, allografts, and synthetic substitutes
- Scalable, GMP-compliant production ensuring affordability and consistent quality

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	10

## Contact Details

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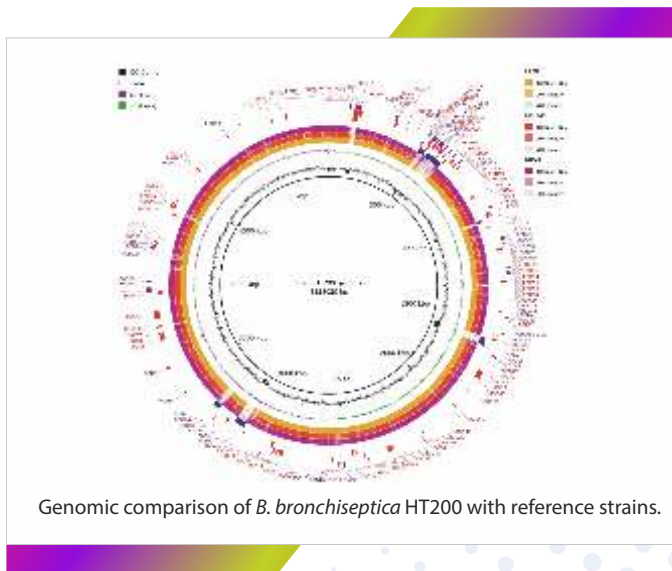
Thematic Area: **Biopharma and Health Technologies**

Category: **Therapeutics**

# Whole Cell Livestock Vaccine for Respiratory Diseases

## Overview

*Bordetella* species are primarily isolated from animals and humans causing asymptomatic infection to lethal pneumonia. Genome sequence revealed genes/ loci encoding the major *Bordetella* virulence factors, such as the dermonecrotic toxin (DNT), adenylate cyclase-hemolysin toxin (ACT), and lipopolysaccharide (LPS) O antigen are absent in strain HT200, while genes encoding other virulence factors, particularly pertactin (PRN), are highly divergent. *Bordetella bronchiseptica* strain HT200 does not produce the virulence factors, pertussis toxin (PTX) and serotype 2 fimbriae (FIM2). Additionally, strain HT200 was non-hemolytic, but showed hemagglutination activity and was able to colonize in the respiratory organs of mice and induced protective antibody response against challenge infection with pathogenic *B. bronchiseptica* strain RB50. The technology has been licensed to Indian Immunologicals Limited, Hyderabad.



## Functionalities



Potential application as a live or heat-killed whole-cell vaccine for livestock immunization.



Induces protective antibody responses against pathogenic *Bordetella bronchiseptica* infection.



Capable of respiratory tract colonization required for effective immune priming.



Suitable platform for development of attenuated veterinary vaccine formulations.

## Key Features

- First reported environmental strain belonging to the classical mammalian *Bordetella bronchiseptica* species.
- Naturally attenuated and non-toxigenic strain lacking major virulence-associated factors.
- Contains accessory genomic islands potentially contributing to environmental adaptability and strain-specific traits.
- Demonstrated protective efficacy in preclinical mouse challenge studies against pathogenic strain RB50.

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	10

## Contact Details

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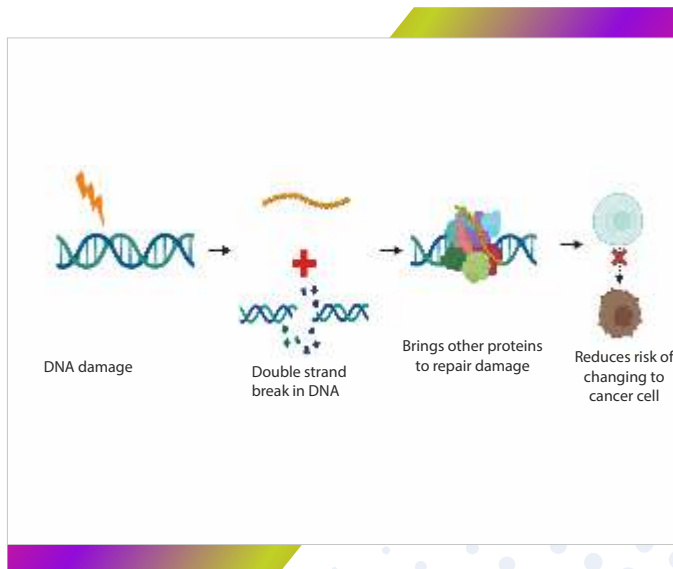
Thematic Area: **Biopharma and Health Technologies**

Category: **Prevention and Prophylaxis**

# A Peptide Agonist to Delay the Onset of Cancer

## Overview

We have discovered a 20-mer peptide which activates DNA damage response delaying the onset of neoplastic transformation. It can be developed as a naturally occurring phosphomimetic peptide in an appropriate delivery system like hydrogel. This may act as the barrier to neoplastic transformation by augmenting and/or reactivating the DDR response which would delay or can even prevent cancer initiation and thereby cancer progression.



## Functionalities



Peptide fragments delay neoplastic transformation



Can be used to prevent or delay initiation of familial breast cancer



Can reduce healthcare costs in familial breast cancer

## Key Features

- Targets early events in neoplastic transformation
- Small size of the peptide eases localized and sustained delivery
- Potential use in other tissues (e.g. skin) to reduce DNA damage

## Implementation Overview

Deployed	TRL	Training Requirement
No	3	NA

## Contact Details

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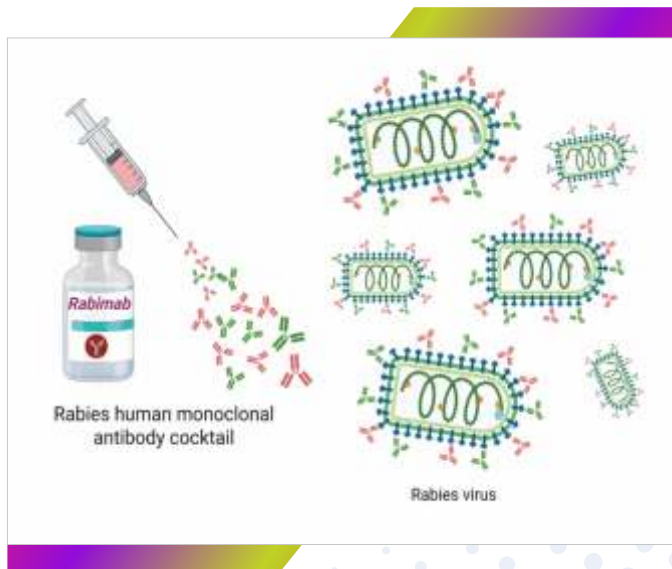
Thematic Area: **Biopharma and Health Technologies**

Category: **Prevention and Prophylaxis**

# Human Monoclonal Antibody Cocktail Against Rabies

## Overview

The present invention includes a cocktail of two fully human monoclonal antibodies specifically targeting the G-protein on the Rabies virus. This antibody cocktail can neutralize the rabies virus before it enters the host cells thereby preventing pathogenesis. It is an effective, scalable, safe and potentially cost-effective option for post-exposure prophylaxis following animal bite.



## Functionalities



**Toxicity:** In-vitro toxicity tested: no cross reactivity to human and mouse proteins and unrelated viral proteins



**Uses:** Scalable, safe and efficacious antibodies to prevent Rabies infection post animal bite.



**Broad spectrum:** Antibodies also neutralize European bat lyssavirus - an emerging global threat

## Key Features

- Scalable, safer, and consistent solution
- Cocktail contains two antibodies against non-overlapping epitopes on Rabies Glycoprotein
- Adaptable for use against rabies in cattle which is a huge drain for rural economy

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	NA

## Contact Details

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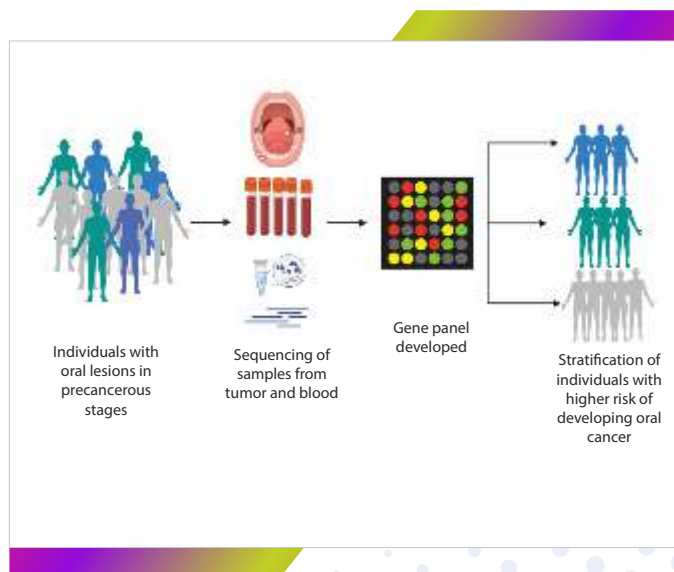
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

# Gene Panel for Oral Cancer Screening

## Overview

A gene panel for early detection of oral cancers with molecular profiling has been developed. The gene panel utilizes genomic DNA isolated from tumour tissue to inform about the molecular patterns. The results analyzed through custom pipelines will indicate the individuals at risk of developing oral cancer from leukoplakia (pre-cancer) lesion. The test can contribute to reducing the national burden of oral cancer by enabling early detection and improving treatment outcomes.



## Functionalities



Useful in early detection of oral cancer in Indian population



Ability to identify individuals at risk of developing cancer from pre-cancer lesion



Potential to reduce healthcare costs significantly

## Key Features

- Based on data from Indian population cohort
- Sensitive and accurate approach to identify cancer at early stage
- Lead to better treatment outcomes and patient survival

## Implementation Overview

Deployed	TRL	Training Requirement
No	3	NA

## Contact Details

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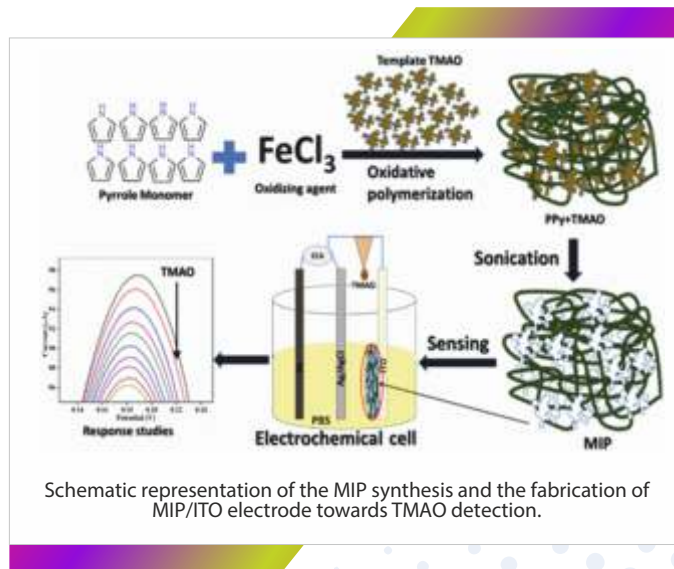
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

# A Sensor for the Detection of Trimethylamine (TMAO)

## Overview

Recent advances in gut microbiome research have identified Trimethylamine N-oxide (TMAO) as an important biomarker associated with colorectal cancer (CRC), cardiovascular diseases, diabetes, and other metabolic disorders. The developed Molecularly Imprinted Polymer (MIP)-based sensor enables simple, selective, and sensitive detection of TMAO in biological fluids such as urine. The present technology provides a promising platform for non-invasive diagnostic applications and offers potential for further development of MIP-based sensing systems for detection of other clinically relevant gut microbiota-derived metabolites.



## Functionalities



The developed Molecularly Imprinted Polymer (MIP)-based sensor enables selective detection of Trimethylamine N-oxide (TMAO) with a broad linear detection range of 1–15 ppm.



Demonstrates high sensitivity and low limit of detection for efficient biomarker analysis.



Provides high selectivity and rapid detection response within approximately 20 minutes.



Establishes MIP-based sensing as a promising platform for detection of gut microbiota-derived metabolites associated with human health and disease.

## Key Features

- Sensor platform is based on Molecularly Imprinted Polymer (MIP) technology with high target specificity.
- Enables non-invasive detection of TMAO in biological fluids such as urine.
- Simple and easy-to-operate sensing platform suitable for diagnostic applications.
- Expandable technology platform for detection of additional clinically relevant gut metabolites.

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	7

## Contact Details

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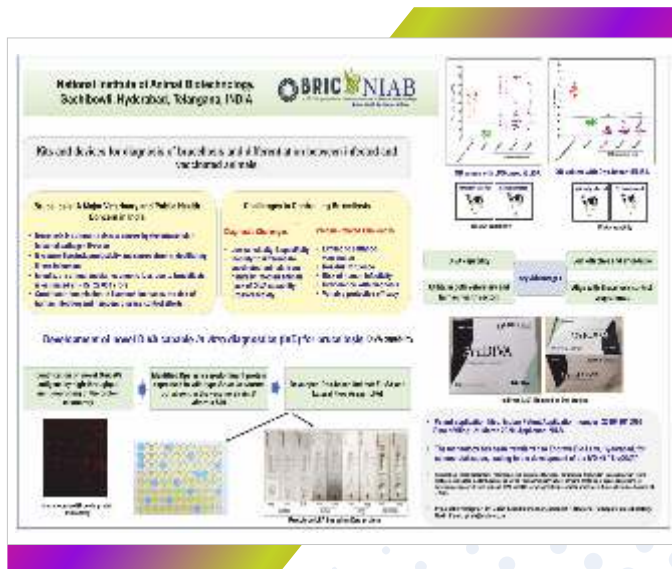
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**






# Kits and Devices for Diagnosis of Brucellosis and Differentiation of Infected Animals from Vaccinated Animals

## Overview

This technology is a DIVA-capable serodiagnostic assay for brucellosis based on *Brucella* Dps protein/peptide, identified through high-throughput immunoprobings. It detects anti-Dps antibodies in naturally infected animals and humans while differentiating them from *B. abortus* S19-vaccinated cattle. Transferred to Engrave Bio Labs Pvt. Ltd. for commercialization, this invention will support brucellosis control and eradication through vaccination monitoring, detection of vaccine failures, and One Health-based surveillance.



## Functionalities

-  Detects anti-Dps antibodies in *Brucella*-infected animals and humans.
-  Differentiates naturally infected cattle from *B. abortus* S19-vaccinated cattle.
-  Supports vaccination monitoring under national brucellosis control programmes.
-  Helps to identify possible vaccine failures and breakthrough infections.
-  Enables One Health-based surveillance for livestock and public health sectors.

## Key Features

- DIVA capability distinguishing infected from vaccinated animals.
- High specificity and sensitivity using *Brucella* Dps protein/peptide.
- Applicable to both livestock and human brucellosis diagnosis.
- Supports large-scale screening and surveillance programmes.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	7	1-2 days

## Contact Details

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Inventor: Dr. Girish K Radhakrishnan, Scientist-F, NIAB

Thematic Area: **Biopharma and Health Technologies**

Category: **Vaccines**

# A Novel Recombinant BCG Vaccine in Tuberculosis and Method Thereof

## Overview

This innovation introduces a novel recombinant vaccine, **rBCGΔppe18**, engineered by deleting the PPE18 protein to overcome the limitations of traditional BCG. By shifting the cytokine profile towards a pro-inflammatory Th1-type and increased effector and memory T-cell responses, this technology provides a superior molecular platform for next-generation TB vaccine. The technology will provide a critical breakthrough for global health sectors struggling with solutions in increasing BCG vaccine efficacy to reduce global TB mortality burden and rise of MDR/XDR strains.



## Functionalities



**Key Function:** Gene knockout modification increases macrophage, Th1-type T-cell activation with better immunological memory than traditional BCG



**Key Use:** A versatile molecular-platform for next-generation, more efficient anti-TB vaccine development; improved protection in preclinical mouse-model.



**Operational Capability:** Overcoming limitations of conventional BCG, enabling more efficient and targeted engineering of future BCG-based vaccine

## Key Features

- Offers better immunogenicity and immunological memory compared to traditional BCG
- Scalable recombinant platform technology
- Foundational shift in vaccine architecture.

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	60 days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Vaccines**

# Bharat's Indigenous Nanoshield: A Self-Reliant Platform for Next-Generation Vaccines

## Overview

The Multivalent Self-Assembled Nanocage (MSN) vaccine platform (NANOSHIELD) is a next-generation indigenous vaccine technology enabling rapid, affordable, and scalable development of thermostable recombinant vaccines. Built on a self-assembling NSP-10 nanocage scaffold, it mimics viral architecture for enhanced immune responses and supports plug-and-play insertion of diverse antigens. Manufactured efficiently in *E. coli* and stable at 2-8°C, MSN is designed to accelerate India's self-reliant vaccine innovation under Atmanirbhar Bharat. Backed by industry partnerships, the MSN platform has mobilized over ₹120 crores to support translational development and progression into human clinical trials.



## Functionalities



Enables multivalent display of diverse viral antigens on self-assembling nanocage scaffold



Indigenous self-assembling nanocage scaffold for multivalent antigen presentation



Provides thermostable, scalable recombinant vaccine production in *E. coli* system

## Key Features

- Successfully deployed in Nano-COVAC, VaxiPox, and Betacoron programs
- Expanding toward broad-spectrum pan-poultry vaccine development application
- Supports rapid plug-and-play vaccine design for emerging infectious pathogens

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	Not required

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Food Safety**

## “ERU Test Kit”

# Bacteriological Drinking Water Testing Kit for Routine Testing of Water Quality

## Overview

The “ERU” Test Kit is a Presence/Absence (P/A) water test kit to detect the presence or absence of coliform bacteria in water samples. Coliforms, belonging to the Enterobacteriaceae family and found in mammalian intestines, indicate fecal contamination and can cause diseases like diarrhea and dysentery. The kit works by detecting hydrogen sulphide (H<sub>2</sub>S) gas produced by these bacteria. A positive result is shown by blackening of the water inside the bottle.



## Functionalities



This kit can detect *Salmonella typhi*, *Shigella flexneri* and *Escherichia coli* contamination in the drinking water.



The minimum limit for the detection of fecal coliform bacteria, *Salmonella typhi*, *Shigella flexneri* and *Escherichia coli* in the water sample in terms of cfu.



Ambient temperature between 25°-40° C

## Key Features

- It is simple and accurate.
- Economical and more sensitive compared to conventional bacteriological testing methods.
- User friendly and rapid results (between 14-16 hrs).

## Implementation Overview

Deployed	TRL	Training Requirement
No	6	1 Day

## Contact Details

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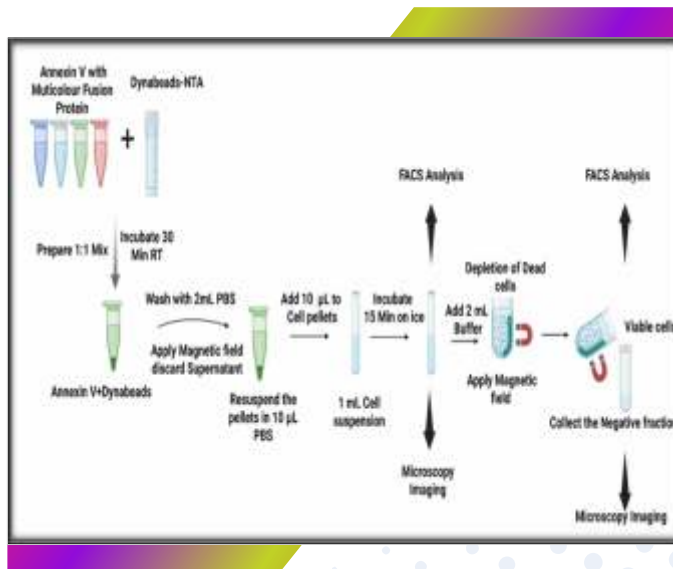
Thematic Area: **Biopharma and Health Technologies**

Category: **Cell Technologies**

# A Cost-Effective, Multiplatform-Compatible Bead-Based System for the Detection and Depletion of Apoptotic Cells

## Overview

Cell death detection and depletion are critical requirements across biological research, bioprocessing, and cell therapy applications. However, currently available technologies generally support either detection or depletion of apoptotic cells, but not both through a single platform. The developed technology provides a cost-effective solution through generation of a panel of recombinant fluorescent Annexin V proteins with unique colour palettes for real-time detection and quantification of apoptotic cells. In addition, functionalized magnetic beads conjugated with fluorescent Annexin V enable simultaneous detection and depletion of dead cells, thereby enriching viable untouched cells for downstream applications.



## Functionalities



Real-time detection and quantification of apoptotic/dead cells using fluorescent Annexin V reagents with multiple colour options.



Single-platform solution enabling both detection and depletion of dead cells.



Recombinant protein-based, non-toxic system compatible with low-calcium media.



Supports multiplex applications across diverse biological and cell therapy workflows.

## Key Features

- Validated across multiple applications and experimental platforms.
- Compatible with microscopy, Fluorescence-Activated Cell Sorting (FACS), and Magnetic-Activated Cell Sorting (MACS) workflows.
- Chemical dye-free detection platform with improved biocompatibility.

## Implementation Overview

Deployed	TRL	Training Requirement
No	8	NA

## Contact Details

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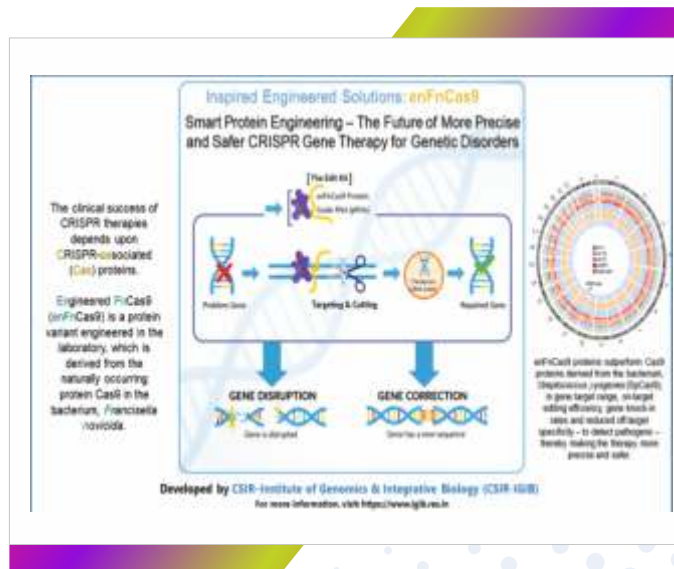
Thematic Area: **Biopharma and Health Technologies**

Category: **Precision Therapeutics and Genome Engineering**

# Kinetically Enhanced Engineered FnCas9 for High-Precision Genome Editing and Diagnostics

## Overview

This technology introduces a kinetically enhanced engineered FnCas9 (enFnCas9) enabling highly precise, efficient, and flexible genome editing. It offers broader PAM recognition, reduced off-target effects, and faster DNA cleavage, making it suitable for therapeutic gene correction, disease diagnostics, and genome regulation. The innovation expands CRISPR applicability across healthcare, biotechnology, agriculture, and pharmaceutical sectors with significant potential for precision medicine and genetic disorder treatment.



## Functionalities



Enables precise gene editing with enhanced DNA binding and cleavage efficiency



Detects and discriminates pathogenic nucleotide sequences with high specificity



Supports both double-strand break editing and base editing applications

## Key Features

- Enhanced kinetic activity improves editing efficiency and speed
- Broader PAM compatibility expands genome targeting capability
- Minimal off-target effects ensure high specificity and safety

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	7-10 days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

# LitLife SCA – Indigenous Genetic Screening Technology for Early Detection of Spinocerebellar Ataxia

## Overview

LitLife SCA is an indigenous molecular diagnostic technology for early and accurate detection of Spinocerebellar Ataxia (SCA), a group of inherited neurodegenerative disorders. Developed by CCMB, it enables cost-effective genetic screening, aiding timely diagnosis, genetic counseling, and disease management. The technology reduces dependence on expensive imported tests and supports improved healthcare outcomes for at-risk populations in India.

## Functionalities



Detects genetic mutations associated with Spinocerebellar Ataxia



Enables early diagnosis through molecular genetic testing



Supports genetic counseling and family screening programs

## Key Features

- Indigenous, cost-effective alternative to imported genetic tests
- High accuracy with reliable repeat expansion detection
- Scalable platform for population-level genetic screening

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
Yes	8-9	

## Contact Details

Director  
CSIR-CCMB  
Hyderabad

Thematic Area: **Biopharma and Health Technologies**

Category: **Precision Medicine & Diagnostics**

# A Rapid, Robust and Affordable Kit for Genetic Screening-cum-Confirmation of Sickle Cell Anaemia

## Overview

The present innovation is directed to a simple and affordable protocol for rapid detection of mutation(s), causing the common and severe genetic disorder, Sickle Cell Anaemia (SCA). It makes the population screening faster and compliant due to ease of collection and need for only one drop of blood spotted on a specialized card which can be stored and transported without any paraphernalia. Combined with direct polymerase chain reaction (PCR) using a punch from the unprocessed blood spot, this method/kit provides rapid, robust and affordable too for combined screening cum genetic confirmation of the disease status.



## Functionalities



PCR based detection of sickle cell anaemia mutation in single tube PCR reaction



Uses dried blood spot collected through finger-prick thus increasing compliance.



Alleviates the hassles of sample collection, storage and transport.

## Key Features

- Direct use of dried blood spot for use in PCR based detection of sickle cell anaemia.
- Suitable for sample collection and screening-cum-confirmation of SCA at population level with higher compliance.
- Rapid, robust and affordable

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, Deployed for population level screening of Sickle Cell Anaemia in Maharashtra and Jharkhand.	7	7 days

## Contact Details

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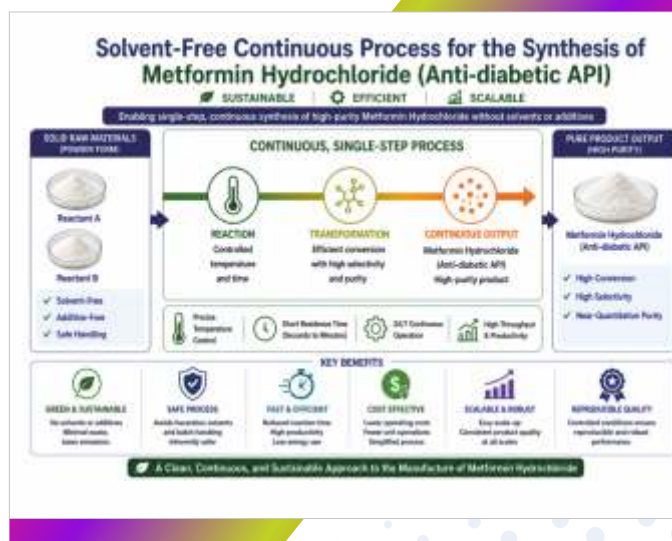
Thematic Area: **Biopharma and Health Technologies**

Category: **Pharmaceutical Process Intensification and Green Manufacturing**

# Solvent-Free Continuous Process for the Synthesis of Metformin Hydrochloride (Anti-Diabetic API)

## Overview

Metformin Hydrochloride is one of the most widely used drug globally to treat Type II diabetes. The conventional process involves large quantities of solvents and hence need longer reaction time, high energy demand and contributes to emissions. CSIR-National Chemical Laboratory has developed and demonstrated a novel solvent-free and additive-free, rapid continuous process enables single-step synthesis of metformin hydrochloride with complete conversion, >90% selectivity and 99% purity. The patented technology eliminates solvents and additives, reduces processing steps, and lowers overall production costs, making it highly scalable and environmentally sustainable. The innovation by CSIR-NCL offers electricity consumption lesser by 60%, OPEX lower by 30% and CAPEX for identical production capacity lesser by 3 times. The product collected at the reactor outlet has 99.89% purity upon single step washing and crystallization.



## Functionalities

- Enables rapid single step continuous process that achieves high conversion, selectivity and near-quantitative purity in one step.
- Continuous reactor is the key aspect that CSIR-NCL has innovated as it reduces reaction time by 100 times when compared to conventional process and eliminates multi-step workup or downstream purification requirements.
- Supports scalable manufacturing with consistent product quality.
- Significantly lower solvent waste, emissions, and environmental impact.
- Improves process safety by avoiding hazardous solvents and batch handling.
- Lowers overall manufacturing costs through process intensification.
- Reproducible and robust operation under controlled temperature and residence time

## Key Features

- Rapid, Solvent-free, additive-free continuous flow synthesis
- Single-step process delivering high conversion, selectivity, and purity
- Produces more product in less time with efficient energy use
- Minimal waste generation enabling environmentally sustainable manufacturing
- Scalable design suitable for industrial-scale pharmaceutical production
- Reduced operational complexity compared to conventional batch processes
- Inherently safer process due to elimination of hazardous solvents

## Implementation Overview

The process has been licensed to an Indian pharmaceutical industry under limited exclusivity for production at a scale of at least 5000 TPA. Pilot scale demonstration completed. Discussion with one more industry for licensing the technology is in progress.

### Deployed

Not yet. Plant design is in progress.

### TRL

6

### Training Requirement

2 days (operation, safety, and logics training for personnel)

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Medical Equipments**

# Nitrogen Oxides Releasing Dressing for the Treatment of Diabetic Foot Ulcer

## Overview

The nitrogen oxides releasing wound dressing is useful for the treatment of chronic infected wounds and non-healing wounds (diabetic foot, pressure ulcer, venous stasis wound etc.). The dressing is poly-antimicrobial (antibacterial and antifungal) activity including antibiofilm and is capable of sustained release of the active ingredient over a long period of time. The dressing is simple in preparation, low in cost and it can be stored at ambient temperature and humidity for two years, without loss of activity.



## Functionalities



The dressing works by decreasing the infection, increasing the microvascularization and granulation thereby aiding wound healing.



It is also suitable for application which requires preparation of wound bed for acceptance of split skin graft based surgery, and



It is suitable for application on infected, non-healing wounds.

## Key Features

- The dressing is useful for the treatment of chronic wounds.
- It can be stored at ambient temperature and humidity conditions for two years, without loss of activity.
- It is relatively inexpensive, broad-spectrum in action and the drug active molecule does not lead to resistance development.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, Licensed to 3 companies	> 5	2 days

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Healthcare & Advanced Surface Engineering**






# Atmospheric Pressure Plasma Jet for Surface Treatment

## Overview

Atmospheric Pressure Plasma Jet (APPJ) technology is an advanced non-thermal plasma process used for sterilization, wound healing, surface decontamination, and biomedical applications under atmospheric conditions without requiring vacuum systems. The technology effectively inactivates bacteria, viruses, and other pathogens while being safe for sensitive biological surfaces. APPJ can support faster healing, infection control, and improved medical surface treatment with minimal chemical usage. It benefits hospitals, healthcare providers, biomedical industries, and public health sectors by enabling safer, cleaner, and environmentally friendly healthcare solutions.



## Functionalities

-  **Sterilization and decontamination of medical surfaces and instruments**
-  **Inactivation of bacteria, viruses, and other harmful pathogens**
-  **Support for wound healing and tissue treatment applications**
-  **Surface modification of biomedical materials for improved biocompatibility**
-  **Non-thermal and chemical-free treatment suitable for sensitive healthcare applications**

## Key Features

- Operates at atmospheric pressure without the need for vacuum systems
- Non-thermal plasma suitable for sensitive biological and medical applications
- Effective against a wide range of microorganisms, including bacteria and viruses
- Chemical-free and environmentally friendly sterilization process
- Portable, energy-efficient, and suitable for rapid on-site healthcare applications.

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	4	7 days

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Healthcare**

# Chemical-Free Sterilization through Microwave Plasma Technology

## Overview

Microwave Plasma Sterilization is an advanced decontamination technology that uses microwave-generated plasma to produce reactive species, UV radiation, and charged particles for rapid inactivation of microorganisms. The plasma effectively destroys bacteria, viruses, fungi, and spores through oxidative and physical disruption mechanisms without relying on high temperatures or toxic chemicals. It enables sterilization of heat-sensitive and complex-shaped materials that may be unsuitable for conventional steam or chemical sterilization methods. The technology offers short cycle times, low residue generation, and environmentally cleaner operation compared with traditional sterilants. Its effectiveness was checked to disinfect bacterial microorganisms like *Staphylococcus aureus*, *Escherichia coli*, *Salmonella abony* and *Pseudomonas aeruginosa* and were able to get a 6 log reduction when exposed for ~1 hour.



## Functionalities

- Rapid sterilization and decontamination using microwave-generated plasma
- Inactivation of bacteria, viruses, fungi, and spores through reactive plasma species and UV radiation
- Sterilization of heat-sensitive and complex-shaped medical or industrial materials
- Chemical-free disinfection with minimal residue generation
- Support for safe and environmentally cleaner sterilization processes
- Effective microbial reduction with up to 6-log reduction for tested bacterial strains

## Key Features

- Uses microwave plasma to generate highly reactive sterilizing species
- Non-thermal process suitable for temperature-sensitive materials and devices
- Effective against microorganisms such as *Staphylococcus aureus*, *Escherichia coli*, *Salmonella abony*, and *Pseudomonas aeruginosa*
- Shorter sterilization cycles compared to many conventional methods
- Eliminates the need for toxic chemical sterilants
- Suitable for healthcare, laboratory, biomedical, and industrial sterilization applications

## Implementation Overview

Deployed	TRL	Training Requirement
No	3	7 days

## Contact Details

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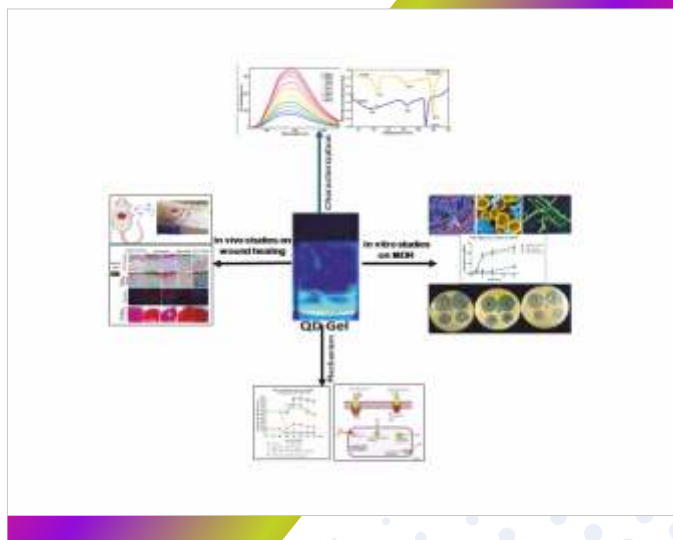
Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# A Quantum Dot Prepared from Simple Antibiotics of Ampicillin and Kanamycin shows High Antimicrobial Efficacy Against Drug-Resistant Bacteria

## Overview

Quantum dots (QDs) have properties intermediate between bulk semiconductors and discrete atoms or molecules. The various applications of QDs in drug delivery, biosensing, bioimaging etc. have raised the hope of its use as an antibiotic/drug for antimicrobial resistance (AMR) which is considered as the major threat by WHO in the current century. Here, we have synthesized the Ampicillin + Kanamycin-based carbon quantum dots (AK-QDs) using the hydrothermal method. Further, the synthesized fluorescent AK-QD (~12 nm) were characterized using FT-IR, DLS, XRD, fluorescence spectroscopy, and TEM. The results of AK QDs were compared with mixture of same concentrations of the antibiotic (AK mix) by MIC, ZOI, time kill assay and CFU studies. The AK-QDs showed 3 to 10-fold more efficacy against all resistant strains in the MIC and CFU studies.



## Functionalities



A small molecule-based therapy which can be used for skin wound healing infections



A gel-based formulation for application against antimicrobial resistance (AMR).

## Key Features

- 1st quantum dot (QD) synthesized with dual antibiotics for AMR studies in vivo.
- This is the 1st study to report a QD with efficacy against various resistant strains.

## Implementation Overview

Deployed	TRL	Training Requirement
No	3	6 Months

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**






# Intranasal Thermo-responsive Pterostilbene Nanoemulgel for Enhanced Nose-to-Brain Delivery in Ischemic Stroke Therapy

## Overview

This technology develops a thermo-responsive nanoemulgel for intranasal delivery of pterostilbene, enabling direct nose-to-brain transport. It enhances bioavailability, prolongs nasal residence time, and provides sustained neuroprotection by reducing oxidative stress and neuroinflammation. The system significantly improves cognitive and motor functions in ischemic stroke models, offering a non-invasive and effective therapeutic strategy.



## Functionalities

-  Enables direct nose-to-brain delivery bypassing blood-brain barrier
-  Provides sustained and controlled release of pterostilbene in brain
-  Enhances neuroprotection via antioxidant and anti-inflammatory action
-  Improves cognitive, motor, and behavioral recovery post-stroke
-  Increases nasal residence time through thermo-responsive gelation

## Key Features

- Thermo-responsive nanoemulgel ensures prolonged nasal retention
- Nanoemulsion enhances solubility and brain bioavailability
- Chitosan coating provides muco-adhesion and sustained delivery
- Non-invasive intranasal route improves patient compliance
- Demonstrates strong neuroprotective efficacy in ischemic models

## Implementation Overview

Deployed	TRL	Training Requirement
No	5-6	3-5 Days

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**






# Tripeptide Encapsulated Niosomes Encapsulated Gel for Dermatological Disorders and the Method of Preparation Thereof

## Overview

This innovation utilizes Lysine-Proline-Valine (KPV) encapsulated niosomes within a thermo-reversible hydrogel for targeted, sustained anti-inflammatory treatment of dermatitis. The formulation enhances skin penetration, extends drug release, and minimizes side effects, improving patient comfort and compliance. By transitioning from sol to gel at skin temperature, it ensures prolonged residence time and efficacy. This technology offers significant benefits to dermatology patients, providing a safer, more effective alternative to conventional topical therapies.



## Functionalities

-  Enables temperature-triggered sol-to-gel transition for localized and convenient drug administration.
-  Facilitates controlled release of encapsulated KPV tripeptide over time.
-  Utilizes niosome-based encapsulation to enhance stability and delivery efficiency of peptide.
-  Supports uniform dispersion of active ingredients within a poloxamer-based gel matrix.
-  Operates through a defined, temperature-controlled preparation process ensuring formulation consistency.

## Key Features

- Thermo-responsive in-situ gel system: The formulation remains in a liquid state at lower temperatures and undergoes gelation at around 32 °C, enabling ease of administration followed by localized gel formation.
- Sustained-release delivery mechanism: Incorporation of a niosome drug delivery system supports gradual release of the active tripeptide, potentially improving therapeutic duration and reducing dosing frequency.
- Potential for localized therapy: The in-situ gelling and extended-release characteristics may help maintain drug concentration at the site of application.

## Implementation Overview

Deployed	TRL	Training Requirement
No	3/4	6 Month

## Contact Details

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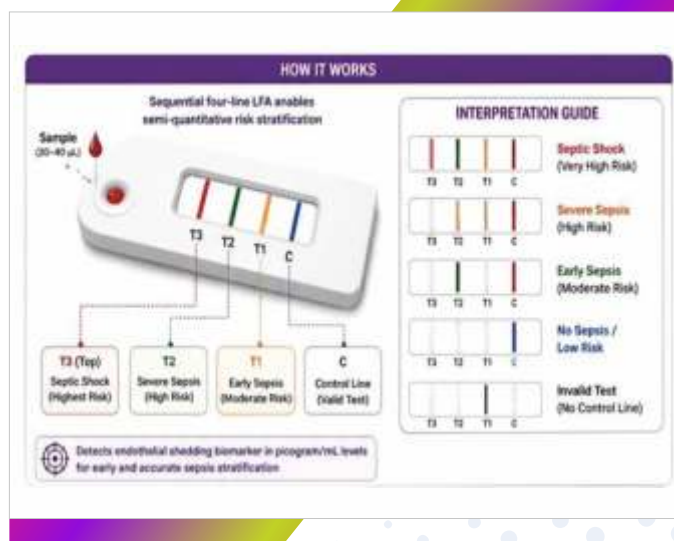
Thematic Area: **Biopharma & Health technologies**

Category: **Diagnostics**

# Rapid Lateral Flow Device for Early Detection and Stratification of Sepsis

## Overview

This lateral flow device utilizes robust multi-color latex microparticles to specifically detect a biomarker shed directly from the endothelial cell lining in patient serum. By directly assessing vascular integrity rather than relying on generalized inflammatory markers, the device provides rapid, semi-quantitative visual risk stratification at the bedside. It distinctly categorizes patients into early sepsis, severe sepsis, or septic shock. This rapid bedside staging empowers clinicians to implement targeted interventions, aiming to reduce sepsis mortality.



## Functionalities

- Semi-quantifies endothelial shedding levels visually using a sequential four-line test architecture on LFA platform.
- Operates completely equipment-free utilizing engineered substrate materials to ensure uniform capillary sample flow.
- Point-of-Care device for rapid diagnosis in ICU as well resource limited setup.
- Affordable devices with a possibility for both diagnosis and prognosis.

## Key Features

- Easy to use and well established LFA platform.
- Quick results without any training requirement.
- Achieves an ultra-sensitive diagnostic detection limit in picogram/mL.
- Eliminates subjective visual errors when paired with optical reader.
- Highly stable latex bioconjugation resists aggregation in complex fluids.
- Very low sample requirements of 20 to 40 microlitres.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	NR

## Contact Details

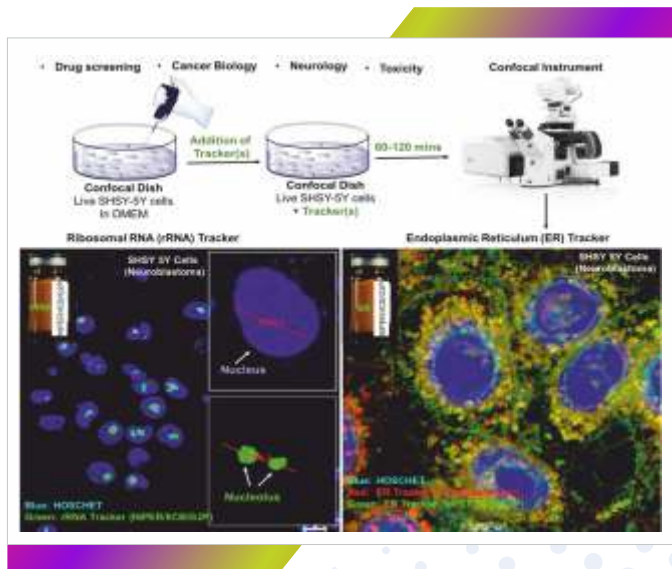
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Thematic Area: **Biopharma & Health technologies**  
Category: **Fluorescent Biosensors for Cell biology**

# Smart Fluorescent Tracker for Cellular Endoplasmic Reticulum (ER) and Ribosomal-RNA (rRNA) Imaging

## Overview

Selective fluorescent probes targeting the endoplasmic reticulum (ER) and ribosomal RNA (rRNA) are essential for studying protein synthesis, cellular stress, and disease progression. Our next-generation probes offer wash-free imaging, high specificity, strong fluorescence, and live-cell compatibility, overcoming limitations of existing technologies. The platform is being advanced for transfer and commercialization with G2P Pvt. Ltd. to enable broad research and industrial applications.



## Functionalities

- Monitoring ER stress and unfolded protein response (UPR)
- Screening ER-targeted drug candidates
- Studying protein folding, trafficking, and secretion pathways
- Investigation of protein translation machinery
- Monitoring ribosome biogenesis and nucleolar activity
- Studying ribosomal dysregulation in cancer (ribosomopathies)
- Antibiotic screening and mechanism-of-action studies

## Key Features

- Wash-free imaging capability (major differentiator over commercial dyes)
- Strong signal-to-noise ratio
- Excellent photostability for prolonged imaging
- Compatible with confocal, fluorescence, and high-content imaging systems
- High binding affinity and selectivity toward rRNA
- Suitable for live-cell and fixed-cell imaging
- Enables real-time visualization of ribosomal distribution and dynamics

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	7	6- 7 Days

## Contact Details

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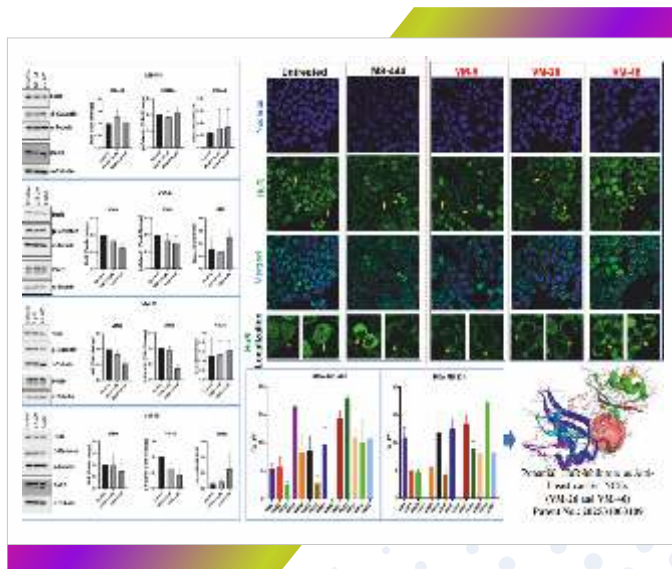
Thematic Area: **Biopharma & Health technologies**

Category: **New Chemical Entities (NCEs)**





# Compounds for Human Antigen R (HUR) RNA Binding Protein Inhibition and Method of Preparation Thereof

## Overview

Fourteen globally novel synthetic compounds (NCEs) were prepared for the first time and investigated as Human Antigen R (HuR) Inhibitors available for further clinical evaluation as a treatment solution of breast cancer. **VM-6**, **VM-26**, and **VM-46** compounds showed HuR inhibition effect and induced apoptosis in MDA-MB-468 cells. **VM-26** and **VM-46** showed remarkably better anticancer activity ( $IC_{50} < 2.5 \mu M$ ) against MDA-MB-468 and MDA-MB-231 breast cancer cells compared to the other synthesized compounds and reference standard MS-444 (failed to attain  $IC_5$ ).



## Functionalities

-  Novel synthetic compounds (NCEs) as Human Antigen R (HuR) Inhibitors
-  Compounds showed better activity against MDA-MB-468 and MDA-MB-231 cells
-  VM-26 and VM-46 showed remarkably better anticancer activity against breast cancer
-  No commercial HuR inhibitors are available for the treatment of cancer

## Key Features

- Distinctive features - Process and Product Patent of Novel synthetic HuR Inhibitors
- Advantages - Novel HuR Inhibitors against breast cancer
- Unique value proposition of the technology/innovation - Globally novel potential synthetic HuR Inhibitors (NCEs) and no player.

## Implementation Overview

Deployed	TRL	Training Requirement
1	3	30

## Contact Details

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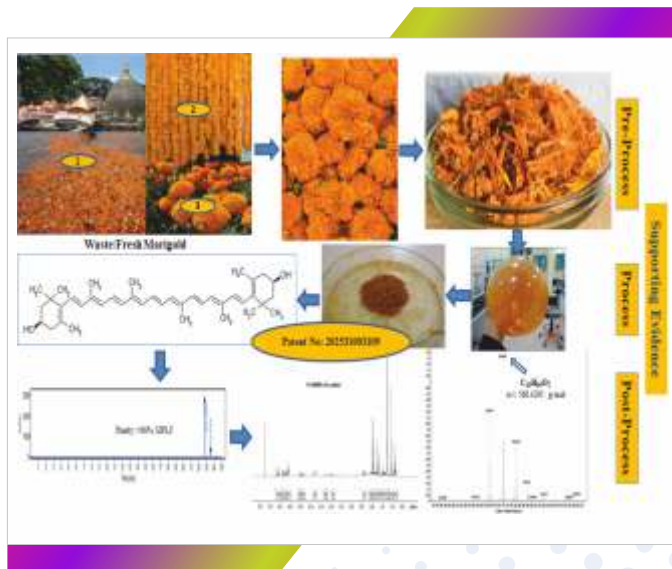
Thematic Area: **Biopharma & Health technologies**

Category: **Process technology for Phyto API**





# Methods for Preparation of Lutein from Marigold Flowers

## Overview

A novel low-cost scale-up process for Lutein production was developed from marigold. The time duration to complete one batch production is 4 days, which is shortest than the exiting industrial process (~28 days). The process is to get high yield (12%) and highly pure (>95%) lutein from marigold flowers. The lutein is export grade and equivalent to the reference standard and useful to valuable for pharmaceutical and nutraceutical industry. The technology can be used for floral waste management. This agriculture-based Zero-waste process technology add value to Bio-Economy, glorify Make in India, and farmers life.



## Functionalities

-  Low-cost novel scale-up process for lutein production from marigold flowers
-  The duration to complete one batch production is very less (4 days)
-  The process to get high yield (12%) and high pure lutein (> 96%)
-  Zero-waste technology can be used for floral waste management.

## Key Features

- **Distinctive features** – Export grade lutein (Phyto API) production Process Technology
- **Advantages** – High demand in the pharmaceutical, nutraceutical, cosmetic, and food industries for the therapeutic area of AMD, Cataract, Uveitis, etc.
- **Unique value proposition of the technology/innovation** – Robust, zero waste, low-cost, high pure Lutein production Process Technology

## Implementation Overview

Deployed	TRL	Training Requirement
2	9	15

## Contact Details

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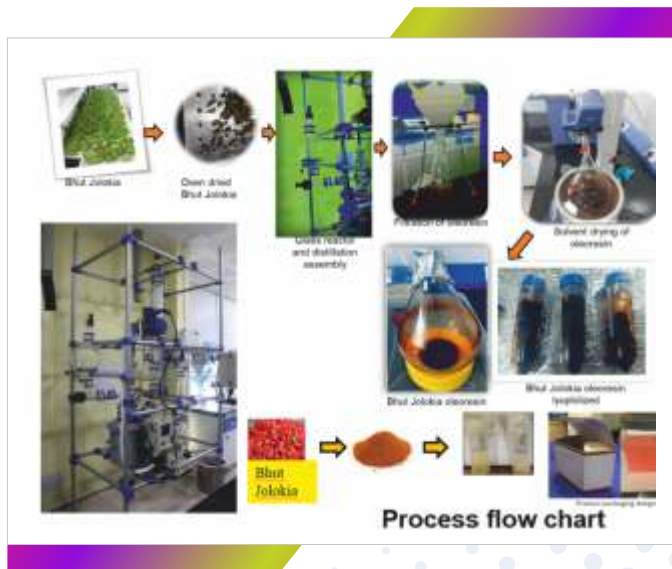
Thematic Area: **Biopharma & Health technologies**

Category: **API**



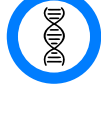

## Scalable industrial process development for the phyto-based oleoresins and reference standards/APIs from indigenous bioresources from north-east India

### Overview

Biodiversity-rich resources from Northeast India, including Bhut Jolokia, Lakadong turmeric, ginger, and black pepper, offer significant potential for development of high-value nutraceutical and pharmaceutical products. Pure bioactive marker compounds such as curcumin, capsaicin, dihydrocapsaicin, piperine, and related phytochemicals have been isolated and characterized with very high purity using advanced analytical techniques including NMR, HRMS, FT-IR, HPLC, and UV spectroscopy. In addition, optimized extraction technologies and oleoresin formulations have been developed using biodegradable solvents for enhanced yield and scalability. The technology platform supports indigenous production of certified herbal reference materials and APIs for routine QA/QC applications, thereby reducing import dependence and strengthening domestic nutraceutical and pharmaceutical industries.



### Functionalities

-  **Development of highly purified plant-based marker compounds and APIs from medicinal and spice crops including Bhut Jolokia and Lakadong turmeric.**
-  **Optimized extraction and oleoresin production technologies for high-yield recovery of bioactive phytochemicals.**
-  **Generation of certified reference materials for routine quality assurance and quality control in herbal, nutraceutical, and pharmaceutical industries.**
-  **Support for indigenous manufacturing and reduction of import dependence on herbal reference standards.**

### Key Features

- Isolation and characterization of high-purity phytochemical markers using advanced analytical techniques including NMR, HRMS, FT-IR, HPLC, and UV spectroscopy.
- Plant-derived marker compounds with strong commercial potential as APIs and QA/QC reference materials.
- Standardized and reproducible extraction procedures suitable for repetitive batch production.
- Technologies developed for multiple medicinal plants and spices including Lakadong turmeric, Bhut Jolokia, ginger, and black pepper.

### Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	3	NA

### Contact Details

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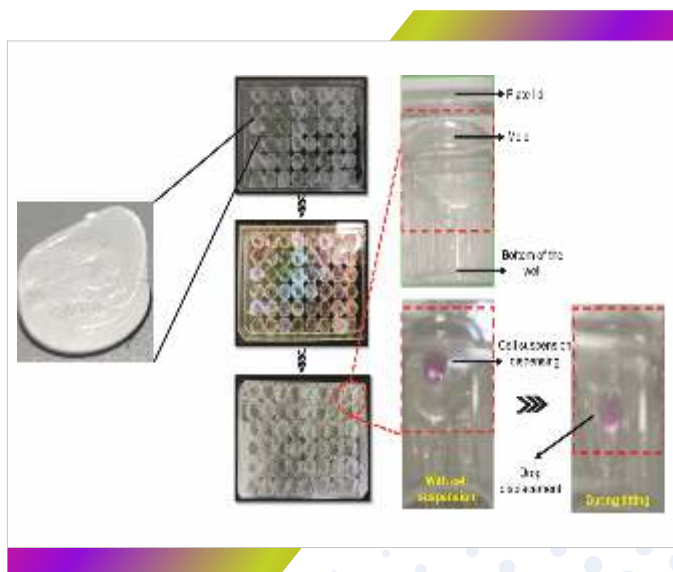
Thematic Area: **Biopharma & Health technologies**

Category: **Cell culture platform**

## 3D-printed Nanofiber-Coated Slippery Device (3D- NS) for High- throughput Production and Retrieval of Cellular Spheroids

### Overview

The present invention relates to a high-throughput generation of in vitro 3D spheroids platform for drug screening applications. The method and platform is easily scalable as 3D-printed slippery device promotes the formation and easy retrieval of spheroids with 100% recovery that can overcome all current limitations associated with conventional hanging drop method. The developed device can be attached to the lid of the tissue culture well-plates that can be recharged and reused.



### Functionalities



Generic device for high-throughput spheroid generation in cancer and other disease cell lines



Easy spheroid retrieval process maintaining spheroid integrity

### Key Features

- High stability of the cultured droplets leading to spherical, compact, and uniform spheroid formation
- 3D-printed device
- Reusable
- Faster and easy spheroid retrieval process

### Implementation Overview

Deployed	TRL	Training Requirement
No	4	2-5 Days

### Contact Details

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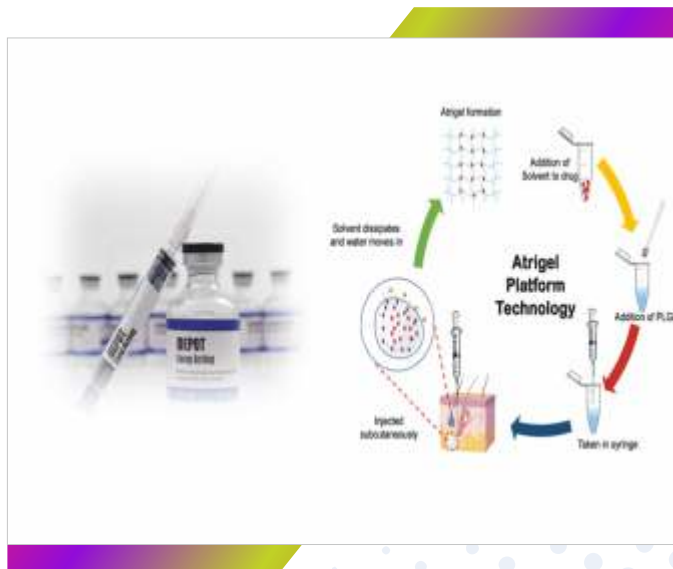
Thematic Area: **Biopharma & Health technologies**

Category: **Platform Technology for long-acting Injectable formulation**

## PLGA-Dipeptide complex as biocompatible pharmaceutical excipient composition for control drug release

### Overview

In-situ forming, poly (D, L-lactic-co-glycolic acid) (PLGA)-based implants offer an interesting potential as parenteral controlled drug delivery system. However, the burst/initial release and high viscosity of formulations are major challenges. The present invention relates to PLGA-Dipeptide complex as biocompatible pharmaceutical excipient composition for control drug release with a reduced initial burst effect of the said drug formulation or pharmaceutical formulation or therapeutic agent. In addition, the eutectic mixture of PLGA and Dipeptides is cost effective, easy to formulate, and has ease of placement, and diverse payload capacity.



### Functionalities



**Reduced Initial Burst Release**



**Reduced Cost of Atrigel with the use of low molecular weight PLGA**



**Modular need-based formulation**

### Key Features

- Defined material attributes vs Unknown material attribute of parenteral long-acting-release (LAR) products e. g ELIGARD®, ATRIDOX®
- Reduction of initial burst release
- Opportunity to match that of innovator product release profile

### Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	3	NA

### Contact Details

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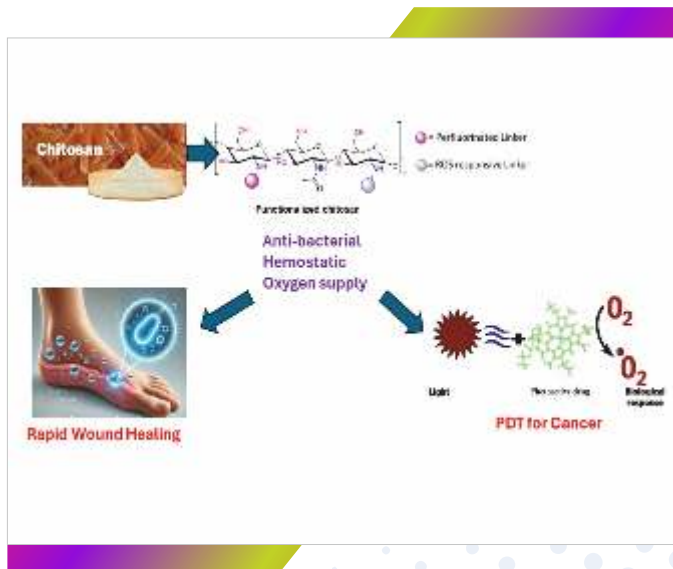
Thematic Area: **Biopharma & Health technologies**

Category: **New BioMaterial**

# Hexafluoro-carbinol functionalised ROS- responsive chitosans and use thereafter

## Overview

This invention discloses a reactive oxygen species (ROS)-responsive chitosan derivative functionalized with hexafluorocarbonyl moieties. Incorporation of HFC aids chitosan ability to carry dissolved oxygen. ROS responsive degradation of chitosan and sustained release of oxygen at the site of chronic wound suggest additional advantage of the antibacterial, homeostatic chitosan applications in wound healing.



## Functionalities



Chitosan with oxygen carrying ability



Degradation in response to ROS

## Key Features

- Opportunity to be used as anti-bacterial coating
- Can be formulated with oxygen generating material
- Applications in Chronic wound healing and Cancer photodynamic therapy

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
No	3	6 Months

Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# Polyherbal Composition Containing Slow Eroding Extrudate for Treatment of Mouth Ulcer

## Overview

A mouth ulcer is a common problem in which a painful sore occurs inside the mouth. The currently available topical gels/creams have limited patient compliance due to an increase in irritation when applied on affected site as well as continuous excessive salivation which demands frequent splitting. Our innovative polyherbal formulation is palatable, polymer-based lozenge and unlike conventional sugar-based lozenges dissolves very slowly in the saliva and hence provides long lasting relief without the need for splitting.



## Functionalities



Polyherbal ingredients provide unique relief in pain associated with ulcer



Unlike conventional sugar-based lozenges, uses inert polymer as base and hence, even suitable for diabetic patients



As slowly erodes and hence, provide long lasting effect

## Key Features

- Sugar free base of lozenges
- Slowly dissolving and thereby providing long lasting relief
- Unique combination of herbal ingredients to provide pain relief and healing in mouth ulcer

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	NA

## Contact Details

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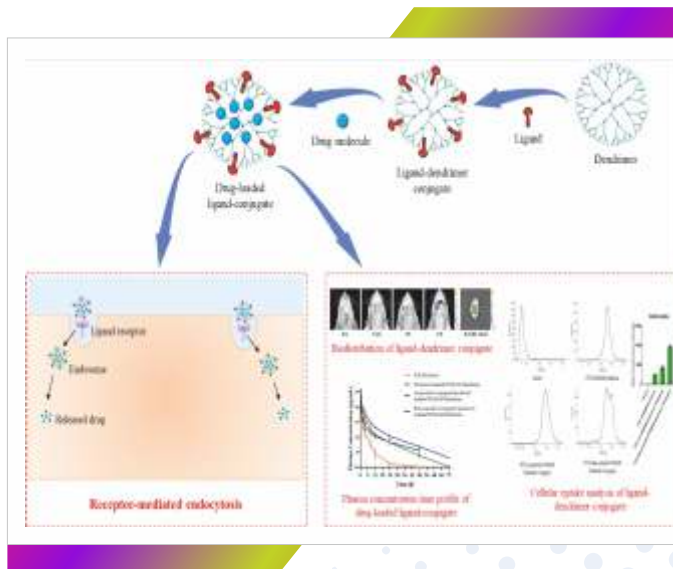
Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# Novel Dendrimer Conjugates for Targeted Delivery of Drug(S) to Treat Life-Threatening Diseases

## Overview

The present technology focuses on developing a ligand-functionalized dendrimeric conjugate for targeted drug delivery in breast cancer and Alzheimer's disease. It enhances drug solubility, improves cellular uptake, enables site-specific drug release, increases drug bioavailability, and reduces systemic side effects. This innovation benefits the pharmaceutical and healthcare sectors by improving therapeutic efficacy while minimizing the toxicity associated with conventional drug delivery systems.



## Functionalities



Enables receptor-mediated targeted delivery of therapeutic agents



Improves solubilization, stability, and systemic bioavailability of hydrophobic therapeutics



Enables controlled and site-specific drug release at targeted tissues.

## Key Features

- Ligand-conjugated dendrimers enable precise active targeting
- Enhanced therapeutic efficacy and minimized systemic toxicity
- Superior pharmacokinetics with prolonged circulation

## Implementation Overview

Deployed	TRL	Training Requirement
No	4-5	7-10 Days

## Contact Details

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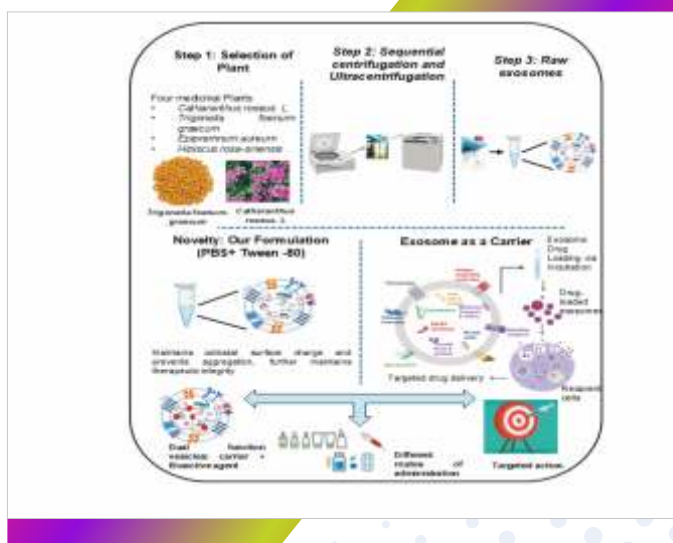
Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# Green Nanotechnology: A Novel Approach to Isolate Plant Exosomes for Drug Delivery and Diagnostics

## Overview

The present invention, plant-derived exosome technology, is a scalable, indigenous method for isolating exosomes from four medicinal plants. It is a biocompatible, cost-effective alternative to synthetic liposomes. These nanovesicles use Tween-80 in their formulation to ensure the therapeutic cargo remains stable for a long time at various temperatures (4°C, -20°C, and 27 ± 2°C). This innovative technology represents a next-generation biocompatible nanopatform, orally deliverable therapeutics with dual functions as both carriers and bioactive agents.



## Functionalities



Scalable and cost-effective indigenous bioprocessing platform for production of plant-derived exosomes.



Supports targeted drug delivery through synergistic exosome-phytochemical interactions.



Oral nanocarrier system with gastrointestinal stability and natural absorption capability.



Biodegradable, non-toxic, and sustainable nano-delivery platform with potential dual-action therapeutic functionality.

## Key Features

- Patented indigenous technology for isolation of high-purity plant-derived exosomes.
- Economical and scalable bioprocessing platform suitable for industrial-scale production.
- Non-synthetic, biodegradable, and low-toxicity nano-delivery system.

## Implementation Overview

**Deployed**

50+

**TRL**

4-5

**Training Requirement**

5-7 Days

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# A Super saturable Self-Emulsifying Drug Delivery System For Improved Oral Bioavailability of Dasatinib

## Overview

Dasatinib (DASA), a second-generation BCR-ABL inhibitor, exhibits poor oral bioavailability (14–24%) and dose-related gastrointestinal side effects. This invention presents a super saturable self-emulsifying drug delivery system (su-SEDDS) incorporating a precipitation inhibitor (PVP K30) to maintain prolonged supersaturation and prevent drug precipitation. The formulation improves solubility, stability, and absorption, showing ~2.7-fold higher AUC than drug suspension and ~1.9-fold over SEDDS without inhibitor, demonstrating strong potential for enhanced therapeutic, efficacy and industrial application.



## Functionalities



Enhanced solubility and oral bioavailability resulted in low therapeutic dose



Industrially feasible as it is a straightforward simple production process



Easily convertible into stable solid dosage forms i.e. Capsules or tablets

## Key Features

- Enhanced oral bioavailability
- Higher aqueous solubility and less precipitation tendency in gastrointestinal environment
- High drug loading capacity and maintained prolonged super saturable state

## Implementation Overview

Deployed	TRL	Training Requirement
50+	3	No

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# Glucobreathe: A Standardized *Dillenia indica* Herbal Intervention for Diabetes and Pulmonary Disorders

## Overview

Glucobreathe is a patented, standardized formulation derived from *Dillenia indica*, traditionally used in North-East India for respiratory and diabetic conditions. Phytochemical analysis identified key bioactives such as betulinic acid and hesperidin. Preclinical studies demonstrated significant anti-inflammatory effects in acute lung injury and improved insulin secretion and glycemic control in diabetes models. Validated at pilot scale for reproducibility, Glucobreathe represents a novel, dual-action formulation with strong translational potential for pulmonary and metabolic disorders.



## Functionalities

- **Dual therapeutic action targeting respiratory inflammation and metabolic dysfunction in diabetes conditions**
- **Reduces inflammatory responses and improves lung architecture in acute lung injury models**
- **Enhances insulin secretion and supports effective glycemic control in experimental diabetes models**
- **Standardized extract ensures consistent phytochemical composition and reproducible therapeutic efficacy across batches**
- **Granule formulation enables convenient oral administration and improved patient compliance**
- **Rich in bioactives like betulinic acid and flavonoids contributing to pharmacological activity**
- **Demonstrated scalability through successful pilot-scale batch production and process validation at GMP facility of IIIM Jammu**

## Key Features

- Pleasant tangy taste enhances palatability and patient compliance
- Unique fruit size minimizes adulteration and ensures raw material authenticity
- No hypoglycemic episodes observed, indicating improved safety profile
- Integrates traditional ethnomedicinal knowledge with modern scientific and pharmacological validation
- Supports prevention of neuropathy and nephropathy in diabetic conditions

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	2-3 Days

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# BiSpekDAb™: A Novel Bispecific Domain Antibody (anti-IL-23/TNF-α) for Inflammatory conditions

## Overview

BiSpekDAb™ is a novel, bispecific domain antibody that can neutralize IL-23 and TNF-α (the major pro-inflammatory cytokines involved in multiple inflammatory conditions). By addressing dual inflammatory pathways, it offers superior therapeutic efficacy over current monospecific antibodies. Preclinical efficacy data demonstrates significant therapeutic potential in inflammatory conditions (asthma, ischemic stroke, neuropathic pain), with a clear path toward clinical development and commercial partnership. Utilizing a cost-effective *Pichia pastoris* expression system, this innovation aims to provide an affordable, high-quality alternative to expensive imported biologics for managing chronic inflammatory conditions.



## Functionalities



Neutralize IL-23 and TNF-α cytokines to attenuate multiple inflammatory signaling pathways.



Demonstrates significant therapeutic efficacy in preclinical animal model of asthma, stroke, and pain.

## Key Features

- Dual-pathway inhibition enhances efficacy over existing monospecific antibodies.
- *P. pastoris* expression platform lowers manufacturing and consequently treatment costs.
- Potential first indigenous biologic improving accessibility for Jan-Manas (common people).

## Implementation Overview

Deployed	TRL	Training Requirement
No	3	Hand holding for GLP-studies & subsequent IND application filing and Clinical studies

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Therapeutics**

# Standardized Alkaloid-Enriched Extract from Curry Leaves (*Murraya koenigii*) as an Anti-Obesity Nutraceutical

## Overview

A standardized alkaloid-enriched extract (AEE) from *Murraya koenigii* (curry leaves) has been developed as a nutraceutical for obesity management. It contains ~75% carbazole alkaloids, standardized using four marker compounds. Preclinical studies show anti-diabetes activity, and safety has been established through preclinical toxicological evaluation and a human study with Sri Dhanwantry Ayurvedic College and Hospital, Chandigarh. The technology (TRL 4–6) shows promise for commercialization as a plant-based for diabetes supplement.



## Functionalities



Provides anti-diabetes effects by modulating lipid and glucose metabolism pathways



Standardized high-content carbazole alkaloid formulation ensures batch-to-batch consistency



Supports weight management and diabetes as a plant-based nutraceutical



Demonstrates safety through preclinical toxicology and human clinical evaluation of capsule formulation

## Key Features

- High (~75%) carbazole alkaloid enrichment ensuring potent bioactivity
- Standardized formulation with four validated marker compounds
- Dual efficacy against obesity and associated metabolic disorders
- Safety validated through preclinical and clinical studies
- Scalable extraction process suitable for commercial nutraceutical production

## Implementation Overview

**Deployed**

No

**TRL**

4-6

**Training Requirement**

NR

## Contact Details

**Prof. Sanjay M. Jachak**

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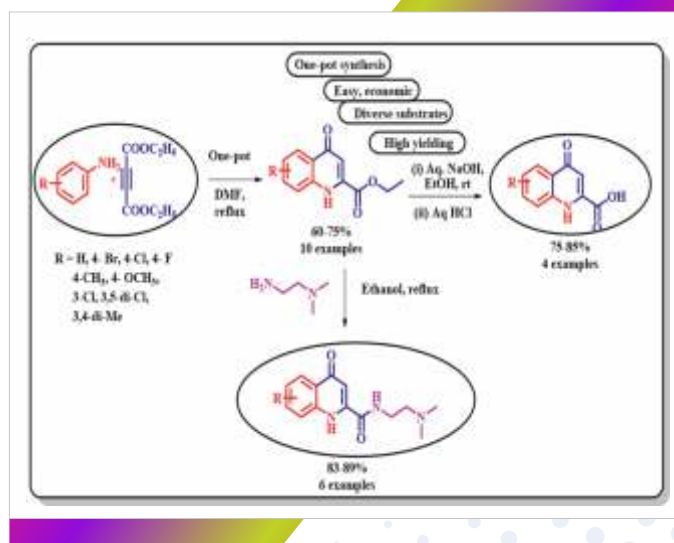
Thematic Area: **Biopharma & Health technologies**

Category: **Small Molecules**

# Easy and Green Synthesis of Neuroprotective Kynurenic Acid and SRZ-72 Derivatives

## Overview

Kynurenic acid (KYNA) is an endogenous molecule as a non-selective antagonist of ionotropic glutamate receptors with neuroprotective activity. Herein we developed a novel one-pot, catalyst free, green synthesis of KYNA esters which were used to synthesize KYNAs via hydrolysis and via condensation with amines to KYNA like SRZ-72 known for neuroprotective effect. Previous methods reported the ester synthesis via two steps using different organic or metallic catalyst, also used coupling reaction or multi- step synthesis to generate amide derivatives.



## Functionalities



As neuroprotective supplement and can be used in treatment of Alzheimer's disease.



Kynurenic acid esters and amides may act as prodrug allowing to cross BBB.



An economic process for kynurenic acid esters and then acid and amide analogues conversion.



Diverse functionality inclusion and tolerability.



Gram scale synthesis achieved with good yields.

## Key Features

- One-pot synthesis of KYNA esters.
- Metal free and catalyst free green synthesis.
- Easy and economic synthesis to kynurenic acid & amide derivatives.
- Direct conversion KYNA ester into kynurenic acid & amide derivatives.

## Implementation Overview

**Deployed**

No

**TRL**

4

**Training Requirement**

5 Days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Dose-flexible Personalized / Patient-Centric medicine**

# Single-Step Direct Powder Extrusion (DPE) Pharmaceutical 3D Printer

## Overview

DPE is an extrusion-based additive manufacturing technique used in pharmaceutical 3D printing. In this approach, a powdered blend of the active pharmaceutical ingredient, polymers, and other excipients is directly fed into a single-screw extruder. The material is heated in a melt generation unit and subsequently extruded through a nozzle to print tablets or other dosage forms in a layer-by-layer manner, based on designs created using CAD software. Notably, this process eliminates the need for filament preparation via hot-melt extrusion. Compared with conventional manufacturing methods, DPE-based 3D printing enables on-demand production of diverse dosage forms, making it particularly well-suited for personalized dosing and specialized therapeutic applications.



## Functionalities



Single-step direct powder extrusion-based Pharmaceutical 3D printing to bypass hot-melt extrusion technique



On-demand manufacturing in hospitals and pharmacies and Implantable drug delivery systems



Solvent-free processing, Process simplification, personalization, and high drug loading



Direct, design-driven digital pharmaceuticals enabling seamless conversion of powder blends into 3D printed dosage forms in a single step

## Key Features

- Single-step additive manufacturing technique to eliminate filament preparation and intermediate steps
- High drug loading capacity without polymeric filament constraints
- Personalized, on-demand manufacturing supports patient-specific dosing and therapies

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	10

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **API**

# Industrial Process Excellency Enabled by Green NO<sup>2</sup> Reduction for Cost-Effective API Manufacturing

## Overview

India, despite being the “Pharmacy of the World,” relies heavily on China for key starting materials, pharmaceuticals and intermediates, creating supply chain vulnerabilities. This technology addresses this gap through a green, metal-free NO<sub>2</sub> reduction platform enabling cost-effective, scalable, and indigenous API manufacturing which covers PLIs and Non-PLIs scheme API. The one-pot telescopic process reduces steps, waste, and cost, strengthening domestic production capabilities and supporting Atmanirbhar Bharat and resilient pharmaceutical supply chains



## Functionalities



Efficient conversion of nitroarenes into API intermediates



Enables one-pot telescopic and scalable synthesis processes



Eliminates metal residues and simplifies purification steps



Supports cost-effective and environmentally sustainable manufacturing

## Key Features

- Metal-free and environmentally benign reduction platform
- One-pot telescopic process reduces operational complexity
- Demonstrated scalability up to 100-200 g level
- Industry-ready technology aligned with PLI initiative

## Contact Details

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**Dr. Maneesh K. Kashyp**  
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## Implementation Overview

Deployed	TRL	Training Requirement
No	5-6	3 Days

Thematic Area: **Biopharma and Health Technologies**

Category: **Drug Delivery Systems**

# NanoCrySP™: A Platform Technology for Preparation of Nanocrystalline Solid Dispersions (NCSD)

## Overview

NanoCrySP™ is a novel bottom-up platform technology that produces nanocrystalline solid dispersions (NCSD) using spray drying. Drug nanocrystals (<1000 nm) are generated and embedded within sugar or sugar-alcohol excipient matrices, forming discrete microparticles (0.5–20 μm). The excipient serves as a crystallization-inducing agent, promoting drug crystal formation through plasticization, heterogeneous nucleation, and imparting a physical barrier to crystal growth. This approach enhances apparent solubility, dissolution rate, and gastric mucosal adhesion, thereby improving biopharmaceutical performance.



## Functionalities

- **Bottom-up nanocrystal generation during spray drying**
- **No requirement of nanosuspension formation**
- **Avoids contamination from milling media (unlike top-down methods)**
- **Closed-system process minimizes contamination and degradation**
- **High drug loading possible with maintained performance**
- **Minimal downstream processing required**

## Key Features

- Eliminates additional drying steps required for nanosuspensions
- Reduces risk of contamination (no beads/media)
- Improved powder properties (flow, morphology, compaction)
- Physically stable solid form (better storage stability)
- Cost-effective due to reduced processing steps
- Applicable to NCEs, generics, nutraceuticals, veterinary and differentiated products of existing drugs.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5-6	2 Days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Casualty Evacuation**

# "Rakshita" Ambulance Bike for Transportation of Casualty for CAPFs and Armed Forces

## Overview

'Rakshita' Ambulance Bike is equipped with a detachable Casualty Evacuation Seat (C.E.S.) which can be used to transport casualty quickly in areas where there are unmetalled and unpaved roads and are not easily accessible for the traditional four wheeler ambulance. It is particularly useful in Naxal and Border areas where CAPFs operate. This bike is equipped with oxygen cylinder, first-aid box, air splint box, head immobilizer, harness jacket, I.V. fluid rod and Multiparameter Patient Monitor (M.P.P.M.) device which can be connected to dashboard mounted TAB through Bluetooth.



## Functionalities



Provide on-spot first-aid treatment to casualty



Easy evacuation of casualty to nearby hospital



Monitoring of vital physiological parameters during evacuation

## Key Features

- Made of high quality stainless steel and aluminium alloys
- Can be maneuvered single handedly like a wheel chair after detaching
- Can take load upto 90 KG

## Implementation Overview

Deployed	TRL	Training Requirement
yes	9	No

## Contact Details

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Phone: 011-23942418, Fax; 23919509  
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Thematic Area: **Biopharma and Health Technologies**

Category: **Fire Protective suit**

# Structural Firefighting Suit

## Overview

Centre for Fire, Explosive and Environment Safety (CFEES) has developed an advanced structural fire-fighting suit using indigenously engineered, multi-layered materials that provide an optimal balance of flame resistance, thermal protection, and wearer comfort. Designed for extreme fire environments, each layer performs a specific role, including flame resistance, thermal insulation, and moisture management. The suit meets EN 469 (Level 2) requirements and thermal protection level performance requirements mandated by NFPA 1971 standard (TPP > 44 cal/cm<sup>2</sup>). The ensemble (coat and trousers) is lightweight (<2.8 kg), reducing wearer fatigue and enhancing operational efficiency. The technology has been transferred to two Industries and the suit is available on GeM



## Functionalities



Provides high thermal and radiant heat protection in extreme fire conditions



Ensures an optimal balance between protection and wearer comfort



Offers effective insulation against convective and conductive heat transfer



Enables moisture management for reduced heat stress and improved endurance



Supports enhanced mobility and operational efficiency during fire-fighting operations

## Key Features

- High thermal protection performance with TPP up to 44 cal/cm<sup>2</sup>
- Excellent resistance to radiant and convective heat (RHTI<sub>24</sub> ≥ 29, HTI<sub>24</sub> ≥ 52)
- High moisture permeability (WVTR > 2330 g/m<sup>2</sup>/day) ensuring breathability, comfort, and reduced heat stress
- Superior water penetration resistance (> 25 psi) under high pressure conditions
- Weight ≤ 2.8 kg

## Implementation Overview

**Deployed**

Yes

**TRL**

9

**Training Requirement**

No

## Contact Details

Director CFEES  
Centre for Fire, Explosive and Environment Safety  
Brig. S. K. Mazumdar Marg, Timarpur  
Delhi – 110054

Thematic Area: **Biopharma and Health Technologies**

Category: **Point-of-Care Diagnostics and Biomarker-Based Detection**






# High-Altitude Pulmonary Edema (HAPE) Rapid Diagnostic Kit

## Overview

The **Diagnostic Kit** is an innovative, point-of-care lateral flow assay developed for the early detection of High Altitude Pulmonary Edema (HAPE) using a specific protein biomarker (SULT1A1). This technology addresses a critical gap in high-altitude healthcare, where access to advanced diagnostic facilities is limited. By providing quick, reliable, and **less invasive** detection (requiring only a small blood sample), the kit facilitates early medical intervention, thereby reducing morbidity and preventing life-threatening complications. The primary beneficiaries include military personnel, mountaineers, trekkers, and civilians deployed or traveling to high-altitude regions. The kit has significant implications for defence services, disaster response teams, and remote healthcare systems by enhancing decision-making in extreme environments.



## Functionalities

-  **Rapid point-of-care detection of HAPE using SULT1A1 protein biomarker.**
-  **Requires minimal blood sample and provides results within minutes**
-  **Portable, user-friendly design suitable for high-altitude and resource-limited environments**
-  **Enables early risk assessment before severe symptoms, improving preventive intervention strategies.**
-  **Reduces need for complex laboratory infrastructure and trained personnel in field conditions.**

## Key Features

- First-of-its-kind biomarker-based rapid detection of HAPE risk
- SULT1A1-based assay enabling early and specific diagnosis.
- Requires minimal blood sample, ensuring less invasive testing approach.
- Field-deployable design tailored for military and remote healthcare settings.
- CDSO-Approved Rapid Point-of-Care Test for Early detection of High-Altitude Pulmonary Edema (HAPE)

## Implementation Overview

Deployed	TRL	Training Requirement
No	6-7 <ul style="list-style-type: none"> <li>● Prototype developed and validated under controlled laboratory conditions.</li> <li>● Field-level validation and user trials currently in progress.</li> <li>● Technology nearing deployment with scope for large-scale manufacturing and adoption.</li> </ul>	1-2 days (includes basic operation, sample handling, result interpretation, and safety protocols.)

## Contact Details

**Dr Yasmin Ahmad,**  
Scientist E  
DIPAS, DRDO, Delhi-10054

Thematic Area: **Biopharma and Health Technologies**

Category: **Antidotes for Radioactive and Non-Radioactive isotopes of Cesium and Thallium**

# Pru-Decorp™ and Pru-Decorp MG- Antidote of Cesium and Thallium

## Overview

**Pru-Decorp™** & **Pru-Decorp-MG** are the CDSO approved capsules developed by INMAS as a medical countermeasure (MCM) for radioactive/nonradioactive Cesium and thallium internal contamination during radiological & nuclear (R&N) emergency. Pru-Decorp™ is recommended for therapeutic use and **Pru-Decorp-MG** for prophylactic use. Both capsules contain Prussian blue insoluble as active ingredient which is WHO recommended critical drug. INMAS has developed the technology for active ingredient and capsules dosage forms.



## Functionalities



Hastens the removal of internalized Cs and thallium by fecal route



Reduces the retention time of Cesium and thallium by one third



Pru-Decorp-MG prevents the internalization of radioactive Cs & TI during R&N emergency

## Key Features

- India is self-reliant for Prussian Blue capsules.
- Pru-Decorp-MG is the novel product, first in the world
- Cost Effective and commercially available in India
- Clinically Used in Thallium poisoning cased in India and Cs-137 contaminated Humans in Indonesia

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, 5 Lakh capsules of Pru-Decorp™ and 10,000 Capsules of Pru-Decorp-MG	9	NA

## Contact Details

**The Director**  
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Thematic Area: **Biopharma and Health Technologies**

Category: **Wound Healing**

# PUNARVARTAN (ReGen)' An Advanced Wound Healing Device

## Overview

'PUNARVARTAN' is a portable, indigenous, advanced wound healing device to accelerate tissue regeneration and reduces healing time (e.g. 30 days down to 7-10 days) for large trauma, burn, and chronic wounds by combining local oxygen delivery with negative pressure to remove discharge and promote blood vessel growth.



## Functionalities



Integrated negative pressure therapy



Targeted topical oxygen delivery



Combination therapy

## Key Features

- Accelerated healing rate to reduce the wound healing time.
- Better outcome reduced wound size, new and healthy tissue formation.
- Reduces the number of dressing changes.

## Implementation Overview

Deployed	TRL	Training Requirement
No	9	yes

## Contact Details

**The Director,**  
Institute of Nuclear Medicine and Allied Sciences (INMAS),  
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E-mail; director.inmas@gov.in

Thematic Area: **Biopharma and Health Technologies**

# CBRN Water Purification System

## Overview

In a CBRN warfare/ disaster scenario water bodies get contaminated with fallout radioactive dust, dispersed CBRN agents, Toxins, turbidity, salinity, etc. Such water if ingested leads to severe health issues and may lead to death. A mobile vehicle mounted CBRN Water Purification System has been developed by DL Jodhpur, for treating such water.

- System Realized
- 01 system installed at HA field area



## Key Features

- Capacity : 2500 liters / hour
- Operational zone : Desert, Plains and High Altitude

## Contact Details

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Rajasthan-342011  
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Thematic Area: **Biopharma and Health Technologies**

Category: **Precision Therapeutics**

# “First-in-Class” Anti Metastatic Anticancer Agent, M2 against Breast Cancer

## Overview

An anti-Metastatic Cancer Therapeutic Agent, M2' was designed against Breast Cancer. This agent inhibits Epithelial to Mesenchymal Transition (EMT), reduces Chemoresistance, Cancer Stemness and Metastasis. It acts on solid tumor and significantly inhibits cancer spread and immune suppression without eliciting significant adverse effects. The toxicity and pharmacokinetic data suggest this can be made to ready for new drug administration to combat cancer metastasis and hence elongate life of cancer patients.

## Functionalities



The most complicated Triple Negative Breast Cancer can be treated using the agent to impede metastasis.



The agent is anti-cancer, antimetastatic against carcinoma (Solid Tumor), can be administered in Oral and IV form.



This agent significantly reduces tumor size, cancer metastasis, chemoresistance and stemness.



It works in Breast Cancer very well, tested in in vivo models (i.e. most dangerous TNBC).

## Key Features

- The anticancer agent can impede cancer metastasis, chemoresistance, stemness.
- The anticancer agent is a small molecule, cost effective and easy to synthesize in industry.
- This molecule will elongate lifespan of the patients without eliciting major side effects.

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	5	NA

## Contact Details

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Department of Biological Sciences, Bose Institute,  
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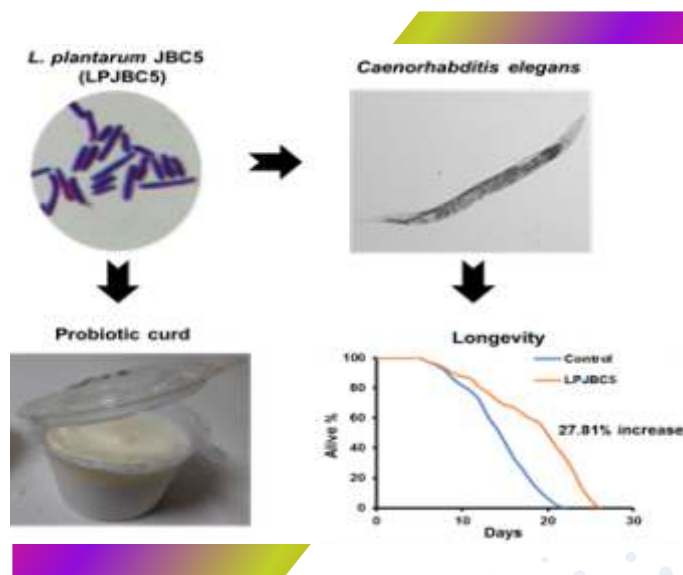
Thematic Area: **Biopharma and Health Technologies**

Category: **Functional Foods / Probiotics / Dairy Biotechnology**





# A Method for Preparation of Functional Curd with Anti- Ageing Property and High Shelf Life

## Overview

A novel functional curd developed using a unique combination of two probiotic strains, *Lactobacillus plantarum* JBC5 and *Lactobacillus brevis* H4 from IASST, Guwahati. The technology delivers anti-ageing benefits and extended shelf life, using locally sourced, low-cost materials. With 90 citations since 2022, it targets the dairy industry for commercial scale-up, offering nutritional and public health benefits to a wide consumer base.



## Functionalities

-  Produces probiotic-enriched curd with scientifically validated anti-ageing properties
-  Extends shelf life of curd significantly, reducing food wastage
-  Ensures consistent and reliable curdling through an optimized probiotic strain ratio
-  Enhances gut health and nutrition via a probiotic-rich functional dairy product

## Key Features

- Novel probiotic combination (*L. plantarum* JBC5 + *L. brevis* H4), not reported in prior art
- Dual benefit: anti-ageing + extended shelf life in a single product
- Scalable for commercial dairy industry adoption at low cost
- Probiotic-rich formulation supporting gut health and nutrition

## Implementation Overview

Deployed	TRL	Training Requirement
No	6	14 Days

## Contact Details

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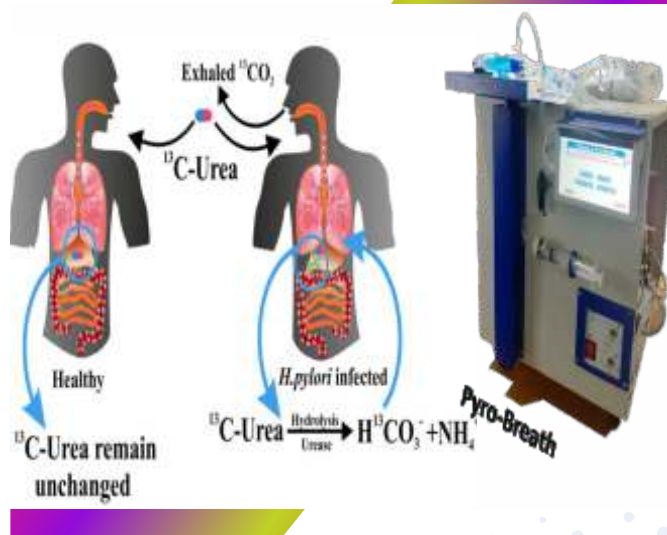
Thematic Area: **Biopharma and Health Technologies**

Category: **Public Health**

# A system and kit for non-invasive detection of peptic ulcer disease, non-ulcerous dyspepsia and *Helicobacter pylori* infection (Pyro-Breath)

## Overview

The method can diagnose *H. pylori* bacterial infection in the stomach and various gastrointestinal disorders by identifying unique breath prints in human exhaled breath.



## Functionalities



A new-generation non-invasive diagnostic strategy



Technology exploiting a simple residual gas analyzer (RGA)



Scans specific 'Breath-Print Masses (BPMs)' in real-time

## Key Features

- Method to detect *H. pylori* bacterial infection via non-invasive and painless method
- Helps physicians for early and quick diagnosis of *Helicobacter pylori* infection
- Accuracy better compared with 'gold-standard' endoscopic tests

## Implementation Overview

Deployed	TRL	Training Requirement
01	6	NA

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Biomaterials/Advanced Materials/Biopharma**

# Bioceramic Beads with Graded Porosity for Drug Delivery in Bone (BONYX)

## Overview

Near spherical Bioceramic beads for controlled drug delivery. Biocompatible system allows for local delivery of active molecules, enhancing activity, reducing systemic toxicity. The beads are made via an innovative process utilizing a super hydrophobic bead bed system. This results in beads with controlled geometry, porosity gradients and is automated with all parts, materials, software sourced from India.



## Functionalities



**Modular Antibiotic Loading**



**Leads fight against anti – microbial resistance**



**Local delivery ensures rapid action in infection**



**Optimized for drug delivery and defect management**

## Key Features

- Novel process based deep tech innovation
- Enables highly spherical, size controlled bioceramic beads
- Clinically applied – commercially available in India
- Make in India from Idea to Application

## Implementation Overview

### Deployed

Yes, 1000 per year

### TRL

9, commercialized.

### Training Requirement

30 days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Biomaterials**

# Wound Healing Matrix-Cholederm from Mammalian Gall Bladder

## Overview

An indigenous technology for recovering extracellular matrix from mammalian gall bladder (cholecyst) of farm animals has been developed and *Cholederm* for dermal applications has been fabricated. It is an advanced wound care product, thin sheets of 200-micron thickness, for faster healing of skin wounds.



## Functionalities



Regulates proteases, immunomodulation, Enhanced Granulation and Angiogenesis



Biocompatible and Safe, Faster healing of skin wounds with minimum scarring



Used for treating diabetic/leprosy ulcers



Potential use in treating cancer recession wounds and venous ulcers

## Key Features

- First indigenously fabricated advanced wound care product from animal tissues
- Contains 154 biomolecules essential for healing
- More affordable health care products from slaughterhouse waste
- Value added products for livestock farmers

## Implementation Overview

### Deployed

1000/year

### TRL

9, commercialized product

### Training Requirement

30 days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Neuromodulation device/Precision Therapeutics / Implantable Medical Devices**

# Deep Brain Stimulator (DBS): An Indigenous Implantable Neuromodulation System for Movement Disorders

## Overview

Deep Brain Stimulator (DBS) is a high-end active implantable medical device designed for the treatment of debilitating neurological disorders such as Parkinson's disease, Dystonia, and Essential Tremor. The technology has also demonstrated future potential in epilepsy, obsessive compulsive disorder, depression, and other neuropsychiatric conditions. This indigenous know-how developed in collaboration with Bhabha Atomic Research Centre, achieved successful prototype realization and preliminary safety validation.



## Functionalities



Precision electrical stimulation for management of movement disorders



Customizable patient-specific therapy through programmable parameters



Rechargeable long-life implantable pulse generator system



Wireless communication for clinician and patient control



Bilateral stimulation capability for advanced neurological cases

## Key Features

- Indigenous high-end implantable neurotechnology developed in India
- Cost-effective alternative to imported DBS systems
- Rechargeable wireless IPG with extended battery life
- Multi-channel programmable stimulation architecture
- Safe charge-balanced stimulation waveform delivery
- Compact miniaturized implant design for patient comfort
- Scalable platform for future neurological indications

## Implementation Overview

Deployed	TRL	Training Requirement
No, Technology transferred to Shree Pacetronix Ltd. for commercialization and industrial scale-up.	7	3-5 days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Precision Therapeutics**

# Nanoparticle Compositions of Antibacterial Compounds and Other Uses Thereof

## Overview

Macromolecular nanotherapeutics designed to combat the superbug crisis. This novel antibacterial therapeutic agent, by targeting the bacterial cell envelope, effectively eradicate drug-resistant Gram-positive and Gram-negative bacteria. Beyond its antibacterial action, this composition also suppresses harmful inflammation, potentially offering a dual-action defense against sepsis and biofilms. Such multifaceted properties of the composition make it a lucrative and superior alternative to conventional approved antibiotics.

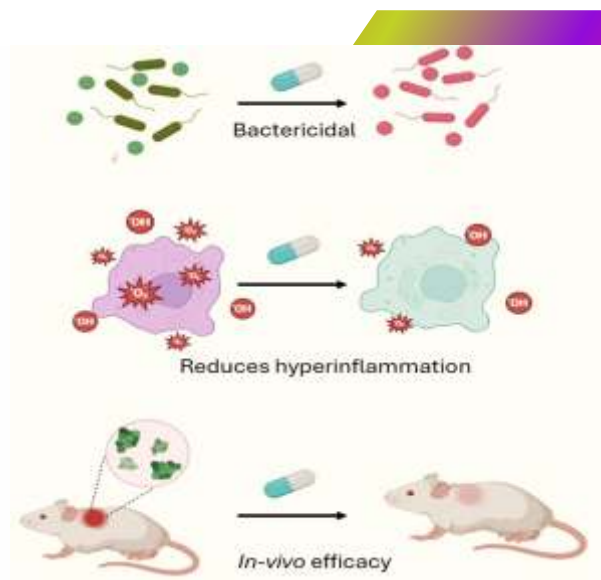


Figure: Utility of Nanoparticle Compositions of Antibacterial Compounds

## Functionalities



Enables lucrative, large-scale production via simple post-functionalization of inexpensive, commercially available starting polymers



Achieves high water solubility for direct therapeutic application without requiring additional chemical excipients



Combines potent antimicrobial action with immunomodulatory behaviour to suppress potentially lethal systemic inflammation, offering better therapeutic prospects

## Key Features

- Effective- Superior to conventional antibiotics across multiple therapeutic performance metrics
- Long lasting- Physically disrupts membranes to prevent multidrug-resistant "Superbug" development
- Safe- Selectively eliminates pathogens while retaining biocompatibility

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	NA

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Antimicrobial therapeutics**

# Nucleoside Hydrogels with Antimicrobial Properties

## Overview

The present invention relates to formation of hydrogel, more specifically to nucleoside hydrogels which also possess tunable antimicrobial properties. The developed hydrogel offers a promising solution for topical treatment of resistant microbial infections. The ultimate beneficiaries will be those patients suffering from resistant microbial infections (bacterial and leishmanial) especially in low- and middle-income countries where disease burden is high. Public health systems will get benefited from improved treatment options with enhanced efficacy and reduced toxicity.

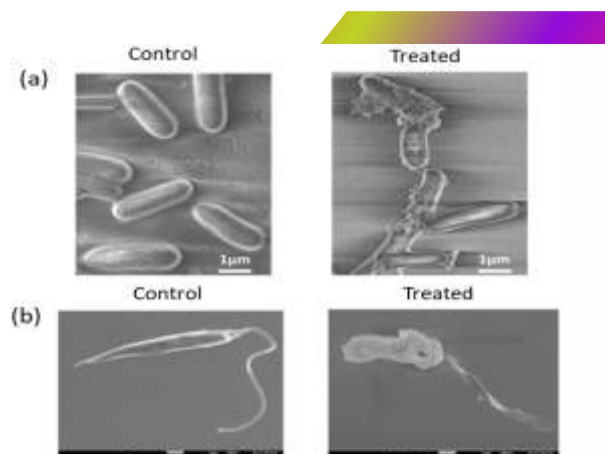


Figure: SEM images of (a) bacterial cells and (b) *Leishmania* parasites after hydrogel treatment, showing membrane disruption and cell death

## Functionalities



Formation of silver ion driven cytidine based supramolecular hydrogels in presence of phenyl boronic acid



Biocompatible gel with significant antimicrobial effect against bacteria and leishmanial parasites



Easy to prepare and can be transportable in lyophilized powder form



The gel exhibits excellent thixotropic property that can be used as promising antimicrobial topical formulation

## Key Features

- Biocompatible nucleoside-based platform with minimal toxicity and high stability
- Cytidine-driven self-assembly expands beyond conventional guanosine gel systems
- pH and metal ion responsive dynamic structural adaptability
- Stable i-motif formation under physiological conditions via Ag induction
- Versatile platform for hydrogels and nanostructures
- Scalable and modular design for diverse biomedical applications

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	6 months

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Public health**

# Non-Enzymatic Fluorescent Rapid Test Kit for Detecting Cholesterol Levels

## Overview

An innovative non-enzymatic fluorescent rapid test kit for sensitive and selective detection of cholesterol levels in biological samples had been developed. Unlike conventional enzyme-based cholesterol assays, this utility patent introduces a direct, metal-free fluorescent nanoprobe platform capable of detecting total cholesterol and its fractions (HDL, LDL, triglycerides) through a single integrated assay. Clinically validated, the innovation has strong translational potential in in vitro diagnostics (IVD), preventive healthcare, and decentralized disease monitoring.



## Functionalities

- **Rapid detection of total cholesterol and cholesterol fractions in serum samples**
- **Non-enzymatic and metal-free fluorescent sensing with turn-on signal response**
- **Ultra-sensitive detection with LOD up to 10 nM (cholesterol) and ~ 30 nM (cholesterol esters)**
- **Single-platform multi-analyte detection for HDL, LDL, and triglycerides**
- **Suitable for point-of-care and laboratory diagnostics**
- **Compatible with complex biological matrices such as blood serum**

## Key Features

- **Innovative:** Direct fluorescence-based detection without enzymes or multi-step reagent systems and Small organic molecule fluorescent nanoprobe technology
- **Sensitive & Selective:** ultra-sensitive detection (10 nM) with high selectivity toward cholesterol esters and Accurate quantification of cholesterol biomarkers
- **Scalable & Affordable:** Rapid, cost-effective testing platform and Potential for portable diagnostic kit development

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	NA

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **IoT-Enabled Healthcare Systems/Food preservation Technologies**




# An IoT-based System for Antibacterial photodynamic inactivation (aPDI)

## Overview

The technology is an Internet of Things (IoT)-based system designed for antibacterial photodynamic inactivation (aPDI). It utilizes a controlled light environment to activate photosensitizers, generating reactive oxygen species (ROS) to eliminate or reduce microorganisms. The system integrates electronics, communication, and computer science engineering to provide a cost-effective and environmentally friendly alternative to traditional antibiotics. This patented technology has significant multidisciplinary applications. In the healthcare sector, it holds promise for infection management and wound care, particularly in addressing antibacterial resistance. In the food and agricultural industries, the system can contribute to microbial load reduction and shelf-life enhancement, supporting safer storage and processing practices.



## Functionalities

-  **Precision Inactivation:** Emits LED light to trigger lethal oxidative stress in bacteria.
-  **Real-Time Monitoring:** Continuously monitors multiple parameters, including light irradiance, operating temperature, and time of exposure.
-  **Automated Control:** A microcontroller manages control inputs for adjusting irradiance levels, exposure time (0-300 minutes), and internal chamber temperature.

## Key Features

- **IoT Integration:** Equipped with a web-based IoT suite for remote observation and recording of experimental data.
- **Multi-Sensor Array:** Employs specialized sensors, including the AS7341 for irradiance and the LM35 for temperature measurement.
- **Interactive Display:** The device shows an informative display of temperature in centigrade and exposure time.

## Implementation Overview

The technology was granted an Indian patent in March, 2026 (Patent No. 582242) and is currently in the pre-commercialization stage.

Deployed	TRL	Training Requirement
No	9	1- 2 days

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Bone regeneration**

# Core–Shell Polymeric Nanofibers for Bone Regeneration Using Sustainable Materials

## Overview

This work presents coaxially electrospun core–shell polymeric nanofibers for bone regeneration, integrating bioactive and antimicrobial functionalities within a biodegradable scaffold. The Poly Caprolactone core incorporates dopamine and natural hydroxyapatite derived from fish waste, promoting osteoconductivity and sustainability, while the Poly Lactic acid shell loaded with ZnO provides infection control. The system enables controlled release and supports cell adhesion and growth, offering a cost-effective and eco-friendly solution for advanced bone tissue engineering applications.

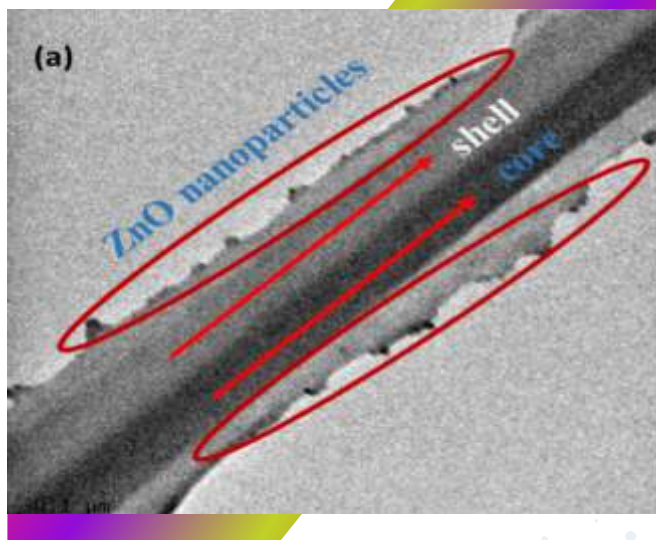


Figure illustrates TEM images of the PCL/Dopamine/Hydroxyapatite and PLA/ZnO core

## Functionalities



Supports bone tissue regeneration through osteoconductive and biocompatible nanofibrous scaffold



Provides controlled and sustained release of bioactive components for enhanced healing



Enhances cell adhesion, proliferation, and differentiation through dopamine-functionalized core



Maintains structural integrity with biodegradable PCL–PLA core–shell architecture during tissue regeneration

## Key Features

- Coaxial core–shell nanofiber architecture enabling multifunctional performance
- Fish waste–derived hydroxyapatite ensures sustainability and biocompatibility
- Integrated antimicrobial ZnO reduces infection risks during healing
- Controlled release system for sustained therapeutic effectiveness

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	14

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Thematic Area: **Biopharma and Health Technologies**

Category: **Veterinary Vaccines and Immunization Technologies**

## FMDV Vaccine Strains (O IND R2/1975, A IND 27/2011, and Asia1 IND 63/1972)

### Overview

A set of updated indigenous FMDV vaccine strains representing serotypes O, A, and Asia1, designed to improve antigenic matching with circulating field viruses. The inclusion of the alternative serotype A strain (A IND 27/2011) enhances vaccine efficacy against emerging variants, supporting robust disease control, reducing outbreak incidence, and strengthening national FMD eradication programs.

### Functionalities



Provides immunization against major FMDV serotypes (O, A, Asia1)



Enhances vaccine efficacy through improved antigenic matching



Supports formulation of updated trivalent FMD vaccines

### Key Features

- Incorporates updated strain for emerging serotype A variants
- Indigenous strains aligned with Indian epidemiological conditions
- Enables broad-spectrum and improved protective immunity

### Implementation Overview

Deployed	TRL	Training Requirement
Yes (Technology transferred to two companies with handholding training support)	5	15 days

### Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **e-textiles / Smart Textiles**

## Heat Generating Smart Textile Products

### Overview

This technology involves development of conductive yarn and coating paste capable of generating controlled heat when powered. It enables the fabrication of smart textiles for therapeutic, orthotic, and cold-protection applications. The innovation offers lightweight, flexible, & energy-efficient heating solutions suitable for healthcare, sports, and defense sectors, improving comfort and functionality compared to conventional heating systems.



### Functionalities



Generates controlled heat through electrically conductive yarn structures



Can be integrated into garments, orthotics, and wearable textiles



Supports uniform heat distribution across textile surfaces



Compatible with coating/printing techniques for scalable production

### Key Features

- Flexible, lightweight, and wearable heating solution
- Energy-efficient with low power consumption
- Easily integrable into existing textile products
- Suitable for therapeutic and cold-weather applications

### Implementation Overview

#### Deployed

Yes (Prototype developed and industry interest initiated)

#### TRL

6-7 (Technology demonstrated in relevant environment)

#### Training Requirement

5-7 days

### Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Vaccine**





## Covaxin: India's Indigenous COVID-19 vaccine

### Overview

Covaxin is an inactivated whole-virion COVID-19 vaccine developed by Indian Council of Medical Research in collaboration with Bharat Biotech. It uses an inactivated SARS-CoV-2 virus to safely trigger an immune response. The vaccine strengthened India's pandemic response by enabling domestic production, improving vaccine access, and supporting large-scale immunization, particularly in low-resource settings.



### Functionalities

-  Supports large-scale immunization through stable storage and standard cold-chain requirements
-  Enables domestic vaccine manufacturing, reducing dependency on global vaccine supply chains
-  Suitable for diverse populations with proven safety and efficacy profiles
-  Provides protection against COVID-19 by generating neutralizing antibodies

### Key Features

- Whole-virion inactivated platform enabling broad antigenic immune response
- Developed using indigenous technology, strengthening national vaccine self-reliance
- Demonstrates favorable safety profile with conventional vaccine platform approach
- Enables rapid deployment in resource-limited and rural healthcare settings
- Compatible with heterologous booster strategies for enhanced immunity
- Leverages traditional vaccine platform with well-established safety record

### Implementation Overview

#### Deployed

Yes; administered to millions across India under national immunization programs

#### TRL

9 (commercially deployed and widely used in real-world conditions)

#### Training Requirement

1–2 days (basic vaccine handling, storage, and administration protocols)

### Contact Details

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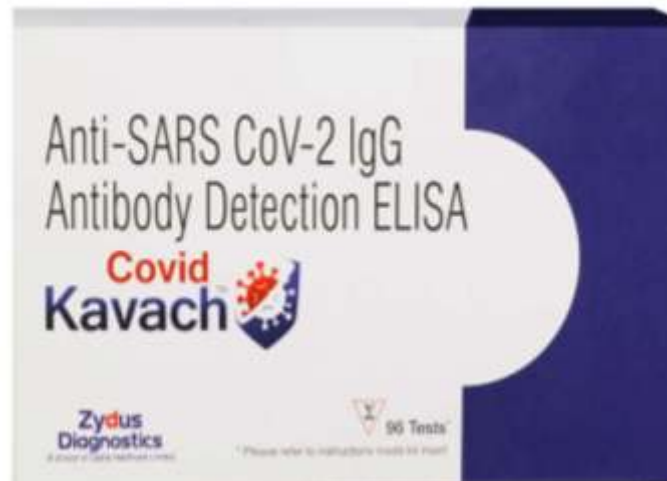
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics & Devices**

# Anti-SARS CoV-2 human IgG antibody detection ELISA assay (COVID Kavach)

## Overview

COVID Kavach is an ELISA-based diagnostic assay designed to detect IgG antibodies against SARS-CoV-2 in human serum or plasma. It helps identify past infection and supports sero-surveillance, epidemiological studies, and vaccine response assessment. The test is cost-effective, scalable, and suitable for large populations, benefiting public health systems by enabling informed policy decisions and tracking immunity trends in communities.



## Functionalities



**Detects SARS-CoV-2 specific IgG antibodies in human serum or plasma samples**



**Enables identification of past infection and immune response in tested individuals**



**Supports large-scale sero-surveillance and population-level epidemiological studies**



**Assesses antibody response following vaccination or natural infection**



**Provides reliable, cost-effective testing suitable for high-throughput laboratory settings**

## Key Features

- High sensitivity and specificity for accurate antibody detection.
- Cost-effective solution suitable for large-scale population screening.
- ELISA-based platform ensures standardized and reproducible test results.
- High-throughput capability enables testing of large sample volumes.
- Useful for epidemiological studies and vaccine response monitoring.

## Implementation Overview

### Deployed

**Yes; implemented across multiple public and private diagnostic laboratories nationwide.**

### TRL

**9 (fully validated and commercially deployed diagnostic technology).**

### Training Requirement

**1–2 days for laboratory personnel familiar with ELISA procedures**

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Thematic Area: **Biopharma and Health Technologies**

Category: **Molecular diagnostics**




## CRISPR-Cas based TB detection system

### Overview

A CRISPR-Cas12a based TB detection system integrating rapid DNA extraction (RapidBact, Patent Appl. No. IN202511026919), multiplex PCR-CRISPR-Cas12a assay (Glow-TBPCR, Patent Appl. No. IN202411043686), and incubation-cum-fluorescence detection device (RapidGlow, Patent Appl. No. IN202411016083) and software (RGLOW, Copyright Diary No. SW-48607/2025-CO). This is a high-throughput, and cost-effective, alternative to centralized diagnostics; enables early, affordable TB detection, reducing disease spread, deaths, stigma, and patient costs, while improving access to diagnosis in hospital settings.



### Functionalities

-  Performs heat-based lysis and rapid column DNA extraction from sputum samples
-  Detects 3 MTB genes using multiplex PCR and CRISPR-Cas12a fluorescence-based assay
-  Enables real-time detection and analysis in RapidGlow device (using integrated RGLOW software)

### Key Features

- Fast (~3.5 hours turnaround time for 16 samples) and low-cost (~₹150 per test and one-time device cost of ~₹6,000).
- High sensitivity and specificity: Multiplex (targets 3 MTB genes), limit of detection: ~1 copy of DNA, 100% sensitivity and specificity (validated in 323 clinical samples vis-a-vis GeneXpert)
- High scalability (16 samples at a time), light-weight device (~5 kg)

### Implementation Overview

Deployed	TRL	Training Requirement
	5	NA

### Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

## Nipah Point of Care assay






### Overview

The Nipah Point-of-Care diagnostic is a rapid, field-deployable test developed for early detection of Nipah Virus Infection in humans. It enables timely diagnosis at peripheral healthcare settings without advanced laboratory infrastructure. This innovation supports outbreak containment, reduces transmission risk, and strengthens public health response, particularly benefiting rural and resource-limited regions through faster clinical decision-making and improved disease surveillance.



Nipah Point of Care assay

### Functionalities

-  **Rapidly detects Nipah Virus Infection at point-of-care settings without complex laboratory infrastructure**
-  **Provides early diagnosis using minimal sample processing and simplified testing workflow**
-  **Enables on-site screening in remote or resource-limited healthcare facilities**
-  **Supports timely clinical decision-making and immediate patient management during outbreaks**
-  **Facilitates surveillance and outbreak control through quick identification of suspected cases**

### Key Features

- Rapid results within 1.5 hrs, enabling immediate clinical decision-making.
- Portable design suitable for field and remote healthcare settings.
- Minimal infrastructure requirement compared to conventional laboratory diagnostics.
- High sensitivity and specificity for Nipah Virus Infection detection.
- User-friendly operation requiring limited technical expertise and training.

### Implementation Overview

#### Deployed

Yes Nipah Point of care assay has been extensively validated in field set up. Considering the remote locations of Nipah Virus outbreaks and bat surveillance in forest settings, a user-friendly PoC system would prove to be a boon in detecting the Nipah virus at the source. This would be specifically beneficial for the countries such as India and Bangladesh where access to the containment facility is limited

Successfully deployed during Nipah Outbreak investigations during 2019, 2021, 2023, 2025 and 2026.

- Deployed in various field bat survey activities.

**TRL : 8**

**Training Requirement :** 2-3 days for healthcare workers and laboratory technicians on device operation and interpretation

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Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

# Diagnostic ELISA for Detection of IgM Antibodies against Dengue Virus

## Overview

NIV Dengue IgM Capture ELISA kit is intended for qualitative detection of IgM antibodies in serum of patients presenting clinical signs and symptoms consistent with Dengue. The test was standardized and reported by NIV in 1984. The performance of the test was evaluated by Christian Medical College (CMC), Vellore in 2002. The present DEN IgM kit contains ready to use reagents. Recent evaluation using well characterized samples (n=377) revealed that the kit has a diagnostic sensitivity of 98.53% and diagnostic specificity of 98.84%. The kit has high inter and intra assay reproducibility.



Diagnostic ELISA for Detection of IgM Antibodies against Dengue Virus

## Functionalities

Dengue IgM Capture ELISA developed by ICMR-NIV, can be used as a diagnostic tool to detect probable dengue at late post onset day of infection (POD) (From 5 POD onwards) (can be used at any levels - clinical set ups, public health centres and hospitals).

## Key Features

### Diagnostic Characteristics:

- Diagnostic Sensitivity 98.53%
- Diagnostic Specificity 98.84%

## Implementation Overview

### Deployed

The Dengue IgM Capture ELISA kits are being supplied to sentinel surveillance hospitals and apex referral laboratories under national program (NVBDCP and VRDLs) throughout the country by ICMR-NIV. The technology has been transferred to three industries for commercialization

TRL : 6

Training Requirement : 1 week

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

# Diagnostic ELISA for Detection of IgM Antibodies against Chikungunya Virus

## Overview

CHIK IgM Capture ELISA developed by ICMR-NIV is intended for qualitative detection of Chikungunya virus specific IgM antibodies in serum of patients presenting clinical signs and symptoms consistent with Chikungunya. The present CHIK IgM kit contains all ready to use reagents and has been evaluated for performance by Center for Disease Control (CDC), Fort Collins, CO, USA. The kit has a diagnostic sensitivity of 95% and diagnostic specificity of 98%. The kit has high inter and intra assay reproducibility.



Diagnostic ELISA for detection of IgM antibodies against Chikungunya virus

## Functionalities

Chikungunya IgM Capture ELISA developed by ICMR-NIV, can be used as a diagnostic tool to detect probable Chikungunya at late post onset day of infection (POD) (From 5 POD onwards) (can be used at any levels - clinical set ups, public health centres and hospitals).

## Key Features

### Diagnostic Characteristics:

- Diagnostic Sensitivity 95%
- Diagnostic Specificity 98%

### Reproducibility:

Three pools of sera samples were tested on NIV Chikungunya IgM capture ELISA on different days. This data was used to estimate Intra-run and Inter-day precision using analysis of co-variance (ANOVA II). The result is summarized in the following table:

Precision Measures (Using Sample absorbance) of NIV Chikungunya IgM ELISA kit

Sample Pool	Number of Samples (n)	Mean OD	Intra-run		Inter-day		Total	
			SD	%CV	SD	%CV	SD	%CV
CHIK Strong Positive	192	1.168	0.102	8.73%	0.066	5.69%	0.166	14.25%
CHIK Weak Positive	192	0.367	0.040	10.94%	0.020	5.45%	0.071	19.42%
CHIK Negative	180	0.068	0.008	11.88%	0.001	1.00%	0.008	12.17%

SD = Standard Deviation; CV = Co-efficient of Variation

## Implementation Overview

### Deployed

The kits are being supplied to sentinel surveillance hospitals and apex referral laboratories under national program (NVBDCP and VRDLs) throughout the country by ICMR-NIV. The technology has been transferred to following industries: Medsource Ozone Biomedicals, Diatek Healthcare, Matrixlabs

**TRL : 6**

**Training Requirement : 1 week**

## Contact Details

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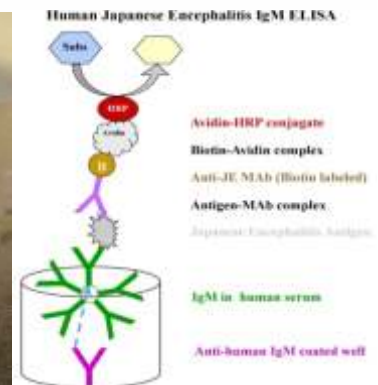
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

# Diagnostic ELISA for Detection of IgM Antibodies against Japanese Encephalitis Virus

## Overview

Japanese Encephalitis (JE) is a mosquito borne viral disease and is an important cause of seasonal viral encephalitis. NIV JE IgM Capture ELISA kit is intended for qualitative detection of IgM antibodies in serum / CSF of patients presenting clinical signs and symptoms consistent with Japanese Encephalitis. The serological assay is designed for providing the presumptive diagnosis of JE. The test was standardized and reported by NIV in 1984).



Diagnostic ELISA for detection of IgM antibodies against JEV

## Functionalities

NIV JE IgM Capture ELISA Can be used as a diagnostic tool to detect probable JE at late post onset day of infection (POD) (From 5 POD onwards) (can be used at any levels -clinical set ups, public health centres and hospitals).

## Key Features

The present JE IgM kit contains all ready to use reagents and has been evaluated by Centers for Disease control (CDC), Fort Collins, CO, USA for its performance.

The kit has a diagnostic sensitivity of 81% and diagnostic specificity of 86%. The kit has high inter and intra assay reproducibility.

## Implementation Overview

### Deployed

The technology has been standardized for up scaling. It is currently in regular production and the kits are being supplied to sentinel surveillance hospitals and apex referral laboratories under national program.

Deployed: The JE IgM Capture ELISA kits are being supplied to national program (NVBDCP and VRDLs) throughout the country by ICMR-NIV.

The technology has been transferred to following industries,

1. Medsource Ozone Biomedicals (Faridabad, Haryana)
2. Diatek Healthcare (Kolkata, West Bengal)

TRL : 6

Training Requirement : 1 week

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics Technology**

# Assay for simultaneous detection of SARS-CoV-2, Influenza A and Influenza B from Respiratory Samples.

## Overview

Influenza and SARS CoV2 are respiratory infections and shared overlapping symptoms like fever, cough, and body aches. In view of the emergence of the SARS-CoV-2 pandemic in December 2019, there was an instant need to have highly sensitive molecular tests for rapid detection of SARS-CoV-2 and Influenza A and B to facilitate public health interventions. ICMR NIV Pune developed cost effective multiplex single tube assay for simultaneous detection and differentiate between SARS-CoV-2, Influenza A, and Influenza B from respiratory samples.



Assay for simultaneous detection of SARS-CoV-2, Influenza A and Influenza B from Respiratory Samples

## Functionalities

- **Simultaneous Detection:** Identify multiple viral targets and differentiate as Influenza A, Influenza B and SARS CoV-2 in same tube.
- **High Specificity and Sensitivity:** 10 viral diagnostic laboratories externally validated the multiplex kit with 98.9 to 100% sensitivity and 100% specificity. Assay do not have cross reactivity with other respiratory viruses.
- **The kit also validated by WHO CC Melbourne with 100% specificity and sensitivity against CDC Kit.**
- **Participated in EQAS program with 100% concordance result using this assay.**
- **Analytical sensitivity (limit of detection): Assay detects 15 Copies of Influenza A, 16 Copies of influenza B and 20 Copies of SARS COV 2.**

## Key Features

- Accurate detection of SARS CoV 2 and its variants (Till date XFG), H1N1/pdm09 and H3N2; Yamagata and Victoria of Inf B.
- It has housekeeping gene to assess sample quality and RNA extraction method
- Integrated surveillance of Flu and SARS-CoV-2 help to take control measures of public health important viruses
- Helps to identify co-infections and give targeted treatment for influenza and SARS CoV-2.
- Cost effective: Comes in kit format hence minimizes the cost.
- The ease of reagent addition as Kit contains primer probe pool (three viruses) Enzyme and positive control. Easiness for setting up the reactions (multiple additions are not required ) minimizes handling errors
- Short turnaround time: Results available within 60 mins after extraction.
- The kit reagents are stable at -200 C and showed long shelf life i.e. 24 months
- Kit has compact and attractive package with one pager hand out (Kit insert)

## Implementation Overview

### Deployed

Yes, Kit is deployed in Pan India syndromic year round surveillance for respiratory viruses since 2021. NIC Is providing ready to use multiplex assay to 73 laboratories. These laboratories submitting epidemiological and testing data to national portal for dashboard display at ICMR website. Niti Ayog reviews this data for public health matures.

**TRL : 9 :** The Multiplex assay technology has been transferred to Meril Diagnostics Pvt Limited, Vapi and J Mitra

**Training Requirement :** Three day training required to understand the assay set up and interpretation

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Thematic Area: **Biopharma and Health Technologies**

Category: **In-Vitro Diagnostics (IVD)**

## Anti KFD Human IgM ELISA

### Overview

The Anti-KFD Human IgM ELISA is a diagnostic assay designed to detect Immunoglobulin M (IgM) antibodies against Kyasanur Forest Disease virus in patients presenting clinical signs and symptoms consistent with KFDV infection human serum. It enables early and accurate diagnosis of acute infections, supporting timely treatment. This technology strengthens public health surveillance, particularly in endemic regions, benefiting healthcare systems, clinicians, and at-risk populations through rapid, reliable testing. This serological assay is designed for providing the presumptive diagnosis of KFDV.



### Functionalities



Detects KFD-specific IgM antibodies in human serum samples for early-stage diagnosis



Enables rapid, high-throughput screening suitable for outbreak surveillance and epidemiological studies



Provides high sensitivity and specificity for accurate differentiation from other febrile illnesses



Supports laboratory-based confirmation using standardized ELISA protocols and reagents

### Key Features

- Rapid turnaround time enables prompt clinical and public health response
- Suitable for large-scale screening during outbreaks in endemic regions
- Standardized assay protocol ensures reproducibility across diagnostic laboratories
- Cost-effective testing compared to advanced molecular diagnostic methods

### Implementation Overview

#### Deployed

Yes, Provided to network laboratories under various projects to support the diagnosis of the KFDV. A study on the kinetics of viral RNA and antibody response in Kyasanur Forest Disease (KFD) patients demonstrated that anti-KFD virus (KFDV) IgM antibodies are detectable from the 4th to the 122nd post-onset day (POD). Based on these findings, a diagnostic algorithm was developed using an in-house kit. During the acute phase (4–24 POD), a combination of real-time RT-PCR and anti-KFDV IgM ELISA is advised to improve diagnostic accuracy by identifying both viral presence and the host immune response. This staged approach enhances timely and accurate diagnosis of KFD.

**TRL : 6**

**Training Requirement :** 1–2 days for laboratory personnel familiar with ELISA procedures

### Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Vaccines**

# Inactivated Japanese Encephalitis Disease Vaccine

## Overview

An inactivated viral vaccine, JENVAC was developed under a public-private partnership between ICMR- National Institute of Virology and M/s Bharat Biotech India Ltd., based on the indigenous Kolar strain of JEV. The vaccine achieves >98% seroprotection in a single dose, reducing the cost of vaccination and removing the risks associated with missed doses for vaccination of susceptible population. The vaccine is stable at room temperature, and reduces risk of cold-chain failure.



*Inactivated Japanese encephalitis disease vaccine*

## Functionalities



Single dose vaccine (reduced cost of multi-dose schedule, no missed doses/ partial vaccination)



Stable at 25°C to 37°C, reducing functional challenges due to cold-chain failure



Single-dose vaccine allows for faster mass-vaccination, and herd immunity in susceptible populations

## Key Features

- Improved compliance and affordability
- Drastically cuts the "cost-to-deliver" due to thermostability
- High yield process to meet demand faster

## Implementation Overview

### Deployed

Yes.

- JE vaccine with the trade name - JENVAC Vaccine is used in India's endemic districts as part of the National Immunization Program (UIP).
- It is utilized for adult vaccination (15+ age) in highly affected districts of states like Assam, Uttar Pradesh, and West Bengal.
- Due to its inactivated nature, JENVAC is suitable for deployment in outbreak situations and during active epidemic seasons.

**TRL : 9, deployed for vaccination**

**Training Requirement : NA**

## Contact Details

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Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

## Human Measles IgM ELISA

### Overview

Measles remains a highly contagious global threat, with India ranking among the top countries for outbreaks. Primarily affecting children through respiratory droplets, it causes severe complications like pneumonia and SSPE. Diagnosis relies on an indirect IgM ELISA, which qualitatively detects virus-specific antibodies in human serum. Using inactivated antigens and HRP-labeled conjugates, this standardized test enables early confirmation, supporting critical public health surveillance and intervention strategies to mitigate the significant morbidity and mortality rates associated with the virus.



Human Measles IgM ELISA Kit

### Functionalities



100% sensitivity and 96.34% sensitivity compared to the reference standard kit



RF-adsorbent technology included, for improved specificity



Accurate and reliable performance demonstrated in inter-laboratory comparison tests

### Key Features

- Indirect IgM detection-based methodology with high sensitivity and specificity
- Faster turn-around time
- Inactivated antigen coated on wells improving safety and enabling field use

### Implementation Overview

#### Deployed

Yes.

- Technology has been transferred to Zydus Cadila
  - Kits and reagents were shared for parallel testing and pilot scale production
- Kits are also being used at ICMR-NIV, Pune for research projects.

TRL : 6

Training Requirement : One-two weeks for deployer, 1-2 days for operator.

### Contact Details

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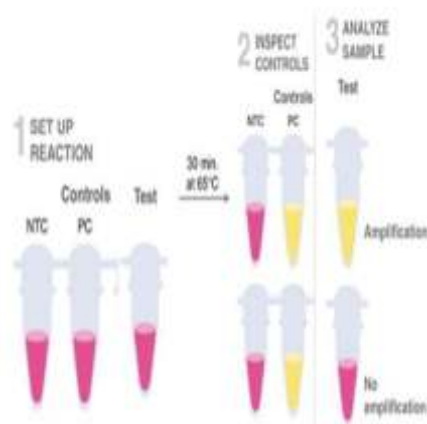
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics & Devices**

## RT Lamp Assay for Detection of SARS-CoV-2

### Overview

Indigenously developed loop-mediated isothermal amplification (LAMP) kit for detection of SARS-CoV-2. The developed assay is rapid molecular assay for detecting two genes-E gene and N gene of SARS-CoV2 for COVID-19 diagnosis and internal control gene (Beta actin) is also included. Technology with single temperature reaction with heating apparatus set to  $65 \pm 1^\circ\text{C}$  may replace the expensive thermal cyclers. No further complex tools are needed to interpret the results



RT-LAMP Assay for Detection of SARS-CoV-2

### Functionalities



A novel and Indigenous RT-LAMP assay for detection of SARS-CoV2



Results can be interpreted visually



The diagnostic sensitivity and specificity of the RT-LAMP assay was 100% and 100%, respectively, as compared to the rRT-PCR



The assay is useful to ramp up testing capacity to diagnose COVID-19 in the country and abroad

### Key Features

- Cost-effective diagnosis of Covid-19 and could enable field testing outside of the diagnostic library.
- Technically less demanding require minimum equipment.
- The assay only takes 40 minutes to complete and no need for a highly skilled technical person.
- Reduce turn-around time for reporting results.

### Implementation Overview

#### Deployed

Transferred to three companies-

- Acrannolife Genomics Pvt. Ltd, Chennai
- Karwa Enterprises Pvt. Ltd, New Delhi
- J Mitra Pvt. Ltd, New Delhi.

TRL : 9

Training Requirement : 1 day

### Contact Details

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Scientist E

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Phone number: 9082553865

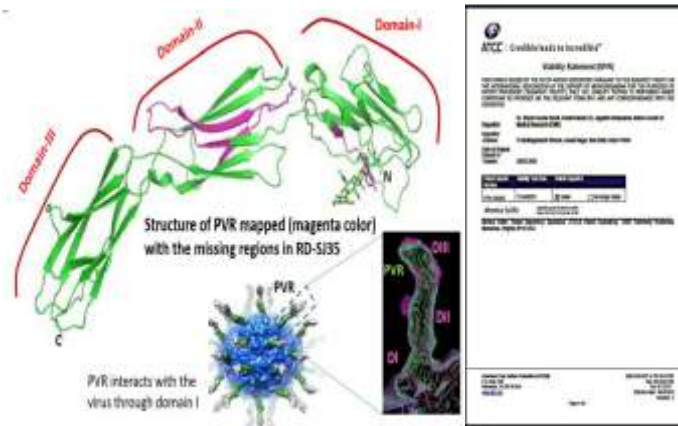
Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics & Devices**

# CRISPR Cas9-based Development of Poliovirus Receptor Gene (CD155) Knockout RD Cell Line





## Overview

Technology describes CD155 (poliovirus receptor) gene knockout RD cell line by dysfunction CD155 gene using CRISPR/ Cas9 technology. Poliovirus do not infect the cells as there is no receptor on the cell surface. Non-polio enteroviruses don't use CD155 as cellular receptor therefore they are not affected by absence of CD155. The new cells will be useful in all laboratories handling poliovirus potentially infectious materials and complying with the WHO-GAP III requirements.



CRISPR Cas9 based development of poliovirus receptor gene (CD155) knockout RD cell line

## Functionalities

-  CRISPR-Cas9 edited CD155 gene of RD cells does support the growth of polio viruses and render them poliovirus non-permissive
-  Susceptibility to NPEV RD-CD155-knock out cells remained unchanged
-  RD-CD155-knock out cells are safe for NPEV isolation from poliovirus PIM without derogating GAPIII/IV containment requirements.
-  With the help of this cell line, laboratories can work with PIM in BSL-II without requiring the mandate of Polio Essential Facility

## Key Features

- The poliovirus non-permissive RD-SJ40 cells may become a preferred cell line to safely work with poliovirus potentially infectious materials (PIM) in enterovirus surveillance, diagnostic and non-poliovirus research laboratories.
- WHO GAP IV refers to use of Poliovirus non-permissive cell development and potential use. Helps poliovirus containment as per WHO guidelines when the country has been eradicated poliovirus after lots of struggle.
- The new cells have immediate applications to assist global polio eradication initiative efforts for poliovirus containment.

## Implementation Overview

Deployed	TRL	Training Requirement
The cell line deposited to ATCC, USA	9	5-8 days

## Contact Details

**Dr. Shyam Sunder Nandi**  
Scientist E

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Institute compound,  
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Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

## Human Chandipura IgM ELISA

### Overview

Chandipura virus (CHPV) causes devastating outbreaks in children with high fatality rates across India. With no vaccines or antivirals available, early diagnosis is critical for clinical management. This indigenous IgM capture ELISA provides a highly sensitive, and specific, solution for detecting the virus in serum and cerebrospinal fluid. By enabling rapid identification during the acute phase, this diagnostic tool facilitates timely supportive care, directly addressing a vital gap in regional public health preparedness and pediatric emergency response.



Human Chandipura IgM ELISA Kit

### Functionalities



The Chandipura IgM Capture ELISA has 92.16% sensitivity, 95.57% specificity



Can be used for both serum and Cerebrospinal Fluid (CSF) samples



Low sample volume requirement makes it safer for susceptible pediatric population

### Key Features

- IgM capture based methodology, improves specificity of assay
- Biotin-Avidin based detection technology for improved sensitivity
- Increased safety due to inactivated antigen

### Implementation Overview

#### Deployed

Yes.

- Technology has been transferred to Zydus Cadila
  - Kits and reagents were shared for parallel testing and pilot scale production
- Kits were shared for use in research project at Department of Neurovirology, National Institute of Mental Health and Neurosciences.
- Kits are also being used at ICMR-NIV, Pune for research projects

**TRL : 6** (Test License received)

**Training Requirement :** 1-2 weeks for deployer, 1-2 days for operator

### Contact Details

**Dr. Gajanan Sapkal**  
Scientist 'F'

ICMR-National Institute of Virology  
Phone: 020-25906835  
Email: gajanansapkalniv@gmail.com

Thematic Area: **Biopharma and Health Technologies**

Category: **Diagnostics**

# Hepatitis E Virus (HEV) IgM Rapid Test for Hepatitis E Diagnosis

## Overview

Hepatitis E Virus IgM Rapid Test is developed for rapid diagnosis of feco-orally transmitted water-borne hepatitis E caused due to hepatitis E virus (HEV). HEV causes acute viral hepatitis/jaundice in the form of sporadic infections and outbreaks. The Test is user-friendly and developed for use in field settings or places where laboratory infrastructure is not accessible. Specialized training is not required for performance of the Test. Rapid diagnosis of viral jaundice helps in better management-control of outbreaks.



Result of Strip Test on Left indicates negative for HEV infection

## Functionalities



Test is lateral-flow based immunochromatographic point-of-care strip test



It sensitively and specifically detects HEV infections



It requires minimum 10 microliter serum/plasma sample



Results are obtained within 15 minutes visually

## Key Features

- User-friendly and rapid
- Useful in PHCs, small private/mobile clinics, under humanitarian emergencies/ at bedside

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	1 day

## Contact Details

Dr. Tejaswini Mahesh Deshmukh  
ICMR-National Institute of Virology, Pune  
Phone 020-26006290/ 25906890

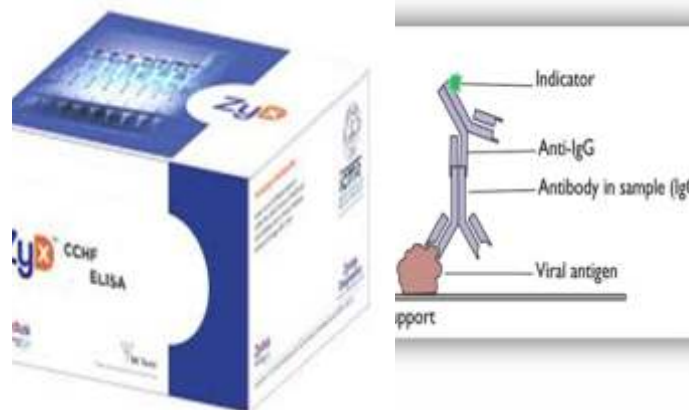
Thematic Area: **Biopharma and Health Technologies**

Category: **In-Vitro Diagnostics (IVD)**

# Anti-Crimean-Congo Haemorrhagic Fever (CCHF) Cattle IgG ELISA






## Overview

The Anti-CCHF Cattle IgG ELISA developed by ICMR-National Institute of Virology is a diagnostic assay designed to detect IgG antibodies against Crimean-Congo Hemorrhagic Fever in cattle. It enables large-scale serosurveillance to identify virus circulation in livestock, supporting early warning systems and outbreak prevention. This cost-effective tool benefits veterinary and public health sectors by strengthening zoonotic disease monitoring and risk assessment



Anti-Crimean-Congo haemorrhagic fever (CCHF) Cattle IgG ELISA

## Functionalities

-  **Detects IgG antibodies against Crimean-Congo Hemorrhagic Fever virus in cattle serum samples**
-  **Enables large-scale serosurveillance using ELISA platform developed by ICMR-National Institute of Virology**
-  **Supports early identification of virus circulation in livestock populations across endemic regions**
-  **Provides reliable, cost-effective screening for veterinary and public health monitoring programs**
-  **Assists in risk assessment and outbreak preparedness for zoonotic disease transmission**

## Key Features

- High sensitivity and specificity for Crimean-Congo Hemorrhagic Fever IgG antibody detection.
- Cost-effective ELISA kit suitable for large-scale field surveillance.
- Indigenous development by ICMR-National Institute of Virology ensuring accessibility and affordability.
- User-friendly protocol requiring minimal specialized laboratory infrastructure.
- Enables early warning through efficient livestock sero-monitoring capability.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes; implemented in multiple surveillance studies and veterinary diagnostic laboratories	8 (system complete and qualified through field validation)	2-3 days for laboratory personnel on ELISA procedures and interpretation

## Contact Details

**Dr. Pragma Yadav, Scientist F,**  
Maximum Containment Facility,  
ICMR NIV Pune,  
Email: yadav.pragya@gov.in,  
Phone number: -020-25906911

Thematic Area: **Biopharma & Health technologies**

Category: **Vaccine**

# Chimeric Recombinant Multi-Stage Vaccine for Preventing *Plasmodium Falciparum* Infection and its Community Transmission (Adfalcivax)





## Overview

AdFalcivax is a fully indigenous advanced novel recombinant multistage malaria vaccine designed to provide protection against *Plasmodium falciparum* infection in humans as well as reducing its community transmission. Produced in *Lactococcus lactis*, and upon formulation with Alum (a widely used adjuvant in humans), AdFalcivax provides high levels of protection (>90%) against a heavy dose of parasite challenge in pre-clinical mouse model. ICMR has licensed this technology to five Indian biotech companies for further development.



AdFalcivax Vaccine

## Functionalities

-  AdFalcivax is a chimeric vaccine designed to target most vulnerable stages of *Plasmodium falciparum* development.
-  AdFalcivax aims to prevent *P. falciparum* infection as well as reducing its community transmission.
-  Produced in *Lactococcus lactis* as a stable chimeric recombinant protein, AdFalcivax promises to be cost-effective.
-  Successful deployment of AdFalcivax, with other existing malaria-control measures, could contribute to *P. falciparum* eradication.

## Key Features

- Dual advantage including protection against malaria infections and reducing community transmission.
- Lower risk of Immune Evasion and potential Long-Term Immunity
- Pre-clinical studies show >90% protection 3 months after 3rd shot.
- Extended stability of active formulation at room temperature (>12 months).

## Implementation Overview

Deployed	TRL	Training Requirement
Tech-transfer done to five Indian biotech companies.	5	(as per requirement)

## Contact Details

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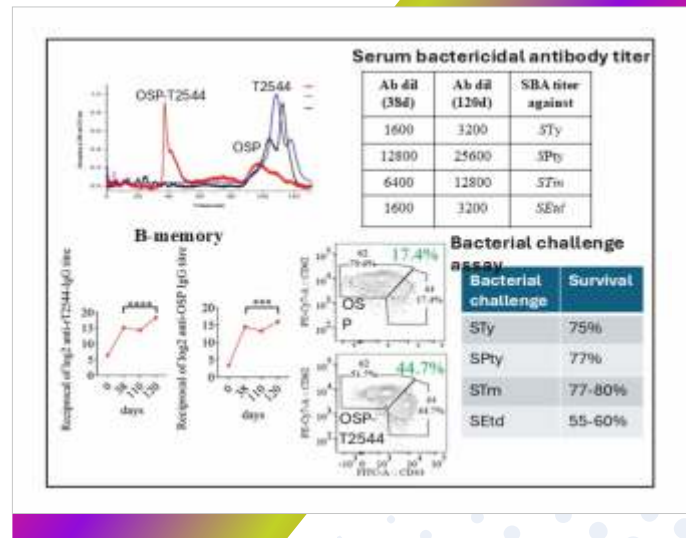
Thematic Area: **Biopharma & Health technologies**

Category: **Precision Therapeutics**





# Broad Specificity Salmonella Vaccine Useful Against Typhoid and Paratyphoid Fever and Salmonella Typhimurium Gastroenteritis

## Overview

This glycoconjugate vaccine comprises of coat O-specific polysaccharide of Salmonella Typhimurium and an outer membrane conserved protein of Salmonella Typhi/ Paratyphi. It intends to protect against >90% of Salmonella pathogens that cumulatively cause typhoid/ paratyphoid fever, septicemia and severe gastroenteritis, resulting in significant morbidity and mortality across the globe and for all age groups with children suffering the most severe outcome.



## Functionalities

-  **Safe, relatively cheaper, injectable preparation,**
-  **Easily field deployable as vaccine cold chain may not be required for lyophilized preparation**
-  **Induces robust humoral and cell mediated immunity and memory response, ensuring high level, durable protection**
-  **Provides broad range protection against human Salmonella infections**

## Key Features

- Protective – single vaccine would protect against vast majority of human Salmonella infections
- Protection range – high level and long term
- Safety and usability – contains no live organisms, easy field deployability of lyophilized powder
- If commercialized, would be the first available vaccine against Salmonella Paratyphi and non-typhoidal Salmonella

## Implementation Overview

### Deployed

Technology transferred to Panacea Biotech and Biological E.

### TRL

4

### Training Requirement

No specific training required; any person capable of giving intramuscular/subcutaneous injection could administer it

## Contact Details

**Dr. Santasabuj Das,**  
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Email: santasabujdas@yahoo.com, director-niced@icmr.gov.in

Thematic Area: **Biopharma & Health technologies**

Category: **Vaccine Development**

# A Multi-Serotype Outer Membrane Vesicles (MOMV) of Shigella as a Novel Candidate Vaccine

## Overview




MOMV is a "cocktailed" hexavalent vaccine candidate derived from outer membrane vesicles of six *Shigella* serotypes. It addresses antigenic diversity by providing cross-protection against 16 major serotypes across all four serogroups (A, B, C, and D). As a non-living immunogen, it offers a safer alternative to conventional live-oral vaccines by eliminating infection risks while ensuring broad-spectrum immunity, significantly impacting global efforts to combat Shigellosis in endemic regions.

### A Breakthrough in Shigellosis Protection: The Hexavalent OMV Vaccine

**New 6-strain non-living vaccine provides broad, safe, and long-lasting protection against all major *Shigella* groups.**

 <b>BROAD COVERAGE</b> <b>Targets all four major <i>Shigella</i> serogroups.</b> <small>Combines OMVs from 6 specific strains to provide cross-protection against 16 different serotypes.</small>	 <b>HIGH EFFICACY</b> <b>Achieves 83% to 100% protective efficacy.</b> <small>Confirmed broad-spectrum protection in neonatal models with significant reduction in bacterial colonization.</small>	 <b>SAFE &amp; NON-LIVING</b> <b>Safe, non-living, and low-reactogenic formulation.</b> <small>Induces significantly lower inflammatory responses than live or heat-killed vaccines.</small>	 <b>LONG-LASTING PROTECTION</b> <b>Immune response persists for 120+ days.</b> <small>Satisfactory levels of protective antibodies (IgA and IgG) remain detectable long after the final dose.</small>
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## Functionalities

-  Provides broad-spectrum coverage against epidemic and endemic strains across all four *Shigella* serogroups.
-  Facilitates passive immunity by transferring protective antibodies from immunized mothers to offspring via milk.
-  Enhances the body's natural defence by increasing bacterial internalization by macrophages up to 10-fold.

## Key Features

- Triggers robust Th1 cell-mediated immunity and high antibody titres.
- Straightforward, scalable, and cost-effective production process for global utility.
- Provides long-term protection with detectable antibody responses over 120 days.

## Implementation Overview

Deployed	TRL	Training Requirement
Technology transferred to Biological E.	4	1 day (6 specialized training hours required)

## Contact Details

ICMR - National Institute for Research in Bacterial Infections  
P-33, CIT Rd, Scheme XM, Belehata, Kolkata, West Bengal 700010.

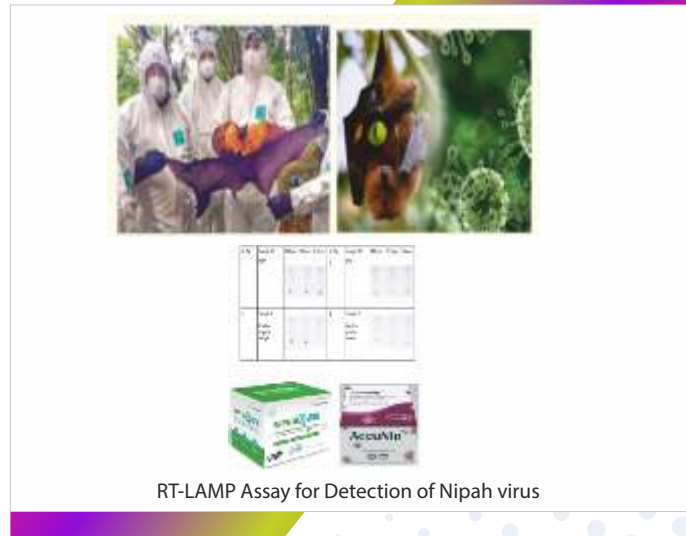
Thematic Area: **Biopharma & Health technologies**

Category: **Diagnostics & Devices**

# RT-LAMP Assay for Detection of Nipah virus

## Overview

The assay is based on a reverse transcription loop-mediated isothermal amplification (RT-LAMP) for the detection of Nipah virus. The assay specifically detects two genes of Nipah virus -N and M gene. It is an isothermal amplification method which does not require a thermal cycler as in case of real-time PCR. The assay can be performed using a single temperature heating device ( $62 \pm 1^\circ \text{C}$ ) and the time required for the assay is only 40 minutes



## Functionalities



A novel and Indigenous RT-LAMP assay for detection of Nipah virus.



The results can be interpreted visually form color change form pink to yellow.



The overall diagnostic sensitivity and specificity is 100% and 100%, respectively, as compared to the gold standard rRT-PCR.



This molecular assay is applicable for sensitive and specific detection of Nipah virus where quantitative detection is not necessary.

## Key Features

- Technically less demanding require minimum equipment.
- The assay only takes 40 minutes to complete and no need for a highly skilled technical person.
- Reduce turn-around time for reporting results.
- This assay will increase the Primary Health Center's testing capability for lower-level laboratories.

## Implementation Overview

### Deployed

Transferred to three companies-

- Acrannolife Genomics Pvt. Ltd, Chennai
- Karwa Enterprises Pvt. Ltd, New Delhi
- J Mitra Pvt. Ltd, New Delhi.

### TRL

9

### Training Requirement

1 day

## Contact Details

**Dr. Shyam Sunder Nandi**  
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Haffkine Institute compound, AD Marg, Parel-400012  
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Phone number: -9082553865

Thematic Area: **Biopharma & Health technologies**

Category: **Diagnostics & Devices**

# LAMP Assay for Detection of Monkeypox Virus





## Overview

The technology discloses a loop-mediated isothermal amplification (LAMP) for rapid and low-cost detection of Monkeypox virus. According to the WHO requirement, the diagnosis of the Monkeypox requires detection of an Orthopoxvirus genus specific gene and confirmation based on Monkeypox virus specific genes. The assay targeted the genus specific B6R (Envelope protein) gene and species specific F3L (F3 protein which an enzyme double-strand RNA binding domain) gene of Monkeypox virus.



LAMP Assay for Detection of Monkeypox Virus

## Functionalities

-  The assay can be run with a single heating apparatus set to  $65 \pm 1^\circ\text{C}$ . The assay only takes 40 minutes to complete.
-  No further complex tools are needed to interpret the results; they may be grasped visually.
-  This assay can be completed without the need for a highly skilled technical person, and it is also cost-effective technology.
-  Comparing the LAMP assay with the Real Time PCR, the overall diagnostic sensitivity and specificity are 100% and 100%, respectively.

## Key Features

- By application of the LAMP, the demerits of real-time RT-PCR such as long detection period, complex operation, and sophisticated instrument requirement have been overcome.
- When quantitative detection is not required, the assay will be the method of choice for detecting the monkeypox virus and distinguishing it from other orthopoxviruses.
- Reduce turnaround time for reporting results; hence prime significance for preventing and controlling the spread of Monkeypox virus.

## Implementation Overview

Deployed	TRL	Training Requirement
Transferred to three companies- • Smart QR technologies Pvt. Ltd., Pune • Acrannolife Genomics Pvt. Ltd., Chennai • J Mitra Pvt. Ltd., New Delhi.	9	1 day

## Contact Details

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Phone number: -9082553865

Thematic Area: **Biopharma & Health technologies**

Category: **Diagnostics / Molecular Diagnostics**




# Detection of Mycobacterium tuberculosis-derived circulating cell free DNA (ccf-DNA) in plasma for early TB diagnosis

## Overview

A highly sensitive, non-sputum-based ddPCR assay detecting *M. tb*-derived circulating cell-free DNA (ccfDNA) in plasma for early tuberculosis diagnosis. It enables detection across the TB spectrum, including subclinical and extrapulmonary TB, and identifies individuals at high risk of disease progression months before onset, improving early intervention, reducing transmission, and enhancing patient outcomes.



## Functionalities

-  Detects *M. tb* ccfDNA in plasma for early TB diagnosis
-  Identifies high-risk individuals prior to active TB development
-  Enables diagnosis in sputum-scarce and extrapulmonary TB cases

## Key Features

- Ultrasensitive dual-target ddPCR assay (IS6110, IS1081)
- High sensitivity and specificity across TB disease spectrum
- Non-invasive, sputum-independent, and has the potential to be translated into field-deployable method through highly sensitive methodologies

## Implementation Overview

Deployed	TRL	Training Requirement
Technology transferred to J. Mitra & co. and Meril Diagnostics.	3	1 week

## Contact Details

**Dr. Luke Elizabeth Hanna**  
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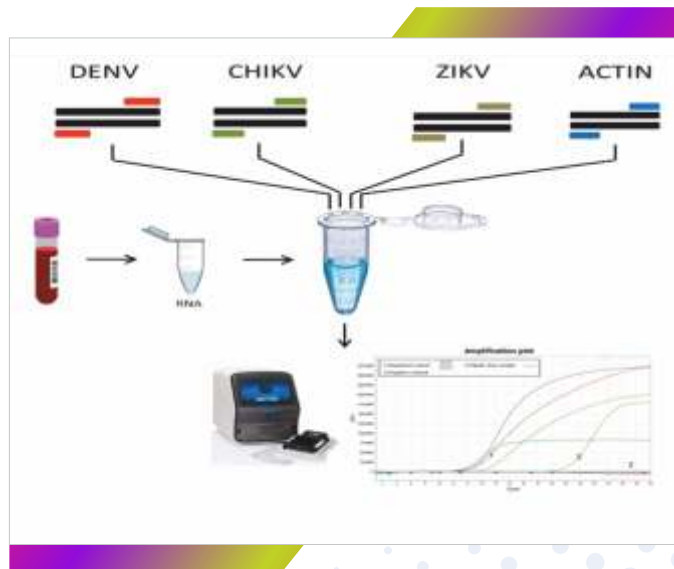
Thematic Area: **Biopharma & Health technologies**

Category: **Diagnostics**

# Single-tube multiplex real-time RT-PCR method for simultaneous detection of Dengue, Chikungunya and Zika viruses

## Overview

This technology aids in the early and simultaneous diagnosis of dengue, chikungunya and Zika viruses in patients with dengue like illness. This technology can be of useful in the regions wherein these viruses are co-circulating. Since the all three viruses are detected using a single tube reaction, this is highly cost-effective. This technology incorporates custom-designed primers and probes, along with an actin internal control, to verify sample integrity and ensure precise diagnosis.



## Functionalities



Simultaneous detection of dengue, chikungunya, and Zika viruses in one reaction



Enables early differential diagnosis in acute febrile illness cases



Includes internal control to validate sample quality and assay performance

## Key Features

- Single-tube multiplex assay reduces cost and turnaround time
- Custom primers and probes ensure high specificity and sensitivity
- Built-in actin control ensures reliable and accurate results
- In-house validation demonstrates strong performance, with 96.1% sensitivity for dengue, 97.2% for chikungunya
- 100% specificity across all three targets
- Produced concordant results in the Quality Control for Molecular Diagnostics proficiency panel (2022-2025) for Zika

## Implementation Overview

### Deployed

Technology transferred to Meril Diagnostics

### TRL

4

### Training Requirement

One day

## Contact Details

**Dr. K. Alagarasu,**  
Scientist E, ICMR-National Institute of Virology, Pune-411001, Maharashtra India  
Email: alagarasu.k@gov.in  
Phone NO. 020-26006256

Thematic Area: **Biopharma & Health technologies**

Category: **Diagnostics**

# AfuPEPLISA Immunodiagnostic Kit for Detection of Antibodies to *Aspergillus Fumigatus* in Sera of Patients

## Overview

AfuPEPLISA Immunodiagnostic Kits, developed by ICMR-NIRRH, Mumbai, are designed for detecting *Aspergillus fumigatus*-specific IgG and IgE antibodies in sera of patients with bronchial asthma and pulmonary tuberculosis. Given the high global burden of TB and asthma and the rapid growth of immunodiagnostic markets, this indigenous technology offers strong potential for TB-associated aspergillosis detection and asthma screening through sensitive serological diagnosis.



## Functionalities

- Detects *Aspergillus fumigatus*-specific IgG and IgE antibodies in patient serum samples
- Enables serodiagnosis of aspergillosis in bronchial asthma and pulmonary tuberculosis patients
- Uses synthetic peptide antigens for consistent and reproducible immunological recognition
- Low intra-assay and inter-assay variations
- Provides high sensitivity and specificity for accurate laboratory-based diagnosis
- Compatible with routine ELISA workflows in district and sub-district hospital laboratories
- Stable kit design with extended shelf life for easier storage and distribution

## Key Features

- Synthetic peptide-based ELISA for consistent and reliable antigen recognition
- High sensitivity and specificity for accurate IgG and IgE detection
- Low intra- and inter-assay variability ensuring reproducible results
- Cost-effective kit suitable for large-scale public health screening
- Long shelf life with stable performance during storage and transport
- Amenable to use in labs of Sub-district/District hospitals

## Implementation Overview

Deployed	TRL	Training Requirement
Technology transferred to Medsource Ozone Biomedicals.	5	

## Contact Details

**Dr. Taruna Madan Gupta**  
Scientist G and Head, Development Research, Indian Council of Medical Research,  
V. Ramalingaswami Bhawan, P.O. Box No. 4911  
Ansari Nagar, New Delhi - 110029, India  
Email: guptat@nirrh.res.in

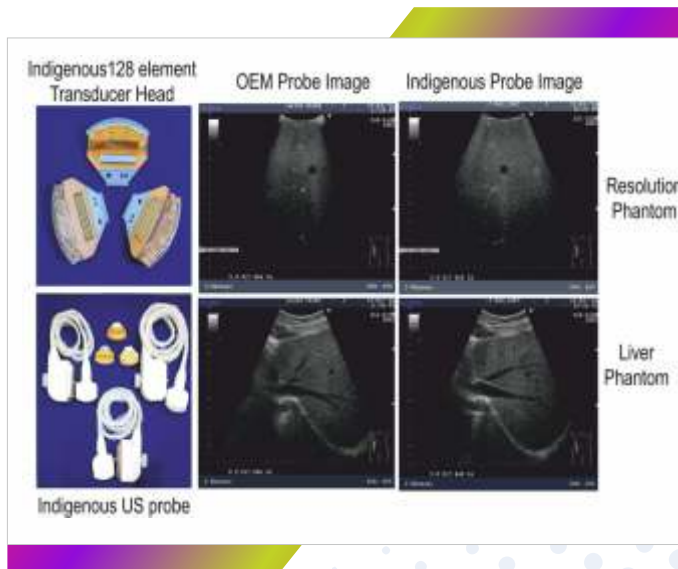
Thematic Area: **Biopharma & Health technologies**

Category: **Medical Imaging and Diagnostics**





# Indigenous Ultrasound Probes for Medical Imaging and Health care

## Overview

Ultrasound based devices are widely used in the health care for imaging and diagnostics. C-MET under MeitY has developed indigenous technology know-how and infrastructure for the developing various designs of ultrasound Transducers catering to diverse health care applications. As an initial phase, curvilinear 128 element ultrasound transducers of 3.5 MHz with all functional materials were developed and benchmarked with internationally renowned commercial OEM probes and qualified various ISO and IEC standards, with a current TRL level of 6.



## Functionalities

-  Indigenous functional materials for catering frequency range between 1 –10 MHz.
-  Useful for Medical imaging and diagnostics
-  Scope for Import Substitute
-  Qualified ISO-60601-1 and 10993-1

## Key Features

- In-house source and technology know-how for the critical functional materials
- Option for customization of functional materials as per end user requirements
- The functional materials shall be used for developing single element and multiple element transducers viz., 256, 128, 64 etc.,
- Scope for supplying functional materials with customized dimensions
- Indigenous Technology Know-how

## Implementation Overview

Deployed	TRL	Training Requirement
No, Technology ready for Transfer	6	20 days

## Contact Details

**Centre for Materials for Electronics Technology (C-MET),**  
Scientific society under MeitY Shornur Road, M.G.Kavu,  
Athani-P.O, Thrissur-680581, Kerala  
Email: cmet@cmety.gov.in

Thematic Area: **Biopharma & Health technologies**

Category: **Health Technologies**

## BLOOD IRRADIATOR (BI)

### Overview

SAMEER has developed two AERB - approved self-contained X-ray blood irradiator units with MeitY's support an essential innovation to protect immune compromised patients from transfusion - associated graft - versus - host disease (TA - GVHD).



### Functionalities

- The BI system can deliver the clinically recommended dose of 25 Gy in about 5 minutes. The cellular blood components are irradiated prior to transfusion to prevent the proliferation of viable T lymphocytes which are the immediate cause of TA - GVHD.
- It is a completely self - shielded system and does not require any special radiation shielded facility.
- SAMEER has obtained Atomic Energy Regulatory Board Type Approval(AERB) Certificate for first Indigenously developed "X - ray Blood Irradiation System".
- CDSCO test license, AERB authorization certificate for supplying "X - ray Blood Irradiation System" and Electrical safety test certificate for the same have also been obtained

### Key Features

- 1 Max energy 225 keV (effective 65 - 85 keV)
- Min 15Gy/25Gy Average/Max 50 Gy
- AVERAGE DOSE RATE 5 Gy/min ( $\pm$  2%)
- TIME FOR 25 Gy 5 mins at 5 Gy/min DOSE UNIFORMITY
- One regular use canister which holds 4 Blood Bags (450 mL each) during the irradiation
- Another canister which holds the dosimetry phantoms during the dosimetry procedure held in a canister

### Implementation Overview

Deployed	TRL	Training Requirement
Being installed & commissioned at Tata Memorial hospital, New Delhi	7/8	1 week

### Contact Details

**Sh. Rajesh Harsh,**  
Program Director(Corporate) - R & TM),  
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Thematic Area: **Biopharma & Health technologies**

Category: **Health Technologies**

# Magnetic Resonance Imaging (MRI)

## Overview

SAMEER along with its collaborating partners IUAC, CDAC & MIRC has designed and developed 1.5 Tesla MRI system with individual sub - systems like superconducting magnet assembly, High power RF Coils, Spectrometer, Imaging & Visualization software and integrated complete system to acquire images of objects.



## Functionalities



Magnetic Resonance Imaging (MRI) is very effective imaging technique used to visualize internal soft tissue structures of the body with high contrast images.



MRI can create 3D high resolution images which helps in diagnosing a broad range of conditions, including cancer, heart and vascular disease, and muscular and bone abnormalities.



MRI can detect abnormalities that might be obscured by bone with other imaging methods.

## Key Features

- 5 Tesla Magnetic Field
- 63.8668 MHz Frequency of Operation
- 6 kHz to 600 kHz (Variable) Bandwidth
- 15 kW Peak (Max.) Transmitted Power
- 16 No. of Receiver Channels
- GRE, SE, IR, EPI(GRE/SE), TSE/FSE, DWI, STIR, FLAIR, GRAPA Imaging Sequences

## Implementation Overview

Deployed	TRL	Training Requirement
Being installed & commissioned at AIIMS, New Delhi	7/8	4 weeks

## Contact Details

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Program Director(Corporate) - R & TM),  
SAMEER, R&D laboratory of Ministry of Electronics and  
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IIT Campus, Powai, Mumbai: 400076, India  
Tel. +91 - 22 - 2572 - 7107 | E - mail: rajesh1@sameer.  
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Thematic Area: **Biopharma & Health technologies**

Category: **Health Technologies**

# CerviSCAN

## Overview

Cervical cancer causes 3.41 lakhs deaths globally each year and India is the most affected country with a mortality rate of 77,000. One Indian woman dies of cervical cancer in every 8 minutes. It is one of the few cancers where precursors of the cancer can be detected, treated and cured much before progressing into invasive cancer. Absence of systematic PAP smear screening programs and lack of trained cytologists is the major cause of cancer deaths in the country. CerviSCAN is an indigenised system for screening of cervical cancer using methodologies of AI and Robotics which makes population screening for cervical cancer feasible



## Functionalities

CerviSCAN solution has the following components

- **DIGISMEAR** – Digitizes stained slides using high - resolution imaging with AI - assisted autofocus for rapid and accurate data capture
- **RotoStainer** – Automates multi - protocol slide staining with precision control to deliver consistent, diagnostic - quality results.
- **KytoSpin** – Prepares uniform monolayer cytology slides from liquid - based samples for optimal staining and analysis.
- **AI PAP** – Identifies and presents the top 25 most suspicious fields of view for fast, AI - assisted cervical cancer screening.
- **Digi - Patho** – Provides an integrated digital pathology framework for image management, remote diagnosis, and collaborative workflows

## Key Features

- End - to - end automated workflow from sample to digital diagnosis.
- AI - driven rapid screening with prioritized high - risk fields
- Standardized, scalable digital pathology services with remote accessibility

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, Pilot Deployment - One Unit	8	14 days

## Contact Details

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Thematic Area: **Biopharma & Health technologies**

Category: **Health Technologies**

# Optical Coherence Tomography (OCT): 'ROSHANI' OCT Imaging System

## Overview

Optical Coherence Tomography (OCT) is a revolutionary non-invasive imaging technique using infrared light for unmatched axial resolution, independent of transverse resolution. With high sensitivity, OCT is transforming in vivo diagnostics, especially in ophthalmology, and expanding across medical fields. SAMEER has developed an OCT prototype "ROSHANI" in collaboration with VIT, Vellore under the project funded by Department of Science and Technology (DST).



## Functionalities

- OCT has emerged as a clinically significant imaging tool for diagnosis, monitoring, and image-guided care across multiple specialties
- Applications:
  - **Ophthalmology:** Retinal imaging, glaucoma, diabetic retinopathy, AMD
  - **Cardiology:** Plaque characterization, thrombus detection, stent optimization
  - **Dermatology:** Skin lesion assessment, burns, wound healing
  - **Dentistry / GI / Oncology:** Caries detection, mucosal imaging, lesion delineation, margin assessment
  - **Non - Medical:** Coating Thickness Determination in Pharma & Aviation Sector, Non - Contact Scanning of Food & Plants in Food & Agro Sector

## Key Features

- High axial resolution (5.0  $\mu\text{m}$  in tissue)
- Fast imaging (80,000 A-scans per sec)
- 2.8 mm Imaging Depth (in tissue)
- 7mm x 7mm ( $\geq 45^\circ$ ) Field of View
- ROSHANI has cleared the EMI/ EMC compliances test viz. IEC 6100 - 4 - 2, 4 - 3, 4 - 4, 4 - 5, 4 - 6, 4 - 8, 4 - 11, 4 - 29; CISPR/11/22

## Implementation Overview

Deployed	TRL	Training Requirement
No	6-7	3 days

## Contact Details

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Powai, Mumbai: 400076, India  
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Thematic Area: **Biopharma & Health technologies**

Category: **Health Technologies**

# Wearable Device for Early Detection and Screening of Breast Cancer

## Overview

Wearable device for breast cancer detection is a vest embedded with high sensitivity thermal sensors for mapping breast skin temperature for the early detection and screening of breast cancer

## Functionalities



Thermal sensor based wearable device for mapping breast skin temperature



The analysis software will provide 2D & 3D thermal image of the breast



Automatic report generating system will provide six vital tumour parameters



For community level screening



Integrated with wireless communication

## Key Features

- Privacy ensured
- Portable and low cost
- No pain
- No radiation exposure
- Simple operation
- No age barrier

## Implementation Overview

### Deployed

Yes, 20

### TRL

9

### Training Requirement

1 day

## Contact Details

### Centre for Materials for Electronics Technology

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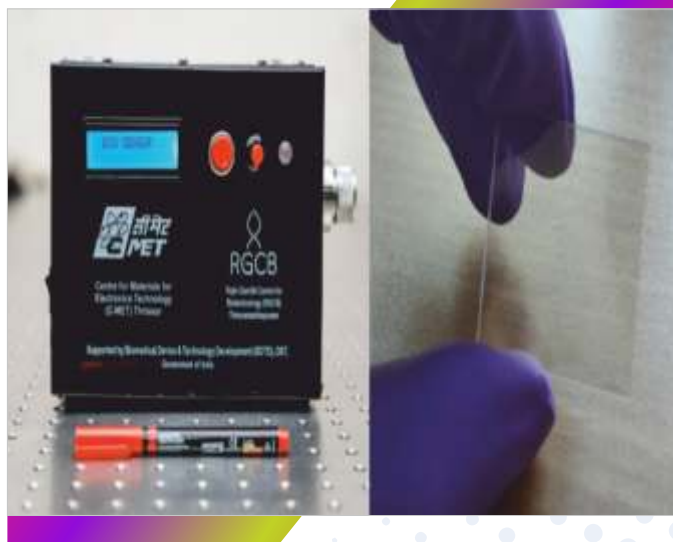
Thematic Area: **Biopharma & Health technologies**

Category: **Healthcare, Digital Technology**

# Planar Plasmonic Sensing Film Technology

## Overview

Planar Plasmonic film is a sensing platform on glass substrate developed as a cost-effective solution for critical applications in portable medical diagnostics. Fabricated from engineered, low-cost materials, it serves as a disposable chip in point-of-care biosensors. The coated substrate developed possesses a sensing effect on par with the conventional plasmonic noble metals. Utilized this sensing technology in conjunction with biomolecular functionalization to successfully develop portable diagnostic tools for food borne bacteria and snake venom detection



## Functionalities



Reliable and Real time analysis of biomolecular interactions at room temperature



Detection through refractive index changes



Functions as a 1×1 inch or 10×10 mm disposable chip



Utilize near infrared rays for plasmonic excitation

## Key Features

- A custom-developed sensing platform backed by patented process.
- Breakthrough in plasmonics - replaced noble metals for sensing applications
- Introduced portability in plasmonic sensing devices
- Tested & validated with peptide-peptide, nucleic acid-nucleic acid & antibody-antigen interactions

## Implementation Overview

Deployed	TRL	Training Requirement
Technology Transferred to start-up	6	5 days

Thematic Area: **Biopharma & Health technologies**

Category: **Biosensor and ICT**

# CoLOSENS: Bacterial Diarrhoea screening biosensor device

## Overview

CoLOSENS, developed by C-DAC Kolkata in collaboration with RIMS Imphal, is a handheld, point-of-care biosensing device for rapid detection of bacterial diarrhea. Using aptamer–gold nanoparticle nano-bioreceptors and AI-enabled image analysis, it enables accurate, low-cost diagnosis (>90% accuracy). Designed for rural settings, it reduces unnecessary antibiotic use, supports rational treatment, and helps combat antimicrobial resistance, especially in children under five.

## Functionalities

- **Rapid colorimetric screening of bacterial diarrhea at point-of-care within 15 minutes**
- **AI-enabled image capture and analysis for automated bacterial etiology prediction**
- **Reduces unnecessary antibiotic usage, supporting antimicrobial resistance control**
- **High-throughput screening with minimal sample preparation and user intervention**
- **Cost-effective solution suitable for large-scale public health deployment**
- **Designed for rural use with portable, battery-operated functionality**

## Key Features

- Handheld, miniaturized biosensor enabling true point-of-care diagnostics
- Aptamer–gold nanoparticle nano-bioreceptors ensuring high specificity and sensitivity
- Mobile-based Android GUI with real-time data monitoring dashboard integration
- SMS-based test result alerts for quick clinical decision-making and reporting
- Battery-operated, portable system suitable for rural and low-resource healthcare settings
- User-friendly interface with mobile integration and real-time reporting

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
Yes, 2	8	2 days

The background features a light blue gradient with several large, semi-transparent blue circles of varying sizes. A pattern of small, light blue dots is scattered across the lower right portion of the image. Two small white plus signs are positioned above and below the main text.

***CLIMATE &  
AGRI-FOOD TECHNOLOGIES***

Thematic Area: **Climate and Agri-food tech**

Category: **Bioformulation for plant growth and health**






# Lignin-Based Biopesticides and Biofertilizers for Crop Protection and Improvement

## Overview

Lignin-based biopesticides and biofertilizers utilize agricultural biomass waste to create sustainable crop protection and nutrient delivery solutions. The technology integrates biodegradable lignin nano-formulations that enhance plant immunity, improve nutrient-use efficiency, and reduce dependence on synthetic agrochemicals. It benefits farmers through lower input costs, improved soil health, and higher productivity while supporting climate-resilient agriculture, environmental safety, and circular bioeconomy development for sustainable agri-industrial growth.



## Functionalities

-  Provides biopesticidal protection through lignin-based bioactive delivery targeting major agricultural pests
-  Enhances soil fertility via slow-release nutrient delivery improving plant growth and productivity
-  Acts as plant defense elicitor stimulating systemic resistance against biotic and abiotic stress
-  Converts agricultural biomass waste into high-value agro-inputs supporting circular bioeconomy systems
-  Designed for scalable manufacturing, field application, and farmer-ready commercialization platforms.

## Key Features

- Dual function biofertilizer enhancing soil health and productivity
- Controlled-release nutrients via lignin nano-matrix system
- Carbon-negative platform supporting circular bioeconomy
- Improved nutrient-use efficiency, reduced fertilizer inputs

## Implementation Overview

Deployed	TRL	Training Requirement
No	8	1 week

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Bioformulations for plant growth and health**

# Pro-Transpirants to Increase Crop Productivity

## Overview

This technology uses a patented small-molecule formulation that selectively inhibits the stomatal ALMT12 anion channel in guard cells, modulating ion flux to sustain stomatal opening, enhance CO<sub>2</sub> uptake, and boost photosynthetic efficiency without disrupting ABA-mediated stress responses or plant fitness. Applied as a foliar spray, it maintains optimal stomatal conductance and transpiration across major crops such as rice, wheat, cowpea, and mungbean, improving productivity and yield even under environmental stress.



## Functionalities



Targets stomatal ALMT12 to sustain opening and boost CO<sub>2</sub> uptake without ABA disruption.



Enhances photosynthesis and yield across major cereals, pulses, and legumes.



Foliar spray formulation for simple, broad crop productivity enhancement.

## Key Features

- Agrochemical formulation enhance growth and overall plant productivity.
- Low-cost, broad-spectrum solution for diverse crops and soils.
- Boosts grain yield, biomass, and nutritional quality simultaneously.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	10

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Bioformulations for plant growth and health**

# RNP Complex for Crop Protection Against Bacterial Diseases

## Overview

This technology is a next-generation crop-protection platform that delivers CRISPR–Cas9 ribonucleoprotein complexes into plant pathogens using engineered cationic polyaspartate nanopolymers. The system precisely disrupts key virulence genes, suppressing infection without conventional pesticides. Applied as a foliar spray, it provides both preventive and curative disease control across bacteria, fungi, and viruses. Non-transgenic, scalable, and environmentally sustainable, the platform offers broad-spectrum protection and represents a promising alternative to traditional agrochemicals in modern agriculture.



## Functionalities



Targets pathogen virulence genes via CRISPR–Cas9 RNPs to block disease.



Broad-spectrum control of bacteria, fungi, and viruses across crops.



Foliar spray works preventively and curatively to halt infection spread.

## Key Features

- Nanopolymers enable efficient, non-transgenic RNP delivery into pathogens.
- Eco friendly alternative that cuts chemical pesticide use and impact.
- Broad applicability platform for diverse crops and pathogen types.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	yes

## Contact Details

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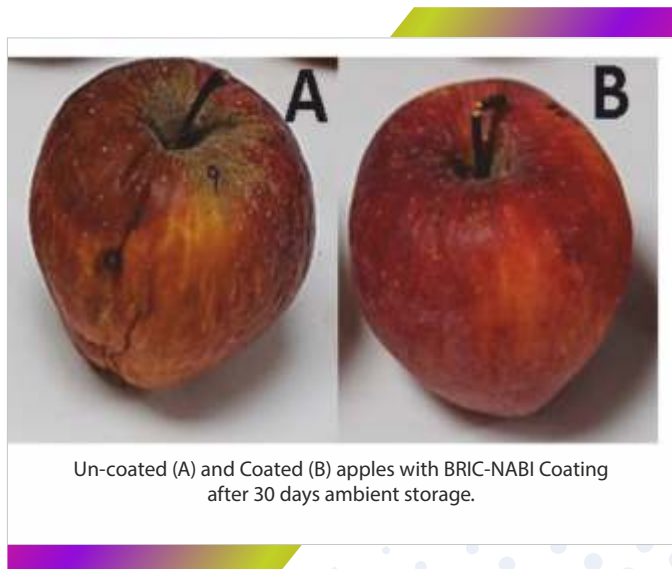
Thematic Area: **Climate and Agri-food tech**

Category: **Postharvest Management**

# Edible Coatings for Improved Shelf-life of Fruits

## Overview

The present technology offers coating formulation based on polysaccharides from agricultural and food processing by-products to extend the post-harvest quality of different varieties of fruits and vegetables. The coating technology is simple and can be applied to minimize post-harvest losses and increase the income of farmers in India.



## Functionalities



Form a protective barrier around fruits and vegetables.



Inhibit respiratory activity, ethylene production, reduce weight loss, and delay fruit softening.



Extended shelf life of apples by 30-45 days under ambient storage.



Extended shelf-life of peaches, guavas and bananas up to 6-9 days under ambient storage.

## Key Features

- Biocompatible, and edible.
- Plant based coating, alternative to conventional animal derived wax coating.
- Cost effective: Rs.0.5 (~50 paise) to coat 1 kg of apples.
- Easy to prepare, and can be seamlessly integrated into existing farm practices, requiring minimal training or investment in equipment.

## Implementation Overview

Deployed	TRL	Training Requirement
No	7	1 day

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Post-Harvest Management**

# Shelf-Life Enhancing Device for Fruits and Vegetables

## Overview

An engineered and patented device has been developed for increasing shelf-life of fruits and vegetables using hypoxia induced nitric oxide. Storage and Transportation devices have been developed, which can operate without refrigeration and can keep fruits and vegetables fresh for several days and also prevent postharvest spoilage of fruits and vegetables. The one of its kind device can be integrated with solar energy panels and can be installed in fruit stores, industries, farmer fields, transport vehicles, storage godowns, shipping and at consumer levels.



## Functionalities



Works by hypoxia-driven generation of physiological level of nitric oxide.



Nitric oxide works as an antagonist to ethylene, a pro-ripening hormone.



Short and long-term storage of fruits and vegetables for transport and shops.

## Key Features

- Advanced version offers innovative devices with additional cooling option
- Additional solar panel-driven energy sources
- Adjustable to specific needs and conditions suitable for transport and long-term storage

## Implementation Overview

Deployed	TRL	Training Requirement
No	9	No

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Crop genotyping**

# Pan-genome SNP Genotyping Arrays for Accelerated Crop Improvement of Rice

## Overview

A first-of-its-kind Pan-Genome 90,000 SNP (Single Nucleotide Polymorphism) Genotyping Array, named Indian Rice panArray (IndRA), has been developed for the major cereal crop rice. This 90K pan-Genome SNP genotyping array has 80K variable SNP markers and 10K control markers can identify the rice landrace and cultivars by identifying SNPs. This SNP array shall be used for breeding purpose and also to determine the genomic background of any Indian rice.



## Functionalities



India's first 90K pan-genome Indica rice SNP array



Ideal for DNA finger printing and variety identification



DNA fragment hybridization-based genotyping

## Key Features

- Trait association and QTL mapping
- Identification of novel genomic loci governing traits
- Facilitate genome-guided breeding and variety identification

## Implementation Overview

Deployed	TRL	Training Requirement
500	9	Yes

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Climate-resilient Crop Variety**

# Superior Drought Tolerant High-Yielding Chickpea Varieties

## Overview

### ADVIKA and SAATVIK: Superior Drought Tolerant High-Yielding Chickpea Varieties

ADVIKA and SAATVIK are two drought tolerant and high-yielding chickpea varieties developed by genomics-guided molecular breeding. These varieties were released by the Ministry of Agriculture and Farmers Welfare for commercial use and have been nominated as promising pulse cultivars in Self-Reliance in Pulses Mission Initiative. These improved seed varieties contributed to over 30% of the total breeder seed indent by the farmers highlighting their significant adoption among chickpea varieties released so far.

**ADVIKA**

Next-generation Molecular Breeding Develops A New Superior Climate Smart Drought Tolerant High-Yielding Chickpea Variety

**Year of Release:** 2023 (CVRC, Ministry of Agriculture & Farmers Welfare, Government of India & Notification in The Gazette of India (No. 4854) on Sep 25, 2023)

**NSPGR Accession ID:** IC 645848

**Recommended Area:** Central Zone (Gujarat, Maharashtra, and Madhya Pradesh)

**Suitable Production Conditions:** Rabi, timely-sown and rainfed conditions

**Average Yield:** 1818 kg/ha (11% yield superiority over JG 18 under drought stress)

**Maturity:** Early Maturing (167 days)

**Plant Height:** Semi-erect with semi-dwarf plant height (42.5 cm)

**Quality Trait:** Seed protein content 22.7%

**Grain Characteristics:** Medium bold, yellowish-brown seed (28.6 g per 100-seeds)

**Disease Resistance:** Resistant to Fusarium wilt and Stunt  
Moderately resistant to Dry root rot, Collar rot & Pod borer

**Salient Features:** Marker-assisted backcross breeding-derived drought tolerant desi chickpea variety (ADVIKA) developed by introgressing superior natural alleles of an ABC transporter gene (DAR602) in the genetic background of JG 18 that enhances yield under drought stress

**SAATVIK (NC 9)**

Next-generation Molecular Breeding Develops A Superior Drought Tolerant High-Yielding Chickpea Variety

**Year of Release:** 2024 (CVRC, Ministry of Agriculture & Farmers Welfare, Government of India, The Gazette of India, S.O. 1589(E), dated 27/03/2024)

**NSPGR Accession ID:** IC 692347

**Recommended Area:** Central Zone (Gujarat, Maharashtra, and Madhya Pradesh)

**Suitable Production Conditions:** Rabi, timely-sown and rainfed conditions

**Average Yield:** 1886 kg/ha (11.4% yield superiority over JAKO 9218 under drought stress)

**Maturity:** 195 days

**Plant Height:** Semi-erect with plant height 42.6 cm

**Quality Trait:** Seed protein content 24.3%

**Grain Characteristics:** Medium bold, yellowish-brown seed (28.8 g per 100-seeds)

**Disease Resistance:** Resistant to Fusarium wilt and Stunt  
Moderately resistant to Dry root rot, Collar rot and Pod borer

**Salient Features:** Marker-assisted backcross breeding-derived drought tolerant desi chickpea variety (SAATVIK-NC 9) developed by introgressing superior natural alleles of a basic helix-loop-helix (bHLH) transcription factor gene in the genetic background of JAKO 9218 which enhances yield under drought stress

## Functionalities



Drought-tolerant high-yielding chickpea varieties tolerant to common diseases



Developed following genomics-guided molecular breeding by introgressing superior alleles of ABC transporter and bHLH genes



Released by the Central Varietal Release Committee for cultivation in Central Zone (Gujarat, Maharashtra and Madhya Pradesh)

## Key Features

- 11.5% higher yield and suitable for the Central India
- Early maturing
- Semi-erect and tolerant to common chickpea diseases e.g. wilt, stunt and rot

## Contact Details

Director

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**Deployed**

Yes

**TRL**

9

**Training Requirement**

No

## Implementation Overview

Thematic Area: **Climate and Agri-food tech**

Category: **Climate-resilient agriculture**

## A time and space saviour agro-techniques and product development from optimally harvested and processed *Swertia chirayita* leaves for direct use/consumption

### Overview

*Swertia chirayita* is a long-gestation (three years pluri-annual), temperate Himalayan, endangered medicinal crop with low seed viability and germination. Its conservation through cultivation optimization yielded yearly intermittent harvest from unutilized space (time & space savior agro-technique). Cliff area plantation between hilly/mountainous land-tiers yielded metabolite rich leaves before final harvest, which are value added for product development. Metabolites amarogentin, mangiferin and swertiamarin ranged from 6.96 to 7.94 µg/mg, 107.5 to 132.46 µg/mg and 118.22 - 200.00 µg/mg, respectively.



### Functionalities



Conservation through cultivation of globally demanded endangered medicinal plant of temperate Himalaya.



Makes crop farming lucrative, otherwise hesitant due to long-gestation, lacking agro-technique, low seed-viability & germination.



Yearly intermittent yield from unutilized land plantation gives additional income before final harvest.

### Key Features

- **Demand fetching**-Agro-technique fulfilling sapling and product demand.
- **Conservation**-Conservation through cultivation safeguarding harvesting from wild.
- **Additional Income**-Utilization of unutilized space fetching additional income.

### Implementation Overview

Deployed	TRL	Training Requirement
02	7	02

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Precision Livestock Genomics**

## Gau SNP Chip for Cattle

### Overview

The Gau Chip is a custom-designed genomic tool (77K SNP chip) used to map the DNA of indigenous Indian cattle developed by a consortium which includes NIAB, NDDDB, NBAGR and BAIF. It allows farmers to predict an animal's genetic potential like milk yield and disease resistance at an early age. By enabling data-driven breeding, this innovation empowers farmers to improve herd quality, increase milk production, and ensure sustainable dairy farming tailored to local environmental conditions.



### Functionalities



**Genomic Profiling:** Analyzes 77k genetic markers to identify superior traits in indigenous Indian cattle breeds.



**Early Evaluation:** Enables accurate prediction of an animal's lifetime milk productivity right from its birth.



**Breeding Precision:** Assists farmers in selecting the best quality bulls for sustainable and high-yielding herds.

### Key Features

- **Indigenous Specificity:** Tailored specifically for the genetic evaluation of Indian cattle breeds.
- **Unified Digital Access:** Streamlines genomic services through a centralized genomic portal.
- **National Scalability:** Provides comprehensive genetic improvement services to farmers across India.

### Implementation Overview

Deployed	TRL	Training Requirement
Yes	9	1 month

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Livestock diagnostics**

# A Portable Device for Field Level Rapid Antimicrobial Sensitivity Testing

## Overview

Antimicrobial resistance (AMR) is a significant global health concern because it makes infections harder to treat and increases the risk of death. To combat this issue, a portable device has been developed for rapid antimicrobial sensitivity testing, providing results within two hours directly from samples. This tool offers timely, affordable, and on-site solutions for farmers and veterinarians, with technical support available.



## Functionalities



**Detects antimicrobial sensitivity from specimen**



**Provides results in 2 hours**



**Enables use in the field without lab facilities**



**Helps reduce antimicrobial resistance in livestock**

## Key Features

- Designed for use in remote field locations.
- The kit is economical, with each test costing less than ₹50.
- This portable and inexpensive device is ideal for rural and resource limiting settings.
- No trained personnel are required to operate it.

## Implementation Overview

Deployed	TRL	Training Requirement
No	8	2

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Livestock Health Monitoring**

# A method for detection of subclinical and clinical mastitis and assessment of microbial quality of milk using non-functionalized iron oxide nanoparticles

## Overview

This portable nanotechnology kit detects somatic cell count (SCC) in milk within 10 minutes using iron oxide nanoparticles. It allows quick, on-site identification of subclinical mastitis and milk quality monitoring without laboratory facilities. The technology enables early disease detection, better quality assurance, and reduced antibiotic misuse in dairy production. Each test costs about ₹25, with industry partners validating and preparing it for large-scale use.



## Functionalities



A portable device that quantitatively counts somatic cells in the field



Detects mastitis at an early stage, before visible symptoms develop



Useful for predicting the microbial quality of milk

## Key Features

- Nanoparticle-based SCC detection delivers lab-level accuracy.
- Portable, affordable device for rural or decentralized milk testing.
- Enables early mastitis detection and better dairy quality monitoring.
- Records can be stored long-term for future reference.

## Implementation Overview

Deployed	TRL	Training Requirement
No	8	10

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Organic Waste to Bio-Energy for Sustainable Development**

## AGR Technology for Generation of Biogas and Fermented Organic Manure from Organic Waste

### Overview

High rate biomethanation Technology based on ANAEROBIC GAS LIFT REACTOR (AGR) has been developed for the generation of biogas and fermented organic manure from organic wastes (food waste, organic fraction of MSW, poultry litter, cattle manure, agriculture waste etc.) and about 35 plants are working across in the waste processing capacity range of 25 to 10,000 kg/day.



### Functionalities



**AGR Technology: Decentralized Remunerative Wet Waste Management System: Helps reduce GHG emissions**



**Waste to Wealth (WoW): Biogas and Fermented Organic Manure (FOM) from Organic waste: Versatility across substrates**



**Biogas as a substitute for LPG and Grid power: Improvisation of soil fertility through digestate usage as "FOM"**

### Key Features

- Selection of special seed culture for inoculation: Mixing without mechanical equipment: No scum formation
- Lower foot print area: Design capacity available from 25 kg/day to 10 TPD
- Fostering high organic solids break-down efficiency: Higher methane/biogas yield: Nutrient rich FOM

### Implementation Overview

Deployed	TRL	Training Requirement
35 PLANTS	9	10 Days

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Agrochemical Technologies**

# Process Technology for Fungicide, Cyazofamid

## Overview

Cyazofamid is an exceptionally effective protective foliar fungicide utilized for the control of Oomycetes pathogens, including late blight in potatoes and tomatoes, as well as clubroot in brassicas. Current trends in the Cyazofamid market suggest a movement towards more advanced fungicide formulations, with approximately 64% of manufacturers concentrating on water-dispersible granules and suspension concentrates. Furthermore, the rising resistance to conventional fungicides has led to a 47% increase in demand for specialized molecules such as cyazofamid. The Asia-Pacific region commands about 43% of the market share, followed by Europe at 27%, North America at 21%, and the Middle East & Africa contributing roughly 9%.



## Key Functions and Advantages of Cyazofamid

- **Preventive/Protectant Action:** Cyazofamid functions as a "super protective" fungicide, effectively inhibiting all phases of fungal development, which includes the release of zoospores, their motility, the germination of cystospores, and the growth of mycelium.
- **Unique Mode of Action:** Classified by FRAC as a Group 21 fungicide, it acts inhibiting the Quinone inside (Qi) center of complex III in mitochondrial respiration, making it effective against pathogens resistant to other chemical classes.
- **Superior Rainfastness:** Cyazofamid quickly adheres to the waxy surface of plants, providing resistance to rainwater erosion shortly after it is applied.
- **Low Application Rates & Long-Lasting Protection:** Effective @ 80-100 g a.i./ha, significantly lower than many alternative fungicides and residual activity is robust, minimizing the necessity for frequent re-application.
- **Environmental Compatibility and excellent crop safety & short Interval:** It is suitable for Integrated Pest Management (IPM) programs. It is safe for crops, even during flowering, and has a short pre-harvest interval (can be used near harvest).
- **Resistance Management:** Due to its unique mechanism, it can be rotated or combined with other fungicides to combat resistant pathogen

## Key Technology Features

- Cyazofamid (CAS: 120116-88-3)
- Cyazofamid is an cyano-imidazole class fungicide
- Four step manufacturing process from indigenously available raw materials (Make in India, Atmanirbhar Bharat)
- Innovative process with potential of filing process patent
- Process Know-how out-licensed to the client
- it is possible to expand if any more clients come forward
- Creates Direct employment in production

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
35 PLANTS	8	0

Thematic Area: **Climate and Agri-food tech**  
Category: **Climate Monitoring & Air pollution**

# CSIR-AMPRI's Indigenous SODAR (Sound Detection and Ranging) System

## Overview

Lower atmospheric research is important for improving weather and climate models, predicting hazardous events like storms and fog, and monitoring air quality and pollution dispersion. Sound Detection and Ranging (SODAR) is an acoustic remote sensing technique for real-time monitoring of lower atmosphere characteristics. It supports air quality monitoring, weather and fog forecasting, aviation safety, and industrial planning by identifying optimal emission hours. Policymakers, environmental agencies, airports, and industries use SODAR systems for pollution control, urban planning, and operational safety.



Fig. 1 SODAR Antenna



Fig. 2 Real-time SODAR data acquisition

## Functionalities



SODAR provides real-time, low-cost atmospheric data for weather, environment, and safety applications.



Max Vertical Range ~ 1000 m (extendable), Operating Frequency ~ 2250 Hz, High-resolution, CSIR copyright software



SODAR data enables mixing height estimation, inversion detection, pollution dispersion, and industrial operational planning with local maintenance.



SODAR is lower cost than imported SODAR systems, optimized for Indian atmospheric conditions.

## Key Features

- SODAR designed as per Indian meteorological and geographical conditions
- High accuracy, customizability, Operational robustness, Cost-effective
- Measured Parameters: Atmospheric Boundary Layer height, inversion, stability class, turbulence, pollution carrying capacity of the atmosphere

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, 11 Locations in 9 states	9	7 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Food Processing**

# Millet-Bun: A Healthier Alternative to Conventional Bakery Products

## Overview

The technology focuses on developing and standardizing millet-based buns using a blend of ragi, bajra, jowar, foxtail, and proso millets. Through systematic trials of ingredient proportions, fermentation, and processing conditions, 20% millet flour incorporation was found optimal. The formulation improves nutritional value while maintaining desirable sensory qualities, providing a balanced and healthier alternative to conventional bakery products.



## Functionalities



Develops nutritionally enhanced buns using blended millet flours



Optimizes fermentation and processing for consistent product quality



Ensures acceptable sensory attributes with improved nutrient profile

## Key Features

- Optimal 20% millet incorporation for balanced nutrition and taste
- Blend of major and minor millets enhances micronutrient diversity
- Maintains sensory quality comparable to conventional wheat buns

## Implementation Overview

Deployed	TRL	Training Requirement
01 (On exclusivity)	9	01 day

## Contact Details

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Thematic Area: **Climate and Agri-food tech**  
Category: **Organic Soil Conditioner & Fertilizer**

# Potash Enriched Biochar Production from Selected Biomass Waste for Sustainable Agriculture and Environment

## Overview

The innovation developed process to transform Banana plant wastes, in particular peduncles, to Potash Enriched Biochar (about 10%) through pyrolysis. Potassium in biomass converted into mineral forms such as Kalicinite ( $\text{KHCO}_3$ ) etc. during pyrolysis within specific temperature and time. Technology know-how is licensed to several entrepreneurs and supported circular economy. The technology lead business supported farmers, biochar producers and market intermediaries, user. Biochar has conditioner value for acidic soil and carbon sequestration.



## Functionalities



Alternative valorization method of Banana Plant Waste (peduncles) through pyrolysis



Production of Potash Enriched Biochar, as organic conditioner suitable for acidic soil



Added niche and new product for entrepreneurs and supported value creating biochar product

## Key Features

- Specific Biomass Waste (banana peduncle) and Pyrolysis conditions
- Novel approach towards banana waste recycling for Potash enriched biochar
- Solve problems of banana peduncle waste and conversion to valuable product

## Implementation Overview

Deployed	TRL	Training Requirement
YES [02]	09	02 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**  
Category: **Climate and Agri/Food technologies**

# Heeng Cultivation

## Overview

Asafoetida (heeng) is a medicinal spice native to Iran, Afghanistan, Uzbekistan, and Turkmenistan, valued for its digestive benefits. India heavily imports it due to lack of planting material and agrotechnology. CSIR-IHBT has introduced new accessions and developed cultivation methods for Himalayan cold deserts. Regular plantation can ensure continuous supply. Domestic cultivation can reduce imports and support the Atmanirbhar Bharat initiative, boosting self-reliance in spice production.



View of Heeng plants cultivated in Farmers' Field

## Functionalities

### Functions:

- Development of viable planting material from imported germplasm
- Standardized agrotechnology for cultivation in cold desert regions

### Uses:

- Spice/condiment with strong flavor
- Medicinal applications, especially for digestive health
- Potential use in pharmaceuticals and food industries

### Operational capabilities:

- Suitable for high-altitude, low-moisture regions of the Himalayas
- Enables domestic production, reducing import dependence
- Supports annual plantation cycles for continuous yield
- Promotes farmer income and self-reliance under Atmanirbhar Bharat

## Key Features

- Indigenous cultivation capability: First successful domestication in Indian Himalayan cold deserts, reducing reliance on imports.
- Standardized agrotechnology: Scientifically developed package of practices for sowing, and growth.
- High-value crop potential: Generates better income for farmers due to strong market demand and high price.
- Adaptability: Thrives in harsh, low-moisture, high-altitude environments unsuitable for many crops.
- Import substitution: Significant potential to cut foreign exchange expenditure on asafoetida imports.
- Sustainable production model: Annual plantation strategy ensures continuous supply.
- Medicinal and industrial relevance: Dual use as spice and therapeutic product enhances market scope.
- Alignment with national goals: Supports self-reliance under Atmanirbhar Bharat and boosts rural livelihoods.

## Implementation Overview

A total of 15,000 quality heeng plants were produced during the current year. Of these, 1,600 were distributed in Ladakh, 1,500 in Doda, Bhaderwah and Kishtwar in Jammu & Kashmir, and 1,200 in Chamoli, Uttarakhand. Additionally, 3,600 plants were distributed in Kinnaur and Kullu Districts of Himachal Pradesh for establishing seed production centres.

**Deployed**

**TRL**

**Training Requirement**

5

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

# Agro-Industrial Waste Based 3D Printed Concrete Block (3dpcb) Units and Production Method Thereof

## Overview

This technology develops eco-friendly 3D printed concrete blocks using agro-industrial waste like fly ash and bagasse ash. The blocks are digitally designed, printed without moulds or formwork and used for masonry construction. It reduces carbon footprint, production cost, and construction time while improving strength and durability. Automated 3D printing eliminates formwork and reduces labor dependency, making it suitable for rapid, affordable, and sustainable construction, especially in rural and semi-urban areas



Figure : 3D printed SCBA/fly ash based interlocking block units and printing of hollow 3DPCB units

## Functionalities

- Automated 3D printing of hollow and interlocking concrete block units.
- Utilization of agro-industrial waste materials
- Utilization of fly ash and sugarcane bagasse ash in binder matrix.
- Production of customized block geometries for masonry and infill applications.
- Rapid construction without conventional moulds or formwork and reduced manpower.
- Suitable for rural housing, semi-urban housing and demonstration buildings.

## Key Features

- Agro-industrial waste based sustainable binder system
- Lower carbon footprint construction
- Higher compressive strength blocks
- Faster production without formwork
- Estimated 27 percent cost reduction over OPC blocks.
- Improved durability and moisture resistance

## Implementation Overview

Deployed	TRL	Training Requirement
Yes. Field demonstration completed through construction of a housing unit at CSIR-CBRI, Roorkee using 3D printed concrete block construction.	7-8	5-7 days for printer operation, mix preparation, printing control, curing and block handling

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Marine Biology**

# Harnessing the Blue Economy: CSIR-CSMCRI's Seaweed Cultivation

## Overview

CSIR-CSMCRI's Seaweed Cultivation technology pioneers sustainable aquaculture by enabling large-scale farming of economically important seaweed species. It ensures a reliable supply of raw material for seaweed phycocolloid and natural bio-stimulant industries, reducing dependence on natural harvesting and import. The innovation supports coastal communities through livelihood generation, promotes marine biodiversity conservation, and contributes to climate resilience via carbon sequestration. By integrating science, sustainability, and socio-economic development, it positions India as a leader in marine biology and eco-friendly agriculture.



## Functionalities



The fresh/dry seaweed biomass is liquefied to produce seaweed liquid fertilizer which proven to be a promising low-cost plant biostimulant.



Technology facilitates production of hydrocolloids for food, pharma, molecular biology and biotech sectors.



Supports coastal livelihoods through employment and income generation opportunities.

## Key Features

- The seaweed farming does not required fertilizer, pesticide, irrigation etc. that like of conventional land crops farming.
- Elite micro propagated seedlings achieved an average of 30% increase in biomass yield in cultivation than conventional cultivation.
- Eco-friendly cultivation methods with short crop cycle conserve marine biodiversity and coastal ecosystems.

## Implementation Overview

### Deployed

Yes; successfully deployed along India's coastal regions, with pilot projects demonstrating high biomass yields; licensed to many industries; products based on this this technology are being sold in market by different reputed companies.

### TRL

5

### Training Requirement

Yes, training required in nursery management, sea-based farming, harvesting practices, and production.

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

## CSIR-NIIST's Protein Rich Designer Rice

### Overview

A novel “designer rice,” developed using extrusion technology, delivers high protein, improved dietary fiber, low glycemic index and essential micronutrients. It addresses the dual challenges of diabetes and hidden hunger without requiring changes in the dietary habits. Suitable for large-scale adoption, this technology enhances metabolic health, improves nutritional security and elevates overall dietary quality among populations that rely on rice as a staple food.



### Functionalities



Enables production of high protein, micronutrient enriched designer rice using extrusion technology



Facilitates reduction of glycemic response through controlled starch digestibility and structural modification



Allows integration of essential micronutrients without altering the dietary consumption patterns

### Key Features

- >20% Protein Content – Substantially higher protein levels compared to conventional polished rice
- Low Glycemic Index (GI < 55) – Supports improved blood sugar management and metabolic regulation
- Improved Dietary Fiber – Contributes to digestive health and prolonged satiety
- Micronutrient Enrichment – Includes iron, folic acid and vitamin B12 to address dietary deficiencies

### Implementation Overview

Deployed	TRL	Training Requirement
Yes – 2 technology transfer to industry partner (pilot/commercialization stage)	6	Minimum of 30 days

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Environmental**

# Hybrid Granular SBR For Waste Water Treatment (GST) For Bio-Beads Development for Normal and Saline Wastewater Treatment

## Overview

The hybrid Granular SBR Treatment (GST) is a compact biological treatment method for effective removal of contaminants from domestic and industrial wastewaters. It makes use of the natural microbes present in the wastewater for removing contaminants. The microbial growth is predominantly in bio-beads comprising of biomass particles (biofilms and granules). It enables building compact effluent and sewage treatment plants with smaller land footprint and lower costs as compared to other methods.



## Functionalities

### Bio-beads



achieve high biomass levels,



simplify separation of biomass from treated wastewater, and



decrease the load of pollutants to acceptable levels

## Key Features

- The bio-beads produced during wastewater treatment are a source of C, N and P and a fertilizer-supplement in organic farming.
- The treated wastewater and fertilizer-supplement, can partly recover the OPEX.
- The sequencing batch reactor and bio-beads are used for treating wastewater in a single tank system.

## Contact Details

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## Implementation Overview

### Deployed

Yes, Licensed to 36 companies

### TRL

> 5

### Training Requirement

4 days.

Thematic Area: **Climate and Agri-food tech**

Category: **Environmental**

# Compact Helical Biodegradable Waste Converter SHESHA For Processing Biodegradable Waste

## Overview

Biodegradable waste management has assumed global significance. In order to manage the biodegradable waste generated in smaller housing societies, restaurants, a novel, compact helical shaped waste converter has been developed at NA&BTD, BARC. This allows decentralized processing of the biodegradable waste. The system has tremendous potential to process the waste as well as generation of good quality fuel and manure required for soil applications.



## Functionalities



Process is amenable for different amount of waste processing like 10 kg, 25 kg, 50 kg, 100 kg waste processing,



Design suitable for understanding different process parameters online, and



Sampling from different locations is feasible.

## Key Features

- Helical shape digester made from low-cost PVC pipes.
- Design suitable for mounting on wheels/vehicle for processing waste from different societies/residential complexes.
- Design has inbuilt capacity of biogas recycling for methane enrichment

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes, Licensed to 13 companies	> 5	2 days

Thematic Area: **Climate and Agri-food tech**

Category: **Water Technology**

# A Method of Preparation of Forward Osmosis Membrane using Synthesized Polysulfone-co-amide Polymer

## Overview

This device is based on polysulfone type of ultrafiltration membrane in a unique cylindrical configuration and useful to purify the domestic water with respect to microorganism, colour, odour, suspended solids and organics. It is very effective as it removes bacteria to the extent of > 99.99% (4 log scale) & removes complete turbidity and produces crystal clear water. This device does not need electricity or addition of any chemical.



## Functionalities



The device effectively removes 99.99% bacteria



It needs neither electricity nor any chemical, and



A single unit can produce 40 litres of drinking water daily.

## Key Features

- The device is almost maintenance free except occasional cleaning of filter residues
- No wastage of water unlike RO membranes.
- A cost competitive solution while compared with UV and RO based purifier, especially for remote areas.

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes, Licensed to 25 companies	> 5	1 day

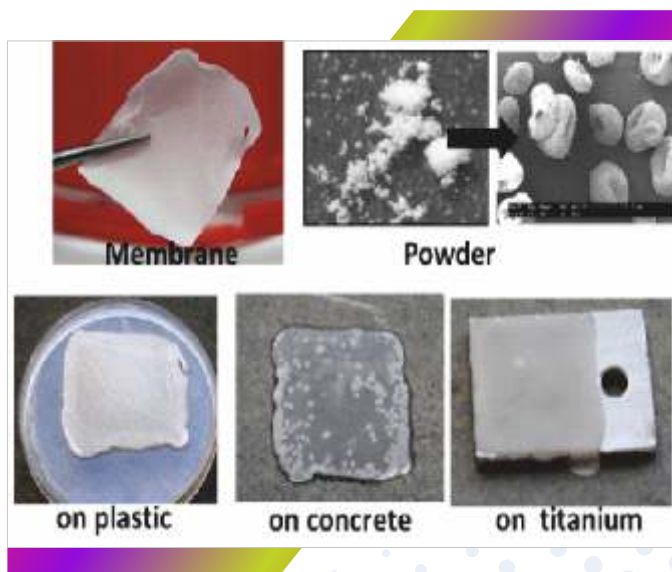
Thematic Area: **Climate and Agri-food tech**

Category: **Water Technology**

# A Method for Preparing Chlorine-Dioxide Releasing Polymer

## Overview

CLEAN is biodegradable polymer-based chlorine dioxide releasing polymer which can be used for “on demand” water disinfection. The polymer can be synthesized for predetermined dose and dose rate of chlorine dioxide by altering its constituents. Being completely biodegradable, it does not create any environmental pollution. Chlorine dioxide (ClO<sub>2</sub>) is a very effective biocide for drinking water disinfection and biofouling control.



## Functionalities



Being completely biodegradable, it does not create any environmental pollution.



It can be used as “on the go” water purifier where water gets purified in < 15 minutes.



The disinfection efficiency of chlorine dioxide is not influenced by pH and organics present in water.

## Key Features

- ClO<sub>2</sub> is a very effective biocide for drinking water disinfection and biofouling control,
- The polymer composite can be used for water disinfection of various volume and easily scalable, and
- It can be used to preserve water for any duration.

## Contact Details

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## Implementation Overview

### Deployed

Yes, Licensed to 7 companies

### TRL

> 5

### Training Requirement

5 days

Thematic Area: **Climate and Agri-food tech**

Category: **Waste management, Waste to Energy**

# “RAUDRA™” Plasma Pyrolysis Technology for Clean Energy and Waste Reduction

## Overview

Plasma pyrolysis is an advanced waste treatment technology that uses extremely high-temperature plasma to safely convert hazardous, biomedical, municipal, and industrial waste into useful products such as syngas and inert slag. The process significantly reduces waste volume, minimizes harmful emissions, and enables energy recovery from non-recyclable waste. The technology benefits municipalities, hospitals, industries, and environmental agencies by supporting cleaner waste management, reducing landfill dependency, lowering pollution, and contributing to sustainable energy generation and circular economy initiatives.



## Functionalities



Safe destruction of hazardous, biomedical, municipal, and industrial waste



Conversion of non-recyclable waste into useful syngas for energy recovery



Significant reduction in waste volume, landfill usage, and pollution



Generation of environmentally safe inert slag with minimal residues



Support for sustainable and circular waste management practices

## Key Features

- Ultra-high temperature plasma enables complete and efficient waste destruction
- Capable of treating diverse and mixed waste streams, including hazardous waste
- Produces useful syngas for energy recovery with minimal secondary waste generation
- Environment-friendly and sustainable technology supporting circular economy initiatives
- All emissions are within the limit set by US-EPA and CPCB/MoEF&CC.
- Approved for safe disposal of biomedical waste under BMW management rules 2016

## Implementation Overview

Deployed	TRL	Training Requirement
7	7	15 days

## Contact Details

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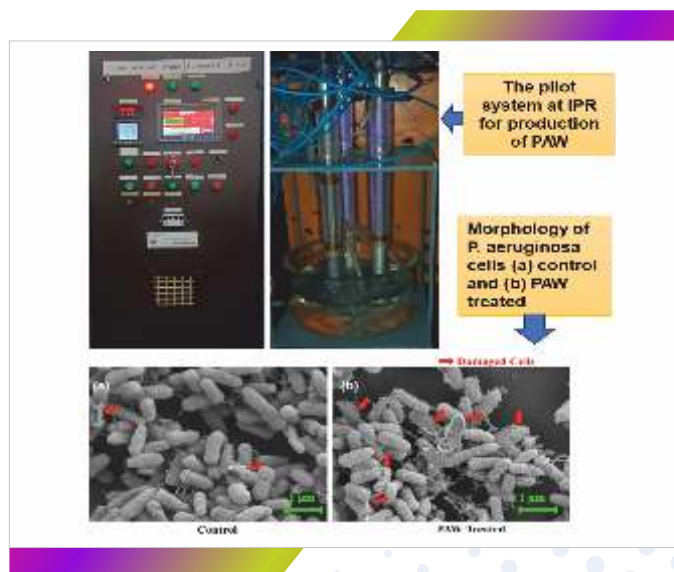
Thematic Area: **Climate and Agri-food tech**

Category: **Healthcare/Agriculture**

# “PlazNeer” Eco-Friendly Plasma Activated Water Technology for Healthcare and Agriculture

## Overview

“PlazNeer” Plasma Activated Water (PAW) technology uses non-thermal plasma to generate reactive oxygen and nitrogen species in water, giving it strong antimicrobial and disinfecting properties. The technology provides an eco-friendly and chemical-free solution for surface sanitization, healthcare hygiene, food safety, agriculture, and water treatment applications. PAW effectively inactivates bacteria, viruses, and other harmful microorganisms while minimizing chemical residues and environmental impact. The technology benefits healthcare, agriculture, food processing, and public sanitation sectors by enabling safer, sustainable, and cost-effective disinfection solutions.



## Functionalities

-  Generation of antimicrobial and disinfecting reactive species in water using plasma
-  Inactivation of bacteria, viruses, fungi, and other harmful microorganisms
-  Surface sanitization and hygiene applications in healthcare and public spaces
-  Support for food safety, agriculture, and water treatment applications
-  Chemical-free and eco-friendly disinfection with minimal environmental impact

## Key Features

- Chemical-free and environmentally friendly disinfection technology
- Effective against a broad range of microorganisms, including bacteria and viruses
- Generates reactive species in water without harmful chemical residues
- Suitable for healthcare, food safety, agriculture, and sanitation applications
- Cost-effective, sustainable, and safe for routine disinfection use

## Implementation Overview

Deployed	TRL	Training Requirement
No	4	7 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Climate**

# Improved Space Heating Device (Bukhari), HIM-TAAPAK

## Overview

The "Bukhari" is an improved, safe, and highly efficient kerosene-fueled space heater developed by DRDO's Defence Institute of Physiology and Allied Sciences (DIPAS) for Indian soldiers in high-altitude, cold regions like Ladakh and Siachen, significantly reducing fuel use and preventing hazards like carbon monoxide poisoning and backblast fires. It's known as "Him Tapak" and offers major cost savings, becoming a standard issue for troops.

Accepted by the CRPF.



## Features

- Two chambered designs, one for hot air blower and other for flue gases
- Safe: Triple level protection – no chance for blast or fire
- No CO builds up in the room
- Maximum heat extraction – less wastage of heat at exhaust level
- Convective and radiative heating
- Uniform heating of room air for better comfort
- Safe and Efficient burner; Low fuel consumption (500-700 ml/hr)
- Burner can be moved out for cooking/warming food or water heating
- Controllable blue flames, no soot formation

## Implementation Overview

Deployed                      TRL                      Training Requirement

## Contact Details

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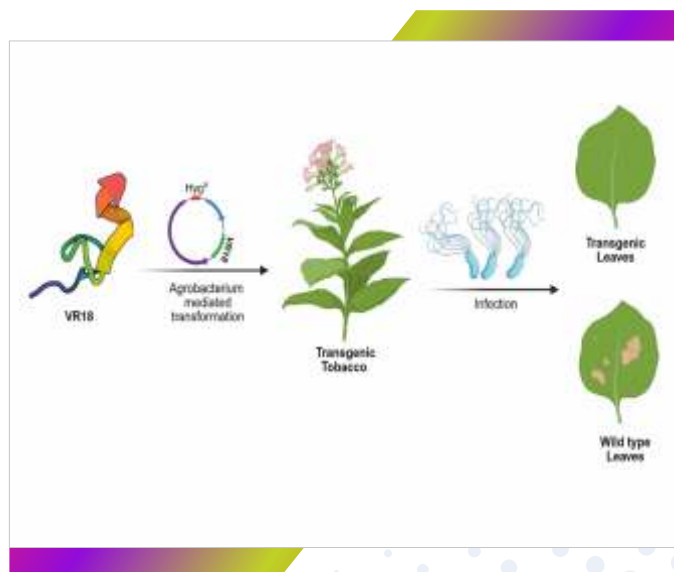
Thematic Area: **Climate and Agri-food tech**

Category: **Agricultural Biotechnology / Bio-based Crop Protection Technologies**




# De Novo Designed Novel Antimicrobial and Antiseptic Peptides and Its Application against Plant Pathogens

## Overview

This innovation focuses on the design of novel antimicrobial and antiseptic peptides for effective control of plant pathogens. These peptides are biodegradable and offer a targeted, eco-friendly alternative to conventional chemical pesticides, reducing environmental toxicity and resistance development. The technology can benefit farmers by improving crop health, yield, and quality, while supporting sustainable agricultural practices. It holds strong potential for application in integrated crop protection and long-term food security.



## Functionalities

-  Exhibits strong antimicrobial activity against a broad range of plant pathogenic microbes.
-  Acts as an antiseptic agent preventing infection spread on plant surfaces and tissues.
-  Provides targeted action, minimal harm to beneficial microorganisms and surrounding ecosystem.

## Key Features

- Reduces reliance on chemical pesticides, supporting safer and sustainable crop protection practices.
- Can be applied as foliar spray, seed treatment, or soil amendment formulations across multiple crops and agricultural systems.
- Shows potential for scalable production and integration into existing agricultural management systems.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	Not Applicable

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Disease and growth Management**

## Endophytic Actinomycetia-based Bioformulation for Sustainable Management of Fusarium Dieback Disease in Tea (*Camellia sinensis* L.)

### Overview

Fusarium dieback is a major constraint in tea cultivation, causing severe yield losses and dependence on chemical fungicides. This technology from IASST introduces an endophytic Actinomycetia-based bioformulation that suppresses *Fusarium solani*, exhibits potent broad-spectrum activity against major foliar and soil-borne fungal pathogens, and is proven effective through field-based experiments. The eco-friendly solution enhances plant growth, reduces fungicide residues, improves yield, and promotes sustainable, export-compliant tea production.



Figure: Fusarium dieback disease biocontrol in field condition

### Functionalities



Biocontrol of *Fusarium* dieback and major foliar fungal pathogens in Tea.



Enhances plant growth via nutrient mobilization and phytohormones.



Improves soil and plant health through microbial synergy.



Provides field-applicable liquid bioformulation for easy spraying.

### Key Features

- Streptomyces strains with synergistic biocontrol activity against *Fusarium* dieback disease.
- Eco-friendly alternative to chemical fungicides and Reduces disease severity and increases tea yield.
- Shelf-stable, scalable, and cost-effective formulation.

### Implementation Overview

#### Deployed

Field trials conducted in tea estates (Assam)

#### TRL

7

#### Training Requirement

1-2 days training for farmers/extension workers

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Sustainable Agriculture & Pest Management**

# Nanomatrix-Based Controlled Release Dispenser for Delivery of Semiochemicals

## Overview

The present technology relates to a nanomatrix-based controlled release system designed for the delivery of semiochemicals (pheromones) for insect pest management. The nanoporous matrix enables efficient adsorption and sustained release of pheromones, ensuring prolonged field activity and enhanced trapping efficiency. This eco-friendly approach minimizes the dependence on chemical pesticides and reduces associated health and environmental risks. The technology has been validated through field trials and is suitable for large-scale agricultural deployment.



Figure: Field demonstration of Tuta Pheromone in Farmers Fields

## Functionalities



Enables controlled and sustained release of pheromones for pest monitoring and trapping



Enhances trapping efficiency with prolonged lure activity under field conditions



Scale down the reliance on chemical pesticides, promoting environmentally sustainable practices

## Key Features

- Controlled Release – Prevents rapid depletion and ensures sustained pheromone emission  
Better spatio-temporal release and hence cost effective.
- Reusable Matrix – Durable and farmer-friendly for repeated field applications

## Implementation Overview

### Deployed

Yes, in more than 5000 acres in Karnataka, Kerala and Tamil Nadu

### TRL

8

### Training Requirement

Two weeks training for the firms to produce the materials and loading of the pheromones.

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Organic farming**

# A Micronutrient Composition for Black Pepper and a Process for Its Preparation

## Overview

There is a vast difference between the recorded yield and present level of national productivity of black pepper. Soils in the majority of production areas are acidic with low to medium essential nutrients. For increasing the productivity in these soils, this product is developed with definite proportion of essential micronutrients and other nutrients required by black pepper for foliar application and it gives 15-20% yield increase by supplementing essential nutrients.



## Functionalities



The technology has improved the benefit cost ratio of black pepper production thereby improving the financial status of the farmers and their affordability status



As the technology aims for balanced crop nutrition, it upkeeps the product quality and supports the nutritional requirement of the population and health also.

## Key Features

- Improves health, quality and yield of black pepper (15-20% yield increase)
- Water soluble and compatible with simple or complex fertilizers standard fertilizers
- Easy to transport and long shelf life (12-18 months)
- Environment friendly and hence can fit into any of the organic packages
- Low investment/cost of production with cost benefit ratio 1:2.5
- Huge potential for fertilizer industry

## Implementation Overview

Deployed	TRL	Training Requirement
11 licenses (for commercial production and marketing)	9	1-2 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Precision Aquaculture / Sustainable Farming System**

# Super Intensive Precision and Natural Shrimp Farming

## Overview

The Super Intensive Precision and Natural Shrimp Farming System (SIPNSF) developed by ICAR-CIBA is an indigenous, climate-resilient aquaculture model designed for high-density culture of *P. vannamei*. SIPNSF integrates advanced aquaculture engineering with biological process control to create a smart, responsive farming system. The technology is driven by a centralized smart control panel connected to a network of sensors that continuously monitor critical parameters such as dissolved oxygen, temperature, and water movement, enabling real-time adjustments and automated control of aeration, mixing, and feeding. This precision management ensures optimal oxygen distribution, efficient feed utilization, and stable hydrodynamics, even under super-intensive stocking densities.



Harvesting in a Super Intensive Precision and Natural Shrimp Farming

## Functionalities



Enables high-density shrimp culture with precision monitoring



Maintains optimal water quality through natural inputs



Improves survival rate and production efficiency



Environment friendly farming system

## Key Features

- Achieves higher yield with reduced environmental impact
- Enables real-time monitoring and control of culture conditions
- Farmer-friendly system adaptable from small to commercial scale

## Implementation Overview

Deployed	TRL	Training Requirement
Yes. Field Level demonstrations with farmers No. 5	8	5 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Fish Waste to Wealth**

# Plankton<sup>Plus</sup> – Fish waste to Wealth

## Overview

CIBA Plankton<sup>Plus</sup> is an innovative feed supplement developed from fish waste and trimmings to enhance plankton production in aquaculture systems. It supports the growth, survival, and health of shrimp, fish, and mollusc larvae by maintaining a balanced phytoplankton and zooplankton bloom, while reducing dependence on artificial feeds. Enriched with proteins, lipids, essential fatty acids (DHA/EPA), vitamins, and minerals, it improves fry and post-larval quality and lowers early-stage mortality by 15–30%. The technology also promotes eco-friendly disposal of fish market waste, enabling a circular bioeconomy approach that is scalable and suitable for both coastal and inland aquaculture systems.

Patent No. 538446

Granted on: 17.05.2024



CIBAPlankton<sup>Plus</sup>

CIBA-Plankton<sup>Plus</sup> application

## Functionalities



Converts fish waste into nutrient-rich bio-inputs



Enhances plankton growth for aquaculture productivity



Reduces organic waste load and environmental pollution

## Key Features

- Enables responsible and sustainable utilization of fish waste
- Low-cost, simple, and farmer-friendly technology
- Enhances resource efficiency and supports waste-to-wealth approach

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	9	3 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Genome Editing and Precision Crop Biotechnology**

# Tnpb-Based Compact Genome Editing Platform for Precision Crop Improvement and Accelerated Breeding

## Overview

TnpB is a tiny genome-editing protein, about one-third the size of commonly used tools like Cas9 or Cas12a. Its small size makes it far easier to deliver into plant cells, including through virus-based carriers. TnpB can reach and edit parts of the DNA that larger tools often cannot. It also goes beyond simple DNA cutting; it can switch genes on or make precise letter-by-letter edits. These qualities make TnpB a promising next-generation tool for developing better crop varieties.

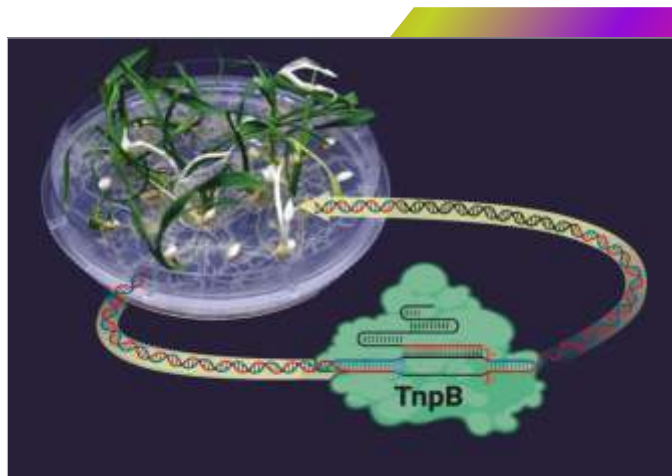


Figure: TnpB was used to disable a gene required for chlorophyll production, leading to albino plants.

## Functionalities



Targeted gene knockout and allele modification in crop plants via programmable RNA-guided cleavage.



Enables multiplex editing of multiple genomic loci simultaneously for complex trait engineering.



Compatible with base editing configurations for precise single-nucleotide changes.



Facilitates efficient delivery into plant cells and functional genomics.



Applicable across monocots and dicots for trait improvement including yield, stress tolerance, and quality.

## Key Features

- Hyper-compact nuclease (~400 aa) — markedly smaller than SpCas9 (~1368 aa), easing delivery constraints for genome editing applications
- IP-protected innovation: patent granted (Indian patent no. 570650)
- Scalable and adaptable for multiple crop improvement applications

## Implementation Overview

### Deployed

Yes (Validated under controlled laboratory and greenhouse conditions).

### TRL

TRL 4/5 – Technology validated in laboratory / plant cell environment

### Training Requirement

5–7 days (molecular cloning, plant transformation, genotyping; for trained plant biotechnologists)

Scale-up Readiness: Ready for licensing to private seed/agri-biotech companies; 7 companies have expressed formal interest

## Contact Details

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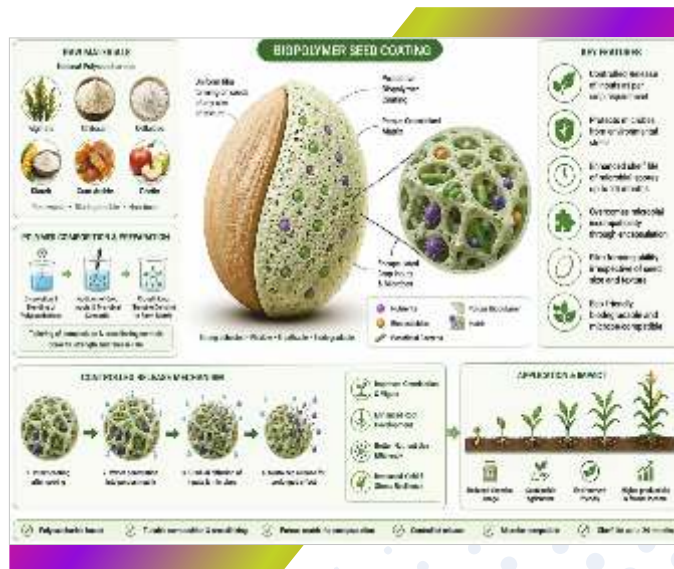
Optional: Dr. KA Molla, Sr. Scientist, ICAR-CRRI, [kutubjoy@gmail.com](mailto:kutubjoy@gmail.com). 8018378878

Thematic Area: **Climate and Agri-food tech**  
Category: **Sustainable Crop Production Inputs**

# Biopolymer-Based Tailored Porous Seed Coating for Controlled Release of Crop Inputs and Microbial Consortia

## Overview

A novel biopolymer-based seed coating technology using tailored polysaccharide compositions and crosslinking to create porous matrices for encapsulating agrochemicals and beneficial microbes. It enables controlled release, enhanced microbial survival, and extended shelf life (up to 24 months). The coating improves seed performance, reduces agrochemical load, and ensures compatibility across seed types, contributing to sustainable and precision agriculture.



## Functionalities



Encapsulates crop inputs within crosslinked porous biopolymer matrices



Enables controlled release of nutrients, chemicals, and microbial spores



Enhances microbial viability, stability, and extended shelf life

## Key Features

- Tailored polysaccharide composition with tunable crosslinking density
- Compatible with diverse seeds irrespective of size, texture
- Overcomes microbial incompatibility through protective encapsulation

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes, 250 trials have been completed across different crops	6-7	4-5 days for operators and technical staff

Thematic Area: **Climate and Agri-food tech**

Category: **Sustainable Crop Protection and Input Delivery Systems**

# Biopolymer-Based Multilayer Seed Coating Technology for Enhanced Crop Productivity and Reduced Agrochemical Load

## Overview

An eco-friendly multilayer seed coating technology using biodegradable tailored and crosslinked biopolymers such as polysaccharides to deliver crop inputs efficiently. The system enhances germination, plant vigor, and stress tolerance while reducing pesticide use. It acts as a controlled-release carrier for nutrients, bioagents, and chemicals, improving input efficiency and yield sustainability in agricultural crops.



## Functionalities



Enables layer-by-layer delivery of nutrients, bioagents, and pesticides.



Provides controlled and sustained release of crop inputs



Enhances seed germination, vigour, and early plant establishment

## Key Features

- Biodegradable, eco-friendly polymer-based coating system
- Reduces chemical input usage and environmental contamination
- Customizable multilayer design for crop-specific requirements

## Contact Details

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## Implementation Overview

### Deployed

Yes of 70 no. (validated field conditions in different crops like oilseeds, pulses, cereals, millets, vegetables etc.)

### TRL

6–7 (technology demonstrated in relevant environment)

### Training Requirement

2–3 days for operators and technical staff

Thematic Area: **Climate and Agri-food tech**

# Bio-fortified Crop Varieties Developed by ICAR

## Overview

ICAR has developed a diverse portfolio of bio-fortified crop varieties across cereals, vegetables, and legumes, aimed at improving nutritional security, enhancing farmer income, and promoting climate-resilient agriculture. Most of these technologies are at TRL-9 (field-ready and widely adopted), with several already commercialized through non-exclusive licensing.

### Wheat Varieties (ICAR-Indian Institute of Wheat and Barley Research, Karnal)

Variety	Key Nutritional Trait	Area of Adoption	Avg Yield	Social Impact	Licensing
DBW187 (Karan Vandana)	Iron (43.1 ppm)	NWPZ, NEPZ, CZ	Up to 61.3 q/ha	₹6260 Cr benefit; 11.36% productivity gain	351 licensees
DBW303 (Karan Vaishnavi)	Protein (12.1%)	NWPZ, CZ	Up to 81.2 q/ha	₹3339 Cr benefit	243 licensees
DBW316 (Karan Prema)	Protein (13.2%)	NEPZ	41 q/ha	Suitable for late sowing	25 licensees
DBW327 (Karan Shivani)	Zinc (40.6 ppm)	NWPZ	79.4 q/ha	₹388.6 Cr benefit	208 licensees
DBW332 (Karan Aditya)	Protein (12.2%)	NWPZ	78.3 q/ha	₹106.3 Cr benefit	25 licensees
DBW371 (Karan Vrinda)	Protein + Zinc	NWPZ	75.2 q/ha	Improves nutrition and income of farmer	98 licensees
DBW372 (Karan Varuna)	Protein + Zinc	NWPZ	75.3 q/ha	Early sown, high yield	95 licensees
DBW443 (Karan Saanvi)	Protein + Zinc + Iron	Peninsular Zone	49.2 q/ha	Triple biofortified	Licensed to FPO

### Rice Varieties (ICAR-National Rice Research Institute, Cuttack)

Variety	Trait	Regions	Key Impact
CR Dhan 310	High Protein	Odisha, UP, MP, Assam	Nutritional security
CR Dhan 311	Protein + Zinc	Odisha, Assam	Improved dietary quality
CR Dhan 411	High Protein	Odisha	Enhanced grain nutrition
CSR 101	Salt Tolerant	Sodic soils	Reclamation + productivity

### Vegetables & Legumes (ICAR- Indian Institute of Vegetable Research, Varanasi)

Crop	Variety	Key Trait	Economic Potential
Okra	Kashi Lalima	High anthocyanin	Premium market value
Pea	Kashi Tripti	High yield	Urban demand
Carrot	Kashi Krishna	High anthocyanin	Processing industry
Faba Bean	Kashi Sampada	L-DOPA rich	Pharma/nutraceutical
Winged Bean	Kashi Annapurna	Protein-rich	Superfood market
Water Spinach	Kashi Manu	High yield + Iron	Continuous income

### Oilseed (Soybean) Varieties (ICAR- National Soybean Research Institute, Indore)

Variety	Trait	Impact
NRC 181	High protein	Improved human nutrition
NRC 127	High protein, inhibitor-free	Better digestibility

#### Key highlights of the biofortified crops:

- Nutritional Impact: Enriched with iron, zinc, protein, anthocyanins, and other micronutrients
- Economic Impact: Multi-crore income gains and productivity improvements
- Adoption Scale: Millions of hectares under cultivation
- Commercialization: Wide non-exclusive licensing (hundreds of companies)
- Sustainability: Climate-resilient and resource-efficient varieties

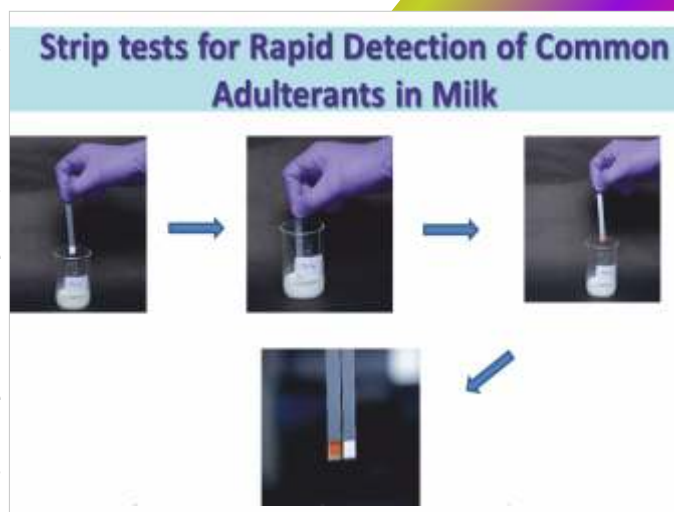
Thematic Area: **Climate and Agri-food tech**

Category: **Dairy and aquaculture technologies**

# Paper Strip tests for Rapid Detection of Common Adulterants in Milk

## Overview

Milk is important part of diet for neonate, infant, young, old, and pregnant individual. Many media reports and surveys done by FSSAI have indicated the adulteration of milk and milk products. These adulterants are being added to milk to fraudulently increase milk solids, increase shelf-life of milk and to mask the developed acidity of milk. Over the years, ICAR-NDRI has made efforts to simplify the detection of adulterants being added to milk. The developed strips are easy to use and require just one step wherein either they are dipped in milk sample or a drop of milk sample is applied to the prepared strip followed by visualization of change in color. In all cases, sensitivity of the prepared strips was found better than the existing wet chemistry-based tests. The details about their sensitivity and time taken to do the tests are as follows:



S. No.	Detection of adulterants	Type of test	Limit of detection	Time taken to do the test
1.	Neutralizers	Paper strip	0.04%*	10 seconds
2.	Added urea	Paper strip	0.1%	3 min
3.	Glucose	Paper strip	0.04%	5 min
4.	Hydrogen Peroxide	Paper strip	0.001%	20 seconds
5.	Maltodextrin	Paper strip	0.15%	8 min
6.	Sucrose	Paper strip	0.1%	8 min
7.	Salt	Paper strip	0.2%	3 min
8.	Formalin	Paper strip	0.05%	7 min
9.	Boric Acid	Paper strip	0.02%	7 min
10.	Starch	Paper strip	0.02%	2 min
11.	Nitrate/nitrites	Paper strip	0.005/0.0005%	2 min
12.	Sorbitol	Paper strip	0.25%	15 min

\*For Caustic soda

## Functionalities



Encapsulates crop inputs within crosslinked porous biopolymer matrices



Enables controlled release of nutrients, chemicals, and microbial spores

## Key Features

- Tests are rapid (maximum up to 10 min) and require no equipment to use strips
- Paper strip-based tests are better in sensitivity than existing wet-chemistry based methods

## Implementation Overview

### Deployed

Yes, 10 Organisations

### TRL

9

### Training Requirement

2 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **AI/ML-Based Precision Animal Health & Disease Surveillance**






# National Animal Disease Referral Expert System (NADRES V2): AI-Powered Early Warning System for National Livestock Disease Surveillance, Risk Forecasting and Informed Decision-Making

## Overview

NADRES V2 is an AI and ML-powered national early warning system developed by ICAR-NIVEDI, Bengaluru, for proactive livestock disease surveillance. It delivers district-level risk forecasts for 16+ major livestock diseases up to two months in advance, integrating real-time climatic, remote sensing, and epidemiological data. Actionable alerts are disseminated to farmers, veterinarians, and policymakers, enabling targeted surveillance, strategic resource allocation, and timely disease control to safeguard India's livestock sector.



## Functionalities

-  **AI/ML-based monthly risk forecasting for 15+ notifiable livestock diseases**
-  **District -level spatio-temporal disease risk mapping using ensemble ML models**
-  **Real – time integration of remote sensing, meteorological, and ecological data**
-  **Multi – channel alert dissemination via SMS, email, bulletins, and mobile apps**
-  **Passive clinical diagnosis via CADDES (cattle) and PDDDES (pig) expert systems**

## Key Features

- Covers 15 diseases; expanding to include Avian Influenza, Anaplasmosis, Mycoplasmosis
- Ensemble ML models (RF, Decision Tree, Stacking) with robust performance metrics
- Multi- language mobile app support: English, Hindi, Assamese, and Bengali
- FMD epidemic calculator for scenario-based intervention policy simulation
- Quantitative risk assessment for cross-border disease incursion probability

## Contact Details

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[https://nivedi.res.in/Nadres\\_v2/index.php](https://nivedi.res.in/Nadres_v2/index.php)  
<https://github.com/SEL-NIVEDI/>  
<https://www.youtube.com/@icar-nivedi>

## Implementation Overview

### Deployed

Yes – Operational nationally.

### TRL

8 – System complete and qualified; deployed and validated in operational environment with demonstrated real-world performance

### Training Requirement

2–3 days for veterinary nodal officers and field operators

Thematic Area: **Climate and Agri-food tech**

Category: **Mitigation of Enteric Methane Emissions from Ruminants**

## Anti-methanogenic Feed Supplement- *HaritDhara*

### Overview

HaritDhara is the country's first anti-methanogenic product developed to reduce methane emissions from livestock. It is formulated entirely from phyto-waste materials, with no use of chemical or synthetic components, making it an eco-friendly solution. The product has been widely adopted for livestock feeding across 14 states. Its use has demonstrated a reduction of more than 20% in methane emissions, contributing significantly to climate mitigation efforts. Additionally, incorporating HaritDhara into livestock concentrate helps in reducing overall feed costs while also leading to a marginal increase in milk production of approximately 250 ml per day.



### Functionalities



Feeding of product leads to reduction (20-22%) in daily methane emission



A marginal increase of about 250 ml in daily milk production



HaritDhara has inherent property of partial conversion of protein into bypass protein

### Key Features

- Green technology, formulation is based on the usage of phyto-sources
- Cost effective as the product formulation is based on the phyto-waste material
- First anti-methanogenic product of the country that has been widely adopted
- No adverse impact on the nutrient utilization and health of the host animal
- Far cheaper than the other anti-methanogenic products available globally
- Triple benefits i.e. methane reduction, productivity enhancement & carbon credit

### Implementation Overview

Deployed	TRL	Training Requirement
Yes (licensed to 7 firms for upscaling and large-scale production)	9	2-3 Days

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

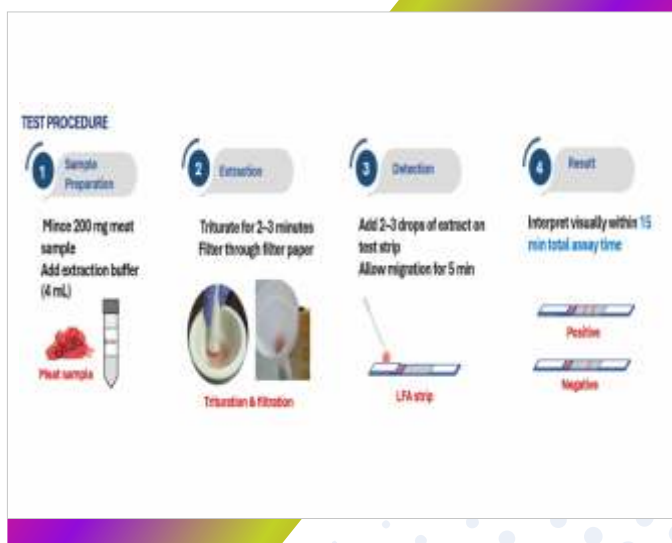
Category: **Diagnostics**

# Immunochromatographic pork and chicken Detection Kit

## Rapid lateral flow assays for detection of adulteration in meat products

### Overview

- **Immunochromatographic Pork Detection Kit (IPDK)** - Rapid lateral flow assay for detection of pork adulteration in meat products
- **Immunochromatography-based Chicken Detection Kit (ICDK)** - Point-of-Care Chicken Authentication Kit



### Functionalities



Meat authenticity verification



Detection of adulteration in raw and processed meat products



Halal/Kosher compliance monitoring



Regulatory surveillance and quality control

### Key Features

- Rapid on-site testing ( $\leq 15$  min) and no specialized laboratory equipment required
- Portable point-of-care detection and cost-effective screening tool
- Suitable for regulatory surveillance
- Useful for producers, regulators, exporters and consumers

### Contact Details

**Director**

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### Implementation Overview

Deployed	TRL	Training Requirement
Technology Commercialized to M/s M. R. Labs, Hyderabad	7-8	5-7 days

Thematic Area: **Climate and Agri-food tech**

Category: **Precision Farming**

## CIAE SPAD Meter 2.0

### Overview

The CIAE- SPAD meter 2.0 achieves similar accuracy to that of commercially available SPAD meter at low cost. The SPAD value is used in plant physiology-based research investigations and making nitrogen fertilizer recommendations. Therefore, CIAE- SPAD can become a potential diagnostic tool for measuring nitrogen status for research and field use due to its lower cost. It also added benefit of data logging to android smart phone as compared to commercially available SPAD meter.



### Functionalities



**Diagnostic tool for measuring nitrogen status**



**Facilitate data logging to android smart phone and memory storage in which data can be logged for further analysis**

### Key Features

- Economic-Low cost compared with commercial SPAD meter
- User Friendly- Easy to operate
- Technology licensing and deployment support provided by ICAR-CIAE

### Implementation Overview

**Deployed**

No

**TRL**

7

**Training Requirement**

05

### Contact Details

**ICAR-Central Institute of Agricultural Engineering**  
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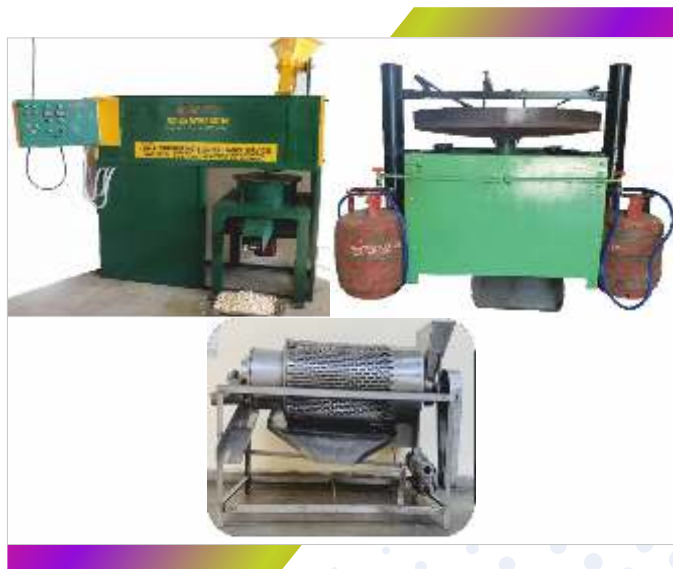
Thematic Area: **Climate and Agri-food tech**

Category: **Post-Harvest Technology**

# Mechanised Package for Makhana Production and Processing

## Overview

Mechanized makhana processing technology package transforms the labor-intensive manual practices to efficient, technology-driven and growth driven makhana processing industry. It encompasses seed collection system, primary roasting machine, upgraded popping machine, popped makhana grader, automated systems, moisture meter, and roasted seed storage protocol. High quality and hygienic product and women friendly machines create opportunities for rural employment. Overall plant capacity is 30 kg seeds/hour and popping can be done till April, which was not possible earlier.



## Functionalities



Machines for all unit operations with matching capacity and requirement.



Electric/LPG operated automated machines.



Each machine can be used individually for one unit operation



High-capacity processing plant can be automated

## Key Features

- Dust and smoke free machines with protection from heat
- Popped makhana does not require polishing that improves nutritional quality
- Reduces labour requirement and assures better quality for export

## Implementation Overview

Deployed	TRL	Training Requirement
30	9	15

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Artificial Intelligence in grading of Natural Fibres**

# AI-IoT Enabled Jute Fibre Grading System

## Overview

The AI-IoT enabled jute fibre grading system consists of several components: a feeding tray, a conveyor, an image capturing unit, a color measurement setup, and a bundle strength measurement unit. Three of the five parameters are measured through a computer vision-based contour detection model. The bundle strength measurement unit and color measurement setup measures the strength & color. After measuring all parameters, the mobile app "Jute Grader" displays test results.



## Functionalities



**Rapid and accurate grading of jute fibres**



**Non-destructive assessment of natural fibres, except bundle strength**



**Ability to grade fibre samples within five minutes**



**Compliance with IS: 7032 (2024) for grading of jute fibre**

## Key Features

- **Robust:** Reliable grading of natural fibres with 95% accuracy
- **Capacity:** Grade 40-50 samples/day
- **Versatility:** Suitable for grading of jute, mesta, and bimlifibres

## Implementation Overview

**Deployed**

01

**TRL**

08

**Training Requirement**

07 days

## Contact Details

**The Director**

ICAR-National Institute of Natural Fibre Engineering and Technology  
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Thematic Area: **Climate and Agri-food tech**

Category: **Waste Valorization and Bio-processing**

# Microbial Method for Extraction of Protein Isolate from Deoiled Cake

## Overview

This technology utilizes microbial fermentation for extracting protein isolate from oilseed cakes such as groundnut and soybean. It enhances protein yield, digestibility, and functional properties, enabling conversion of low-value by-products into high-value food ingredients. The process supports sustainable waste utilization and is suitable for applications in protein supplements and processed foods.



## Functionalities



Microbial fermentation improves protein extraction efficiency



Converts oilseed cakes into value-added protein isolate



Enhances digestibility and functional food properties

## Key Features

- Eco-friendly and sustainable bioprocess technology
- High-quality protein suitable for diverse food applications
- Validated strains with proven industrial applicability

## Implementation Overview

Deployed	TRL	Training Requirement
Yes (licensed to 5 industries)	8	5-7 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Biosensor and ICT**

# Aclivia: Biosensor device for Endocrine disrupting chemical detection in water

## Overview

Aclivia, the commercial version of Aqua SURAKSHA developed by C - DAC Kolkata with ICAR - CIFRI, is a portable biosensor for detecting organophosphate pesticides in water. Using enzymatic bioreceptors, colorimetric sensing, and IoT - enabled analytics, it delivers rapid, accurate (>90%) results. Designed for environmental monitoring agencies, aquaculture, and rural communities, it enables real - time water quality assessment, supports ecosystem protection, and helps mitigate health risks from pesticide contamination.



## Functionalities

- **Rapid enzymatic colorimetric detection of organophosphate pesticides in water ecosystems**
- **AI - enabled image capture and analysis for automated EDC presence assessment**
- **Real - time monitoring through mobile dashboard and cloud - integrated data storage**
- **Inbuilt uniform illumination imaging system for accurate colorimetric signal analysis**
- **Portable, battery - operated device enabling on - site environmental water quality testing**
- **User - friendly GUI supporting easy operation and rapid decision - making in field conditions**

## Key Features

- Handheld, field - portable biosensor for on - site water quality monitoring
- Enzyme - based bioreceptor ensures high specificity toward organophosphate pesticide residues
- Rapid colorimetric detection enabling quick and reliable contamination assessment
- Integrated imaging and AI analysis for accurate, automated result interpretation
- IoT - enabled system with cloud connectivity for real - time data access
- Battery - operated device supporting deployment in remote, resource - limited environments
- High accuracy (>90%) validated against conventional laboratory testing methods
- Commercially deployed solution enabling scalable environmental monitoring and regulatory compliance

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes	9	2 days

Thematic Area: **Climate and Agri-food tech**  
Category: **Climate and Agri/Food technologies**






# AI - Based Real - Time Ambient Air Quality Monitoring and Analytics System for Industrial and Urban Environments

## Overview

AQ - AIMS (AirPravah) is an AI - enabled ambient air quality monitoring system that provides real - time measurement of particulate and gaseous pollutants. It integrates hybrid sensors, onboard processing, and cloud - based analytics to compute Air Quality Index (AQI). Designed for industrial and urban deployment, it supports regulatory compliance, environmental assessment, and data - driven decision - making through continuous monitoring and remote accessibility.



## Functionalities

-  Real - time monitoring of particulate matter and gaseous pollutants
-  AI - based AQI computation and temporal air quality assessment
-  Cloud - enabled visualization, logging, and remote system management
-  GSM - based wireless data transmission for continuous monitoring
-  Onboard data acquisition and signal conditioning system

## Key Features

- Multi - parameter sensing: PM1, PM2. 5, PM5, PM10
- Pre - calibrated gas sensors for major pollutants
- Compact, weather - resistant outdoor deployment design
- Integrated web server for configuration and maintenance
- Scalable architecture for industrial and regulatory use

## Implementation Overview

Deployed	TRL	Training Requirement
Yes (Multiple installations across India – Goa SPCB, Vedanta, Lloyds Metals, Tata Chemicals, Fomento)	8-9	2-3 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Climate and Agri/Food technologies**

## Eco-Friendly PCB Recycling Technology

### Overview

E-waste PCB recycling technology focuses on recovery of valuable metals like copper, gold, silver, palladium from discarded printed circuit boards through pyro-metallurgical and hydrometallurgical process

### Key Features

- High recovery of copper, silver, gold and palladium
- Environmentally safer process
- Supports circular economy

### Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	7	7-10 days

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Solar Power Cold Storage with Thermal Energy Storage**

# Solar Cold Storage with Thermal Energy Storage for Sustainable Off-grid Preservation of Perishable Commodities

## Overview

Solar Cold Storage with Thermal Energy Storage is an innovative off-grid cooling solution developed by NISE for preservation of fruits, vegetables, flowers, vaccines and other perishables at farm level. Powered by solar PV and supported through ice-based thermal storage, it provides uninterrupted cooling without dependence on diesel or large battery banks, thereby reducing post-harvest losses, improving shelf life and enhancing farmers' income.



## Functionalities



Provides decentralized cold storage for fruits, vegetables, dairy and perishables.



Uses electricity generated from Solar Photovoltaic (PV) to provide cooling and store cooling energy in thermal storage for non-sunshine hours.



Maintains configurable cold chamber temperatures between 3°C to 20°C.

## Key Features

- Completely off-grid solar refrigeration solution with thermal backup with a cooling backup of 48 hours.
- Portable modular containerized unit requiring minimal installation time.
- Ice based thermal energy storage which charges in 6-8 hours based on solar radiation.
- Solar Photovoltaic installs on the top of the cold room, saves the area requirement.

## Implementation Overview

### Deployed

Around 50 field installations deployed across Tripura, Kerala, Karnataka, Uttar Pradesh and Assam including 5 MT and 10 MT units for FPOs, NGOs, temples and hospitals.

### TRL

8 to 9 (System completed and validated through field deployment in operational environment)

### Training Requirement

10–15 days operator training required for system handling, commodity loading practices, temperature setting and routine maintenance.

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Solar Dryer cum Space Heating System with Thermal Energy Storage**

## Solar Dryer cum Space Heating System for Sustainable Agricultural Produce Drying

### Overview

Solar Dryer cum Space Heating System developed by NISE is an innovative solar energy based drying solution for agricultural and horticultural produce. The system uses solar heated air and thermal energy storage to provide efficient moisture removal, improved product quality and reduced dependence on conventional fuel-based drying, thereby enabling value addition, shelf-life enhancement and higher income generation for farmers and rural entrepreneurs.



### Functionalities



Dries fruits, vegetables, spices, nuts, fish and other produce hygienically.



Uses solar thermal collector for heated air with thermal storage for day and night drying.



Provides hot air up to 120°C for controlled moisture removal.

### Key Features

- Drier uses very efficient and cost effective solar thermal technology for supplying heat.
- Complete off grid system running on solar.
- Drying chamber having drying capacity 50-70 kg in one time
- Designed for 24\*7 operation with NISE designed and developed innovative thermal storage system having heat storage capacity of 6 kWh.
- System designed for dual mode operation with plug and play connection: Drying Mode and Space Heating Mode.

### Implementation Overview

#### Deployed

Around 300 solar dryers cum space heating units deployed in Ladakh region for farmers in collaboration with Horticulture Department of Ladakh.

#### TRL

8 to 9 (System completed and validated through field deployment in operational environment)

#### Training Requirement

2-3 days operator training required for loading, unloading, drying cycle control and maintenance.

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Point-of-Care Diagnostics / Food Safety Testing**

# Rapid Multiplex Detection of Adulteration in Fake Paneer using Biomarker-Based Smart Paneer Testing Kit

## Overview

The Paneer Testing Kit is a rapid, non-enzymatic, color-based multiplex diagnostic tool for on-site detection of adulterants and quality parameters in paneer. It utilizes chromogenic substrate reactions with specific biomarkers to produce distinct color changes for easy visual identification. The portable, instrument-free system enables real-time detection of food fraud, ensuring safety, quality assurance, and regulatory compliance.



## Functionalities



Detects urea, formaldehyde, starch, salt and freshness (5 in 1) multiplex



Nono-enzymatic chromogenic reactions for visible color change detection



Rapid on-site testing without laboratory instruments

## Key Features

- Uses chromogenic chemical substrates instead of enzyme-based assays
- Enables distinct color-coded detection for each adulterant
- Improves robustness under field conditions (temperature, storage stability)
- Reduces false positives associated with enzyme degradation
- Allows rapid decision-making through naked-eye interpretation

## Applications

- Food safety surveillance by FSSAI and regulatory agencies
- Quality control in dairy industries and paneer manufacturers
- On-site testing in markets, street vendors, and retail outlets
- Rapid screening during food inspections and raids
- Use in academic, research, and training laboratories
- Consumer-level testing for household food safety awareness

## Implementation Overview

### Deployed

Prototype kits evaluated in dairy labs and field trials

### TRL

5-6 (Technology validated in relevant environment)

### Training Requirement

Nil

## Contact Details

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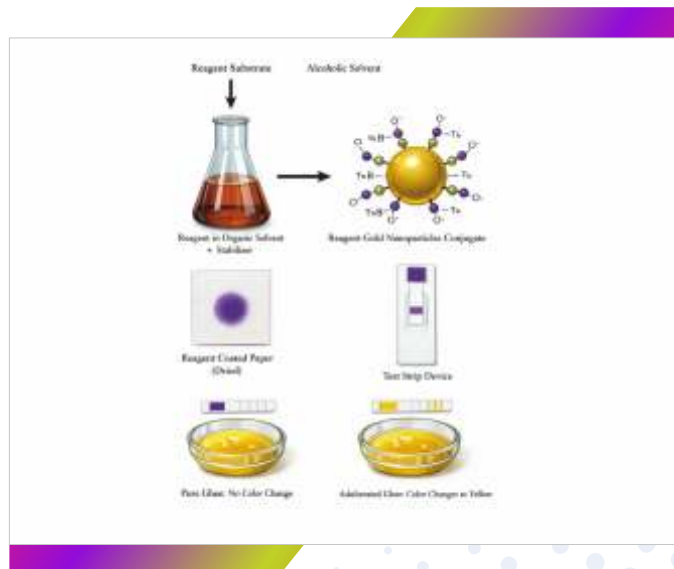
Thematic Area: **Climate and Agri-food tech**

Category: **Food Safety & Quality Diagnostics**

# A Sensitive Strip-Based Nano Biosensor for Rapid Screening of $\beta$ -Sitosterol (Edible Oil) Adulteration in Ghee

## Overview

This technology is a rapid, strip-based nano biosensor designed for detection of  $\beta$ -sitosterol as a biomarker of vegetable oil adulteration in ghee. The system uses nanomaterial-enhanced chromogenic sensing for sensitive and selective detection. It enables quick, on-site screening with visual readout, supporting regulatory monitoring, dairy quality assurance, and prevention of economically motivated adulteration in high-value dairy fats.



## Functionalities



Detects  $\beta$ -sitosterol as biomarker of vegetable oil adulteration



Nano-enabled chromogenic reaction for sensitive colorimetric detection



Rapid strip-based assay suitable for on-site testing

## Novelty / Innovation Highlights

- First nano-enabled strip biosensor targeting sterol-based adulteration
- Utilizes  $\beta$ -sitosterol (plant sterol) vs cholesterol differentiation
- Incorporates nanoparticles for signal amplification and sensitivity enhancement
- Enables rapid screening compared to GC-MS/HPLC methods
- Designed for field applicability with minimal technical expertise

## Key Features

- Nano biosensor strip format enabling high sensitivity detection
- Selective  $\beta$ -sitosterol biomarker recognition for plant oil adulteration
- Portable and rapid visual detection system without instrumentation

## Applications

- Detection of vegetable oil adulteration in ghee and butter
- Quality control in dairy processing industries
- Regulatory food inspection and surveillance (FSSAI labs)
- Rapid screening in supply chains and marketplaces
- Research and teaching in food authenticity studies
- Export quality certification and compliance testing

## Implementation Overview

### Deployed

Laboratory prototype validated with spiked and market samples

### TRL

4–5 (Technology validated at laboratory level)

### Training Requirement

Nil

## Contact Details

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Thematic Area: **Climate and Agri-food tech**  
Category: **Food Safety and Quality Monitoring**

## PestiCheck kit: A Rapid Strip-Based Point-of-Care Kit for On-Site Detection of Pesticide Residues in Green Tea Leaves

### Overview

PestiCheck Kit is a rapid, user-friendly detection method for on-site detection of pesticide residues in food commodities. It enables quick screening through visible color change, reducing dependence on sophisticated laboratory instruments. The kit supports farmers, regulators, and food industries in ensuring food safety, preventing contamination, and protecting public health through early detection of harmful pesticide residues.



### Functionalities



Rapid on-site detection of pesticide residues in food samples



Simple strip or extract-based testing with visual color indication



Compatible with fruits, vegetables, grains, and processed food

### Key Features

- No instrumentation required for detection and result interpretation
- Quick results within minutes enabling immediate decision making
- Cost-effective, portable, and user-friendly field-testing kit

### Applications

- Market surveillance
- Food safety inspection
- Consumer awareness
- On-site testing

### Implementation Overview

#### Deployed

Pilot-scale validation completed (50+ field samples tested)

#### TRL

6–7 (Technology demonstrated in relevant environment)

#### Training Requirement

1 days for basic handling and interpretation.

### Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Oil and Oil seed-based food technologies**

# Ghee Powder: A Spray-Dried, Low-Calorie Fat Alternative with Enhanced Handling

## Overview

This innovation is a spray-dried Ghee Powder developed by Dr. Rajni Chopra. It offers a low-calorie, high-protein alternative to traditional ghee, featuring a flowable powder form that eliminates the mess of semi-solid fats. The technology utilizes a temperature-dependent release mechanism and enhanced solubility, significantly improving handling and storage for food manufacturers and health-conscious consumers while providing a nutrient-dense, shelf-stable dairy product.



## Functionalities



**Spray-Dried Production:** Utilizes advanced spray-drying processes to convert liquid fats into stable powder.



**Nutritional Enhancement:** Delivers a concentrated source of protein (43.43%) alongside functional dairy fats.



**Improved Solubility:** Designed for quick dissolution and easy integration into various food formulations.

## Key Features

- **Low-Calorie Formulation:** Optimized fat content for reduced caloric intake per serving.
- **Flowable Powder Form:** Ensures mess-free handling and precise dosing in industrial settings.
- **Temperature Release:** Controlled release mechanism activated by specific thermal conditions during use.

## Implementation Overview

Deployed	TRL	Training Requirement
No	9	3-5

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Precision Therapeutics**

# VitD2, B2, B12, Biofortified Mushroom Powder

## Overview

The biofortified mushroom powder is an innovative, nutrient-enhanced ingredient developed by enriching mushrooms with essential vitamins D2, B2, and B12. The resulting powder serves as a nutrient-dense, plant-based ingredient addressing common micronutrient deficiencies. It offers significant potential for the nutraceutical, functional food, and public health sectors by supporting vegetarian nutrition, improving dietary quality, and enabling development of value-added health products.



## Functionalities



Enables production of vitamin-enriched mushroom powder targeting key micronutrient deficiencies



Acts as functional ingredient for fortification of diverse food formulations



Supports development of plant-based nutraceutical and dietary supplement products



Maintains nutrient stability through optimized processing and drying techniques



Suitable for incorporation into bakery, beverages, snacks, and health mixes

## Key Features

- Triple vitamin fortification addressing D2, B2, and B12 deficiencies
- Plant-based, vegetarian-friendly alternative to synthetic vitamin supplements
- Nutrient dense with multifunctional health-promoting properties
- Versatile ingredient adaptable across multiple food and nutraceutical applications
- Strong relevance for public nutrition and functional food innovation

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes	8	3-5

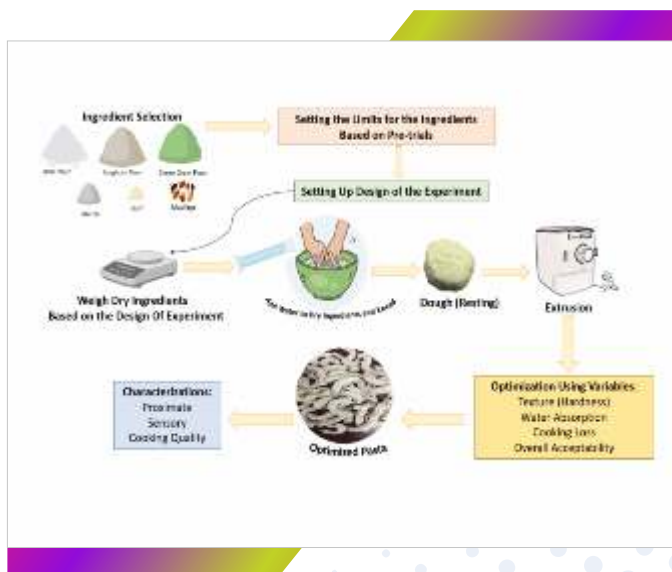
Thematic Area: **Climate and Agri-food tech**

Category: **Special Dietary Food**

# Gluten Free Pasta

## Overview

The gluten-free pasta was developed using gluten-free ingredients such as rice, millets, and pulses to produce a high-value extruded product that can serve as a nutrition-dense food source for people with celiac disease. The ingredients used offer diverse dietary benefits. Additionally, there is a growing trend towards non-gluten food products. The unique combination, when processed under high shear (extrusion), yields a versatile gluten-free pasta with high consumer acceptability.



## Functionalities



Provides a nutritionally dense, safe alternative to durum wheat semolina-based pasta for people suffering from celiac disease.



Combined nutritional benefits of cereals, millets, and pulses.



Supports convenient preparation with cooking qualities comparable to wheat semolina-based pasta.

## Key Features

- Suitable formulation for gluten-sensitive individuals
- Protein Content:10.51% and Dietary Fibre Content: 8.1%
- Natural binders used have various health benefits and help to improve structural integrity.

## Implementation Overview

Deployed	TRL	Training Requirement
Ready to transfer	9	Yes

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Post-Harvest Management**

# Solar Assisted Reefer Transportation with Hybrid control and intelligence (SARTHI): Reducing post-harvest losses through dual-temperature smart logistics

## Overview

SARTHI is a solar-assisted reefer container designed to minimize post-harvest losses in fruits and vegetables. It features dual compartments for simultaneous storage at different temperatures and relative humidity levels. Utilizing a hybrid refrigeration system, it operates on engine power and AC supply, ensuring different temperature management during transport and halts. Integrated sensors monitor CO<sub>2</sub>, Ethylene, and humidity, providing a smart, efficient solution for diverse agricultural transportation needs.



Solar Assisted Reefer Transportation with Hybrid control and intelligence (SARTHI)

## Functionalities



Maintains precise dual-temperature zones ranging from 7°C to 12°C for diverse produce.



Utilizes hybrid power sources including vehicle engine and standard single-phase AC electricity.



Monitors vital parameters like Ethylene, CO<sub>2</sub>, and relative humidity using integrated sensor technology.

## Key Features

- Dual-compartment design allows multi-temperature storage in one unit.
- Standby compressor maintains temperature stability during vehicle transport halts.
- Smart monitoring reduces spoilage through real-time internal environment control.

## Implementation Overview

### Deployed

Ready for Commercialization

### TRL

9

### Training Requirement

Yes, reefer transportation knowledge is must.

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Food Processing and health**

# High Altitude Nutrient-Rich Bar-Nutri Peak

## Overview

Energy-dense, compact bars tailored for high-altitude conditions. They provide sustained energy, essential nutrients, and easy portability, supporting defense personnel, trekkers, and workers in extreme environments.

## Functionalities



Provides high energy and nutrients for endurance in extreme high-altitude conditions



Lightweight, compact design ensures easy portability and long shelf life



Supports physical performance and reduces fatigue among defense and trekking personnel

## Key Features

- Specialized composition addressing high-altitude energy and nutrient demands
- Resistant to harsh climates with extended usability and shelf stability
- Rapid energy release supporting stamina and physical performance

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
Yes	9	3-5 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Food Processing and health**

# Fermented Kanji Powder

## Overview

The Fermented Kanji Powder Technology is a novel approach that converts traditional kanji into a shelf-stable, instant functional beverage using controlled fermentation and spray-drying. It retains probiotics, antioxidants, and nutrients while ensuring convenience and long shelf life. This innovation supports the nutraceutical and functional food sectors by offering a clean-label, gut-health promoting product, benefiting health-conscious consumers, food manufacturers, and public nutrition programs.



## Functionalities



Enables production of instant, reconstitutable probiotic beverage with extended shelf stability



Combines fermentation and spray-drying for microbial preservation and nutrient retention



Delivers high probiotic viability supporting digestive and gut health applications



Suitable for large-scale industrial processing using existing spray-drying infrastructure



Applicable in nutraceutical, functional food, and wellness product formulations

## Key Features

- Shelf-stable probiotic powder with high antioxidant and nutrient retention
- Clean-label formulation without synthetic additives or preservatives
- Combines traditional fermentation with advanced encapsulation technology
- Convenient instant format suitable for modern consumer lifestyles
- Strong market potential in functional foods and wellness beverages

## Contact Details

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Associate Professor (Microbiology)  
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## Implementation Overview

### Deployed

Yes

### TRL

8

### Training Requirement

3-5 days

Thematic Area: **Climate and Agri-food tech**

Category: **Post-Harvest Management**

# SURAKSHIT (सुरक्षित) A Bio-based Packaging Material for a Sustainable Tomorrow

## Overview

\*SURAKSHIT- Sustainable Utilization of Renewable Agro-waste Kocompostable Solution for Holistic Integration of Thriving Ecosystem. The growing issue of plastic pollution and large amounts of waste from farms and food processing plants could be addressed together through truly biodegradable packaging. Unlike current options that mix natural materials with synthetic polymers, this approach aims to create packaging entirely from natural substances that fully decompose. It also repurposes agri-food waste into eco-friendly packaging for fresh food, meeting the rising demand for cleaner, sustainable solutions.



## Functionalities

This packaging film is made entirely from kitchen waste and carries four key features:

- **100% Bio-based, yet strong and flexible:** It achieves flexibility without using any chemical plasticizers, which are commonly added to packaging materials for providing strength but have environmental drawbacks.
- **Enhanced Freshness and Preservation:** It keeps raw fruits and vegetables fresh for four days longer, reducing food waste.
- **Pleasant Fragrance and Customer Appeal:** The film incorporates natural citrus fragrance, again derived from kitchen waste, providing an eco-friendly and aromatic packaging solution that enhances the customer experience.
- **Packaging to Plantation:** After its use, you don't throw it away to cause pollution. The most remarkable feature is that the packaging itself contains live seeds. You can simply plant it in a small pot or garden. The film biodegrades within 21 days, nourishing the soil, and while the embedded seeds grow into a new plant.

## Key Features

- Heat sealable, printable, packaging material
- Enhances the freshness of perishable commodities (capsicum, mushroom, tomato and leafy greens) up to four days.
- The packaging film carries a pleasant citrus fragrance, enhancing consumer appeal.
- The film, when allowed to be planted in a pot, it biodegrades and nurtures plant growth.

## Implementation Overview

### Deployed

Ready for Commercialization

### TRL

7

### Training Requirement

Yes, the process of film fabrication and treatment(s) is needed.

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional Foods / Nutraceutical Ready-to-Eat (RTE) Products**

# Protein-Rich Functional Granola Bar with High Digestibility and Clean-Label Formulation for On-the-Go Nutrition

## Overview

A protein-rich granola bar formulated using whey protein, oats, soy crisps, and natural sweeteners like jaggery and honey offers a clean-label, nutrient-dense snack solution. The product provides highly digestible protein, dietary fiber, and essential minerals such as calcium and iron. Designed for health-conscious consumers, it supports convenient nutrition, sustained energy release, and is suitable for commercialization and technology transfer.



## Functionalities



Provides highly digestible protein (> 90%) with BCAA supporting muscle health



Rich source of dietary fiber – all benefits of foods rich in dietary fiber



Delivers sustained energy through balanced carbohydrates and natural sweeteners



Functions as a convenient, ready-to-eat functional snack for daily nutrition

## Key Features

- High protein: 23-25% (> 13% of RDA), High dietary fiber: 12% (> 11% of RDA)
- Clean-label product with no preservatives or synthetic additives
- Good source of calcium, and iron
- Clean label product – No synthetic additives of any kind – zero preservatives, zero emulsifiers/stabilizers, zero artificial sweeteners
- A copyrighted formulation/recipe
- Process/product technology standardized and ready for commercialization/scale-up

## Implementation Overview

### Deployed

Yes

### TRL

8 (Technology validated in relevant environment)

### Training Requirement

2-4 weeks for production, handling, and quality standardization

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional food**

# Energy Dense Nutritional supplement

## Overview

Fortified, ready-to-use supplementary food designed for pregnant women, lactating mothers, and children. It addresses malnutrition by providing balanced nutrition, improving growth outcomes, and strengthening public health nutrition programs.

## Functionalities



Delivers fortified, energy-dense nutrition for vulnerable groups in community settings



Supports growth, immunity, and overall health of children and mothers



Easy distribution, storage, and consumption within public nutrition programs

## Key Features

- Nutritionally optimized blend tailored for maternal and child requirements
- Designed for mass-scale supplementation under government feeding initiatives
- Stable formulation suitable for varied storage and distribution conditions

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
Yes	9	3-5 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional food**






# Fermented Soymilk

## Overview

A probiotic-fermented soymilk technology using selected *Lactiplantibacillus plantarum* strains enhances nutritional quality and sensory acceptability of conventional soymilk. The process reduces anti-nutritional factors and beany flavor while improving protein digestibility, antioxidant activity, and bioactive compounds like GABA. This innovation offers a functional, plant-based beverage with added health benefits, supporting nutraceutical, dairy-alternative, and wellness sectors, and benefiting health-conscious consumers and lactose-intolerant populations.



## Functionalities

-  **Controlled probiotic fermentation enhances nutritional, functional, and sensory quality of soymilk**
-  **Converts isoflavones into bioavailable aglycones with higher antioxidant potential**
-  **Synthesizes bioactives like GABA, vitamins, and functional peptides during fermentation**
-  **Reduces anti-nutritional factors improving mineral absorption and protein digestibility**
-  **Produces high-viability probiotic beverage supporting gut microbiome modulation and health**

## Key Features

- Human-origin probiotic strains with strong survival and functional performance
- Significant B-vitamin enrichment through natural microbial biosynthesis
- Enhanced bioavailability of nutrients and health-promoting phytochemicals
- Improved taste by reduction of undesirable beany flavour compounds
- Clean-label, vegan, lactose-free functional beverage with proven health benefits

## Contact Details

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## Implementation Overview

**Deployed**

**TRL**

**Training Requirement**

Yes

8

3-5 days

Thematic Area: **Climate and Agri-food tech**

Category: **Solar Thermal Technology**

# Evacuated Tube Solar Hybrid Dryer: A thermally efficient and hygienic system, high-temperature drying of agricultural produce

## Overview

The Evacuated Tube Solar Dryer is a thermally efficient and hygienic innovation developed by NIFTEM-K for the faster drying of fruits and vegetables. Utilizing air as a heat transfer fluid through evacuated tubes, it achieves high-temperature drying at low costs. The system features a food-grade SS304 stainless steel chamber with a 30 to 50 kg capacity, designed to reduce post-harvest losses while maintaining food safety standards in the agricultural sector.



Evacuated Tube Solar Hybrid Dryer

## Functionalities



Utilizes fifteen evacuated tubes to capture solar energy for high-temperature thermal drying.



Employs an integrated blower to circulate air as the primary heat transfer fluid.



Provides five specialized trays within a stainless-steel chamber for fruit and vegetable processing.

## Key Features

- Uses food grade SS304 stainless steel for the drying chamber.
- Offers a low cost and thermally efficient solar drying solution.
- Enables faster drying rates for hygienic post-harvest food processing.

## Implementation Overview

Deployed	TRL	Training Requirement
Ready for Transfer	8	Yes

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional food**

# Lactation Cookies

## Overview

Nutrient-rich cookies formulated to support lactating mothers by enhancing milk production and maternal nutrition. Enriched with essential vitamins, minerals, and galactagogues, they help improve maternal health and infant nourishment, especially in resource-limited settings.



## Functionalities



Enhances breast milk production using natural galactagogues and balanced nutrient formulation



Provides essential vitamins and minerals supporting maternal health during lactation period



Convenient, ready-to-eat snack ensuring consistent nutritional intake for nursing mothers

## Key Features

- Formulated with lactation-supporting ingredients to naturally boost milk secretion
- Targeted micronutrient enrichment improving maternal recovery and nourishment
- Palatable, easy-consumption format ensuring regular dietary inclusion

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	8	3-5 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional Foods / Nutraceuticals - Ready-to-drink (RTD) mix**

# Curcumin Fortified Milk Powder

## Overview

Curcumin Fortified Milk Powder is an innovative functional food developed to enhance the nutritional and therapeutic value of conventional milk powder by incorporating curcumin. Curcumin is brought in sub-micron form with natural milk cream being used as a vehicle: thus, provides highly bio accessible and bioavailable curcumin. It offers a convenient, shelf-stable innovative delivery system for the curcumin suitable for diverse populations, including children and the elderly, thereby contributing to improved public health and value addition in the dairy and nutraceutical sectors.



## Functionalities

- **Curcumin content: 280 mg/100 g powder and approx. 100 mg curcumin/1 cup (150 mL) reconstituted milk/latte**
- **90% bioavailable curcumin**
- **Safe at high concentration-based on In vitro cytotoxicity study**
- **Functional Curcumin Latte - Optimized reconstitution: Simply add hot water in 1:4 ratio**
- **Rapid curcumin release- up to 70%, within 24 h**
- **Suitable for flight/railway kitchens, QSRs and even small outlets**
- **Potent anticancer properties – evaluated in vitro against HepG2 cells**
- **Potent antioxidant properties**

## Key Features

- Delivery of bioavailable curcumin through 'food format', rather than in tablet/capsule form
- No settlement of curcumin at the bottom post reconstitution, smooth, rich creamy mouthfeel
- Sensorially acceptable product
- Highly shelf stable: up to 12 months compared to conventional formulations
- No degradation of curcumin even at the end of shelf life
- High in protein: 24%, Moisture: < 4%
- Prophylactic and therapeutic applications

## Implementation Overview

Deployed	TRL	Training Requirement
No	6	1 month

## Contact Details

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Thematic Area: **Climate and Agri-food tech**  
Category: **Food processing and functional food**

# Multigrain Pasta using Malted Finger Millet and Malted Lentil Flour

## Overview

Multigrain pasta was developed by partially substituting durum wheat semolina with malted finger millet and lentil flour to improve the protein quality, increase dietary fibre content, and provide additional micronutrients. This innovation promotes the inclusion of nutrient-dense staple foods, such as millets, into highly consumed foods (like pasta), thereby offering higher functional value. The formulated product showed cooking properties comparable to those of the control and high sensory acceptability.



## Functionalities



Malting offers benefits for cereals and pulses by improving digestibility and reducing antinutrients



A combination of cereal and legume improves protein quality and supports satiety with higher fibre content.



The developed pasta falls in the medium Glycemic Index range, similar to the traditional pasta

## Key Features

- Made with malted millet and legume.
- Energy and nutrient-dense pasta developed using traditional staples for all age groups.
- High Protein Digestibility and Medium Glycemic Index

## Implementation Overview

Deployed	TRL	Training Requirement
Ready to Transfer	9	Yes (3-5 days)

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional food**

# Fiber-Rich Cookies for Diabetics

## Overview

Specially formulated cookies with high dietary fiber and low glycemic index to aid blood sugar management. They support diabetic individuals by offering healthier snack alternatives without compromising taste.

## Functionalities



Helps regulate blood glucose levels



High dietary fiber content supports digestion and prolonged satiety



Provides healthier snacking option without compromising taste and convenience

## Key Features

- Designed with controlled carbohydrate release for improved glycemic response
- Incorporates functional ingredients beneficial for metabolic health management
- Combines health-focused formulation with consumer-friendly taste profile

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	9	3-5 days

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Functional food**

# Microencapsulated Probiotic Powder

## Overview

The Microencapsulated Probiotic Powder Technology stabilizes *Lactiplantibacillus plantarum* through advanced encapsulation using spray or freeze-drying. It ensures high probiotic survival, extended shelf life, and effective gastrointestinal delivery. This innovation supports nutraceutical, functional food, and pharmaceutical sectors by enabling incorporation of robust probiotics into diverse products, benefiting manufacturers with scalable solutions and consumers with reliable gut-health and wellness support.



## Functionalities

-  Encapsulates probiotics to enhance stability, viability, and gastrointestinal survival rates
-  Enables integration into foods, supplements, and pharmaceutical delivery systems
-  Utilizes spray or freeze drying for scalable and flexible production
-  Protects microbial cells using optimized probiotic-based encapsulating matrices
-  Supports symbiotic formulations combining probiotics with functional prebiotic carriers

## Key Features

- High encapsulation efficiency ensuring effective probiotic delivery
- Excellent survival through simulated gastrointestinal digestion conditions
- Flexible formulation with clean-label and customizable encapsulating materials
- Long shelf life with low moisture and controlled water activity
- Industry-ready technology compatible with multiple product formats

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes	8	3-5 days

Thematic Area: **Climate and Agri-food tech**

Category: **Food Quality Testing & Adulteration Detection**

# Rapid Colorimetric Paper Strip for Detection of Adulteration in Edible Oils using Karanja and Argemone Oil Markers

## Overview

The developed rapid paper strip assay enables on-site detection of adulteration in edible oils with toxic non-edible oils such as karanja and argemone oil. The method utilizes a chromogenic reaction producing a visible color change due to specific bioactive compounds. This simple, rapid, and field-deployable solution helps ensure consumer safety and supports regulatory monitoring against harmful oil adulteration.



## Functionalities



Detects karanja and argemone oil adulteration in edible oils



Produces visible color change via chromogenic reaction



Enables rapid on-site testing without laboratory equipment

## Key Features

- Dip-and-read paper strip for instant detection
- Selective detection of toxic oil adulterants
- Portable, cost-effective, and user-friendly assay

## Applications

- Edible oil quality monitoring in markets and industries
- Regulatory inspection and food safety enforcement
- Market surveillance for adulterated oil detection
- Consumer-level testing for household safety

## Implementation Overview

### Deployed

Yes (Pilot-level validation under laboratory and field conditions)

### TRL

6–7 (Prototype validated in relevant environment)

### Training Requirement

Nil

## Contact Details

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Thematic Area: **Climate and Agri-food tech**  
Category: **Food Processing and nutrition**

# Millet Flakes

## Overview

Ready-to-cook flakes made from millets, promoting sustainable and nutritious diets. Rich in fiber, minerals, and antioxidants, they support digestive health, lifestyle disease prevention, and climate-resilient agriculture.



## Functionalities



Offers quick-cooking, nutrient-rich alternative to conventional cereal-based breakfast options



Promotes dietary fiber intake supporting digestion and metabolic health



Encourages sustainable consumption of climate-resilient millet-based food products

## Key Features

- Utilizes underexploited millets to enhance dietary diversity and nutrition
- Naturally rich in bioactive compounds supporting overall health benefits
- Adaptable product suitable for modern and traditional food applications

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	8	3-5

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **3D Food Printing**

# Ready-to-Eat (RTE) 3D Printed Marzipan Sweet: Advanced food technology for personalized nutrition and intricate confectionery design

## Overview

This innovation utilizes cutting-edge 3D printing technology to create personalized, preservative-free marzipan sweets. By integrating Solidworks for precise modeling and Simplify 3D for automated slicing, the system enables the production of visually appealing, intricate shapes via hot extrusion. Designed for the confectionery sector, this technology is ready to transfer, providing a high-tech solution for producing healthy, customized, and appetizing ready-to-eat products tailored to nutritional needs.



## Functionalities



Employs Solidworks (.dxf) for precise model designing of complex confectionery shapes.



Uses Simplify 3D for automated slicing and generating G-code for printing.



Facilitates hot extrusion within a 0 to 50°C range for product creation.

## Key Features

- Cutting-edge 3D food printing technology.
- Creates visually appealing, appetizing, and completely preservative-free food products.
- Utilizes the high-precision Bocusini 2.1 printer for ready-to-eat sweets.

## Implementation Overview

Deployed	TRL	Training Requirement
Ready for Transfer	8	Yes

## Contact Details

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Thematic Area: **Climate and Agri-food tech**

Category: **Bakery products**

# Gluten Free Cookies

## Overview

Conventional cookies are primarily made from refined wheat flour (maida), sugar, and fat, with gluten providing elasticity, structure, and a desirable texture, contributing to their popularity. However, they have limited nutritional value in terms of fibre, vitamins, and minerals, and are unsuitable for individuals with Celiac disease or gluten sensitivity. To address this, Savoury Veggie Gluten-Free Cookies were developed as a nutritious, ready-to-eat alternative using multigrain flours, seeds, spices, and vegetable grits, offering improved health benefits and functional properties.



## Functionalities



**Gluten-free structure development:** Achieved through multigrain flours (millets and cereals) combined with natural binding components.



**Nutritional enhancement:** Improvement of fibre, protein, and micronutrient density.



**Savory profile development:** Unlike conventional sweet cookies, spices and vegetable grits create a unique savory taste, expanding snack applications.



**Functional bioactivity:** Presence of phytochemicals, antioxidants, and dietary fiber supports health benefits

## Key Features

- 100% replacement of refined wheat flour, making it completely gluten-free
- Multigrain formulation: Combination of millet and cereal flours for balanced nutrition
- Inclusion of seeds and spices for enhanced flavor and functional properties
- Innovative use of vegetable grits to improve texture, taste, and nutritional value
- Savory ready-to-eat snack with broader consumer appeal beyond sweet products Rich in dietary fiber, minerals, and high-quality plant protein
- Potential for functional food positioning targeting health-conscious consumers

## Implementation Overview

### Deployed

Ready for Transfer  
(Technology transferred to Freaeat Food pvt Ltd.)

### TRL

Ready for scale-up

### Training Requirement

Yes

## Contact Details

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The background features a light blue gradient with several large, semi-transparent blue circles of varying sizes. A pattern of small, light blue dots is scattered across the lower right portion of the image. Two small white plus signs are positioned above and below the main text.

***DEEP SEA & ATMOSPHERIC  
TECHNOLOGIES***

Thematic Area: **Deep Sea and Atmospheric Technologies**

# NaviMet – Indigenous Aviation Meteorological System for Safe and Efficient Airport Operations

## Overview

NaviMet is an indigenous, integrated aviation meteorological system developed for real-time weather monitoring at airports. It provides accurate, continuous weather data to support safe aircraft operations, including take-off, landing, and navigation. The system enhances aviation safety, reduces weather-related disruptions, and offers a cost-effective alternative to imported solutions, aligning with the Make in India initiative.



## Functionalities



Real-time monitoring of critical airport weather parameters



Automated data acquisition, processing, and dissemination system



Supports pilot briefing and air traffic management operations

## Key Features

- Fully indigenous system tailored for Indian airport conditions
- High reliability with continuous 24x7 operational capability
- Integration with aviation communication and navigation systems

## Implementation Overview

Deployed	TRL	Training Requirement
Yes (Installed at select Indian airports for operational validation)	8-9	Yes

## Contact Details

The Director  
CSIR-NAL, Bengaluru

Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Atmospheric Technologies**

# Microwave Radiometer

## Overview

The Microwave Radiometer (MWR) system is a ground - based passive remote sensing instrument designed to measure atmospheric microwave emissions and retrieve thermodynamic profiles of the atmosphere. The Microwave Radiometer is indigenously designed developed & installed at IMD, Guwahati. SAMEER has received the supply order of 18 Microwave radiometer from India Meteorological Department to be installed at various location of India. IMD, IITM, ISRO, Indian Air force, Universities are a few of the beneficiaries



## Functionalities

- The radiometer is capable of generating continuous vertical profiles of water vapor, temperature cloud liquid water up to 10 Km
- Operates in K band (22 – 30 GHz) to retrieve continues humidity profile at 50 m height resolution up to 1 km & 100 m height resolution above 1 Km
- Operates in V band (50 - 60 GHz) to retrieve continues temperature profile at 50 m height resolution up to 1 km & 100 m height resolution above 1 Km
- The design is based on a multi - channel total power radiometer configuration with auto calibration, providing high sensitivity and stability through calibration techniques and system - level corrections
- Retrieval algorithms based on radiative transfer models and machine learning techniques convert brightness temperature measurements into atmospheric profiles of temperature, humidity, and liquid water content.
- The processed data is visualized through a browser based graphical user interface (GUI)
- Surface sensors such as pressure, temperature & humidity are acquired by radiometer data acquisition system

## Key Features

- STM32 controller-based data acquisition & control system for real time acquisition processing of data. PC based system configuration & post processing software
- Very high sensitive receiver in K & V band
- Real time calibration for hot (ambient blackbody) & cold load (Liquid nitrogen)
- Elevation & azimuthal scanning drives
- Real time temperature, humidity & surface sensor plots.
- Remotely controlled by powerful browser-based software.
- Temperature & humidity accuracy comparable with Radiosonde data

## Implementation Overview

Deployed	TRL	Training Requirement
Indigenously designed and developed Microwave Radiometer is Installed at IMD, Guwahati	7/8	5 days

## Contact Details

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Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Atmospheric Technologies**

## Sound Detection & Ranging (SODAR)

### Overview

The phased array Doppler SODAR is an advanced system used for atmospheric boundary layer studies and a wide range of environmental applications. With its portable, solar - powered, and battery - operated design, the system is ideal for remote and easily deployable operations, supporting applications such as environmental impact studies, toxic chemical spill prediction, meteorology, and wind energy site evaluation. Indigenously developed SODAR has significantly impacted atmospheric research, wind energy, and environmental management by providing accurate wind and turbulence profiles of the lower atmosphere (up to 1km).



### Functionalities

- **SODAR emits acoustic pulsed to measure wind velocity & direction up to 1 Km**
- **Returning echoes are scattered by atmospheric density perturbations (temperature fluctuations). If the air moves away, the frequency decreases; if it moves toward the device, it increases, allowing for the calculation of wind speed.**
- **Monostatic antenna for transmit & receive**
- **Monitoring mixing heights for air pollution dispersion modelling.**
- **Detecting wind shear or fog formation**
- **Provides Doppler Spectra, Echogram, Radial wind components, Wind speed, Wind direction, Time height plot, Daily wind averages etc.**

### Key Features

- SODAR has 52 element active Phased Array
- Operates in Frequency: 1.7 to 2.5 KHz
- Beam tilt angle 15 - 25 deg user programmable
- It measures wind speed 0 - 30m/sc
- Wind speed accuracy 1.5 m/s
- Range resolution 20 - 100 meters

### Implementation Overview

Deployed	TRL	Training Requirement
SODAR is installed all over India near about 15 places namely NPCIL, IMD, IITM, SHAR, BARC & a few Universities	7/8	5 days

### Contact Details

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Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Potable Water from Sea**

# Low Temperature Thermal Desalination (LTTD)

## Overview

Low Temperature Thermal Desalination (LTTD) is an indigenous NIOT-developed seawater desalination technology that uses the natural temperature difference between warm surface seawater and cold deep-sea water to produce potable water. Demonstrated and deployed in Lakshadweep, it provides a dependable drinking-water source for remote islands with limited freshwater availability and reduces dependence on transported water and conventional high-pressure desalination systems.



Low Temperature Thermal Desalination (LTTD) plant at Kadamat Island of UT Lakshadweep

## Functionalities



Converts seawater into potable water using warm surface and cold deep seawater.



Operates through flash evaporation and condensation under low-pressure conditions.



Supports island-scale drinking-water supply for remote coastal and island communities.

## Key Features

- Indigenous technology proven in Lakshadweep Island conditions.
- Uses natural ocean thermal gradient as process driver.
- Low-temperature process avoids high-pressure membrane operation.

## Implementation Overview

### Deployed

Yes. Operational / implemented in Lakshadweep Islands; publicly reported operational islands include Kavaratti (2005); Minicoy and Agatti (2011); Amini and Kalpeni (2022); Kadamat (2023), Chetlat and Kiltan (2024). Earlier, on or before 2011, NIOT plants were 1 lakh litre/day each; additional island plants are at 1.5 lakh litre/day capacity each.

### TRL

9 - Actual system proven in operational island environment

### Training Requirement

7 days for routine operation and maintenance; 2-3 days refresher training after major maintenance/commissioning support.

## Contact Details

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Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Marine Resource Exploration Overview**

# Deep Water Autonomous Coring System for Marine Resource Exploration

## Overview

The Autonomous Coring System (ACS), developed at NIOT for gas hydrate validation, is a deep water, automated, wire-line drill that operates up to 100 meters below the seafloor (mbsf) in water depths up to 3000 m. Its subsystems include a surface unit for controls and power, a subsurface unit for hydraulics and instrumentation, and various drilling tools. Remotely controlled from a ship, the ACS uses wireline techniques for deep drilling, aiding in gas hydrate ground truthing, marine resource exploration, and geotechnical investigations. It was successfully deployed on the Sagar Nidhi, drilling 100 m below the seafloor at 260 m depth in the Bay of Bengal and 60 m at 1600 m depth in the Krishna Godavari Basin in 2020.



Autonomous Coring System Onboard Ship

## Functionalities



The ACS deployed from Sagar Nidhi with deep water umbilical



Remotely operated subsea drilling operation up to depth of 3000 m using the underwater imaging and sensors



Continuous drilling operation up to 100 m below the seafloor at 260 m depth and 60 m drilling at 1600 m depth at Krishna Godhavari Basin Site

## Key Features

- Remotely operated drilling from the Ship control station
- Subsea drilling up to 100 mbsf at depth of 3000 m
- Wire line drilling technique that reduces the drilling time than conventional rod drilling
- Low-cost drilling than ship-based drilling methods

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, 30	9	Yes, 3 months

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Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Deep Ocean explorations**

# Deepwater Work Class ROV - Remotely Operable Submersible (ROSUB) 6000

## Overview

The ROSUB 6000 is a deep-water work class ROV system capable of diving up to 6000 m water depth. It consists of Remotely Operable Vehicle (ROV), Tether Management System (TMS), Ship based Launching and Recovery system (LARS), Power transmission and Data telemetry system, Integrated Navigation System (INS) and Control software. The submerged weight is compensated by buoyancy packs made of syntactic foam fitted to the ROV. The ROV is equipped with a variety of scientific sensors, imaging devices, sampling devices etc. which enables the recording of oceanographic parameters during the dive and sample collection as required. The vehicle also has the capability to attach additional mission specific scientific payloads.



ROV-Remotely Operable Submersible (ROSUB) 6000

## Functionalities

The ROV is equipped with multifunctional tools and sensors for offshore applications such as:

- Deep ocean mineral exploration,
- Seabed imaging,
- Gas-hydrate exploration,
- Pipeline inspection
- Submarine cable inspection
- Well head detections,
- Subsea sampling
- Search and recovery operations

## Key Features

- Diving depth 6000 m
- Length 2.53 m
- Height 1.8 m
- Breadth 1.7 m

## Implementation Overview

### Deployed

The development of ROSUB 6000 was completed in 2010. The ROSUB system was developed and tested up to a depth of 5289m water depth at PMN site for its envisaged functionality. The scientific explorations at Gas hydrates site in Krishna-Godavari (KG) basin, hydrothermal Sulphides site - SONNE Field in South Central Indian Ridge region, Poly Metallic Nodule Mining (PMN) site in Central Indian Ocean Basin (CIOB) was conducted using deep water ROV (ROSUB 6000) up to a depth 5289m. ROSUB 6000 system was deployed and operated using imaging sonar and optical imaging at 3400m water depth for target verification of the missing Indian Air Force AN32 aircraft during September 2016. The system has successfully completed more than 45 dives in excess of 1000 m water depth.

### TRL

TRL 9 (Technology transferred to L&T and BEL through NRDC)

### Training Requirement

Professional ROV Pilot training is essential for the operators. About 2 weeks of intense training required for the maintenance staff for understanding the routine maintenance and up-keeping of the system.

## Contact Details

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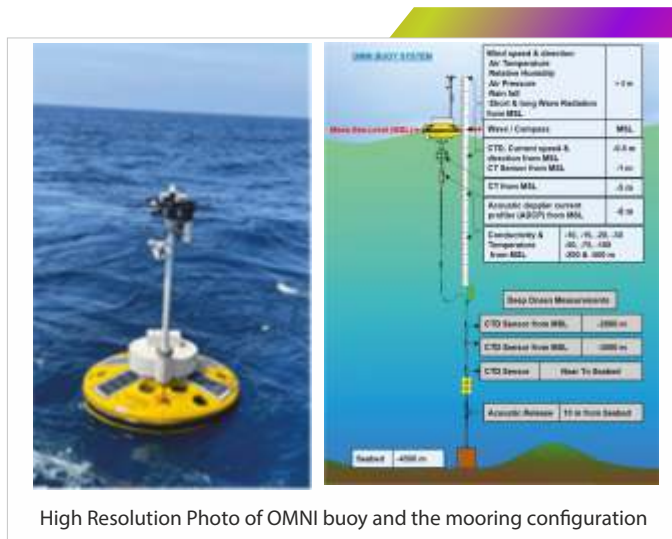
Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Ocean Observation Platforms**

# Ocean Moored Buoy Network for Northern Indian Ocean (OMNI)

## Overview

Ocean-atmosphere interactions in the North Indian Ocean are crucial for the onset, evolution, and withdrawal of the Indian monsoon. Under the Ocean Observation Network (OON) of MoES, NIOT's Ocean Buoy Network (OBN) under Ocean Health Vertical, operates buoy-based observing systems to understand the phenomenon of the mean seasonal cycle of the Indian monsoon, the intra-seasonal to intra-decadal oscillations of air-sea interactions, trends that are related to tropical cyclones. These observations support ocean monitoring, improve model accuracy, and aid regional forecasting. The beneficiaries of this OMNI programme include, scientific community, researchers and general public.



High Resolution Photo of OMNI buoy and the mooring configuration

## Functionalities



The OMNI buoy network comprising about 12 advanced data buoys deployed in Bay of Bengal and Arabian Sea.



The OMNI buoy measures Meteorological parameters including solar radiation and precipitation, Oceanographic parameters including wave and subsurface Currents (up to 200m depth), conductivity and temperature (up to 500 m depth).



Data is transmitted to shore in near real time via satellite telemetry.

## Key Features

- Crucial for monitoring and predicting cyclonic activity in the North Indian Ocean.
- Provides valuable data for climate studies, El Niño and La Niña, and other ocean-atmosphere interaction.
- Real-time in-situ and environmental monitoring
- Continuous long-duration observations
- Supports weather, fisheries and navigation studies

## Implementation Overview

### Deployed

The OMNI buoy network comprising 12 data buoys have been deployed and established in Indian seas since the year 2010.

### TRL

9

### Training Requirement

Hands ON professional training is required in buoy configuration, deployment and retrieval operations of the OMNI buoy system

## Contact Details

### The Director

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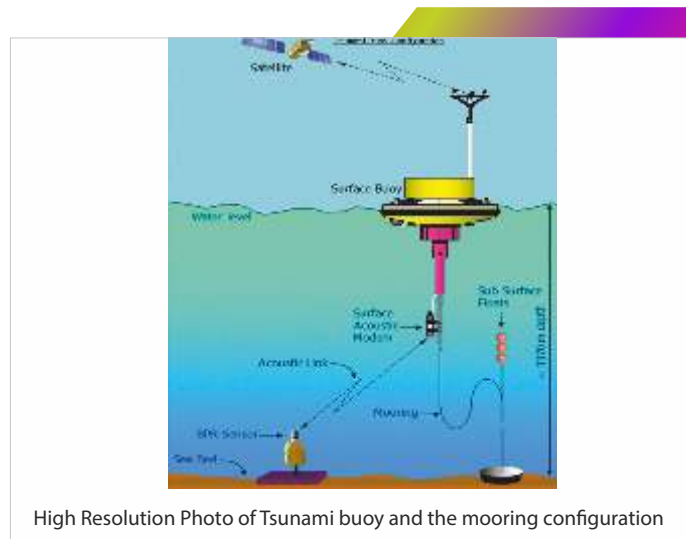
Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Tsunami buoys for Tsunami Early Warning System.**

# Indian Tsunami Buoy Network

## Overview

The Ocean Buoy Network (OBN) team of NIOT under the Ocean Health vertical is tasked with deploying specialized buoys for tsunami detection and early warning. The OBN team deploys specialized buoys, including Bottom Pressure Recorders, to detect tsunamis and monitor sea-level changes in real time. This robust network strengthens early warning systems and disaster preparedness in the Indian Ocean, benefiting National Disaster Management Authorities, Indian-Ocean rim of countries and public.



High Resolution Photo of Tsunami buoy and the mooring configuration

## Functionalities

- Continuously measures water pressure to detect tsunami waves & reduces tsunami hazard impact.
- Monitors ocean conditions, distinguishing normal waves from tsunami signals.
- Switches to event mode upon detecting anomalies, increasing data transmission for detailed monitoring.
- Utilizes a tsunami algorithm for data filtering and validation to minimize false alarms.
- Manages solar-powered systems and batteries for long-term, autonomous operation.
- Provides validated water level data to tsunami early warning systems for timely alerts.

## Key Features

- The tsunami buoy consists of a seabed-mounted Bottom Pressure Recorder (BPR) and a surface buoy that measures changes in water pressure to detect tsunami waves and small sea-level variations critical for early alerts.
- Data from the BPR is sent to the surface buoy and relayed via satellite to warning centers, enabling timely alerts.
- Tsunami buoys operate in standard monitoring and event detection modes, with increased data transmission during abnormal conditions.
- Built-in algorithms ensure data integrity by filtering out noise and false signals, and they integrate with national and international early warning systems for effective disaster mitigation.

## Implementation Overview

Deployed	TRL	Training Requirement
NIOT has deployed buoys capable of detecting Tsunamis since the year 2005.	9	Hands ON professional training is required in surface buoy and Bottom Pressure Recorder configuration, deployment and retrieval operations of the Tsunami buoy system

## Contact Details

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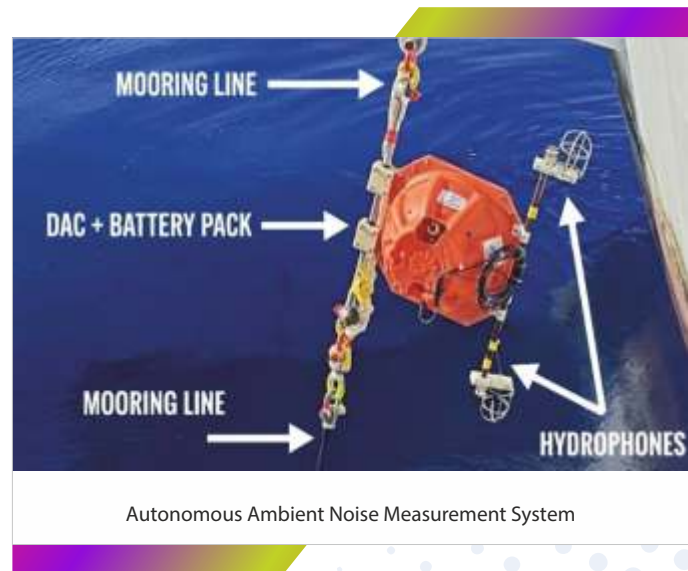
Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Passive Acoustic Monitoring**

# Autonomous Ambient Noise Measurement System

## Overview

Ambient noise measurement system (ANMS) has been developed to acquire and analyze ocean sound in shallow and deep waters of Indian Ocean for strategic as well as oceanographic applications. In addition, ANMS is also used for ice dynamics study in Arctic region towards climate change studies. Acoustic signals are recorded using omnidirectional hydrophones, capturing dominant surface-generated noise (such as wind and rain), biological activity and shipping. This study offers non-invasive, cost effective and scalable solution to monitor underwater domain.



## Functionalities



Passive acoustic monitoring (PAM), in Arabian Sea and Bay of Bengal.



Passive acoustic monitoring (PAM) along East and West coast of India



Supports long-term autonomous underwater soundscape study



Provides high-resolution multi-channel data recording with programmable sampling and storage

## Key Features

- Low-power, high-speed indigenous autonomous data acquisition system with anti-aliasing filter
- Simultaneous programmable sampling for hydrophone channels
- Realtime data processing and transmission of processed data

## Implementation Overview

### Deployed

Yes (More than 15)

### TRL

6

### Training Requirement

15 days required for the employer/operator

## Contact Details

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Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Open Sea Cage culture**

# Open Sea Cage Fish Farming: A Sustainable Technology for Enhancing Coastal Livelihoods

## Overview

NIOT has standardized development and deployment of 10 m diameter, circular floating HDPE cages with multipoint mooring and demonstrated at North Bay (Andamans), Olaikuda (Tamil Nadu), Kothachathram, Thuplipalem (Andhra Pradesh) and Kumta (Karnataka) involving coastal fishermen. NIOT has also developed submersible cages with water-ejector-based sub-sea feeder, and AI-based systems for fish biomass estimation and health monitoring. The institute is also advancing in development of broodstock development in open-sea conditions with natural water exchange to improve fish health and reduce costs for coastal communities.



Open Sea Cage Fish Farming

## Functionalities



Offshore cage (10 m diameter) with multipoint mooring provides a stable, secure structure for open-sea fish farming, minimizing drift and withstanding waves for long-term use.



Automated surface and sub-sea feeders ensure efficient, uniform feed distribution in floating and submerged cages, reducing waste, manual effort, and improving feed efficiency.



AI-based fish health and biomass monitoring enables real-time assessment for data-driven management.



Open-sea broodstock systems with natural water exchange support healthy breeding, improve seed quality, reduce disease risk, and lower reliance on hatcheries.

## Implementation Overview

Current Status: NIOT is extending technical support and training in development, deployment and demonstration of pilot scale cage farming jointly with Department of Fisheries and industry in A&N islands

### Deployed

NIOT has deployed 10 m diameter 16 cage (8 x2) systems (Chidiyatappu & North Bay) with 320 m3 for demonstration of pilot scale cage farming.

### TRL

8

### Training Requirement

At total of 25 day for cage fabrication, deployment and 6 months for culture management.

## Key Features

- Enables offshore high-value finfish farming using robust cage systems.
- Supports submerged aquaculture operations in high-energy sea conditions.
- Enhancing fish production and reducing pressure on wild fisheries & supporting sustainable livelihood generation for coastal communities.
- Enabling efficient, large-scale mariculture operations.

## Operational Capabilities

- Secure cage deployment using multipoint mooring in harsh conditions.
- Efficient feed delivery with minimal waste.
- Submerged operation to minimize wave and environmental stress.
- AI-based monitoring for informed farm management.
- Improved fish health and lower costs through natural water exchange.

## Contact Details

### The Director

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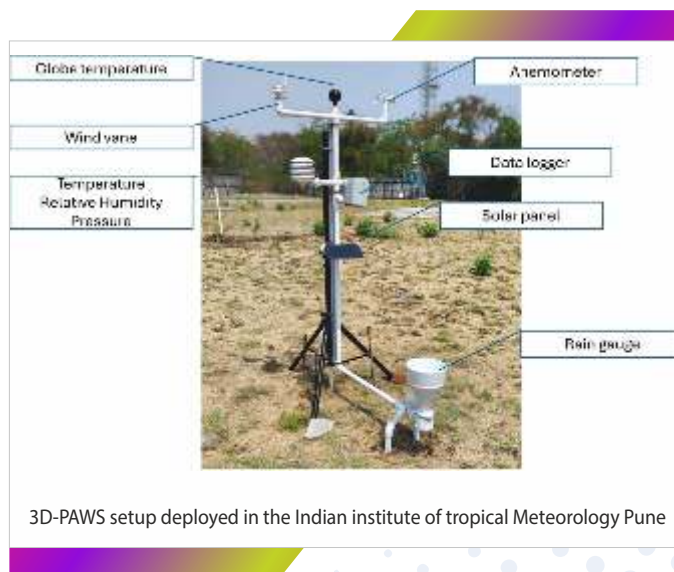
Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Atmospheric Sciences**

## 3D-Printed Automatic Weather Station (3DPAWS)

### Overview

An economical 3D-Printed Automatic Weather Station (AWS) was developed by IITM in collaboration with UCAR, offering a practical and cost-effective solution for weather monitoring in urban areas. The system integrates WMO-approved sensors with 3D-printed components, open-source electronics, and cloud-based technologies for seamless data transfer and real-time monitoring. This initiative was undertaken as part of the Urban Meteorology Delhi Project. The low-cost system is now being implemented in several other urban areas across the country to generate high spatial resolution and dependable weather data. These AWS units are capable of measuring key meteorological parameters such as wind speed and direction, temperature, relative humidity, wet bulb globe temperature, atmospheric pressure, and rainfall, thereby strengthening urban weather services and climate resilience planning.



### Functionalities



Economical solution for dense urban networks



Possibilities to add more sensors and observational capabilities



Monitoring of weather in remote and under surveyed regions



Help develop a decision support system for flood, heat stress and other high impact weather

### Key Features

- Easily replaceable 3D printed parts
- Economically viable
- Self-sustainable
- Environment friendly
- Renewable energy based
- Easily replaceable and deployable

### Implementation Overview

#### Deployed

15 units installed at various locations

#### TRL

6

#### Training Requirement

2 hours

### Contact Details

The Director

Indian Institute of Tropical Meteorology, Dr. Homi Bhabha Road, Pune

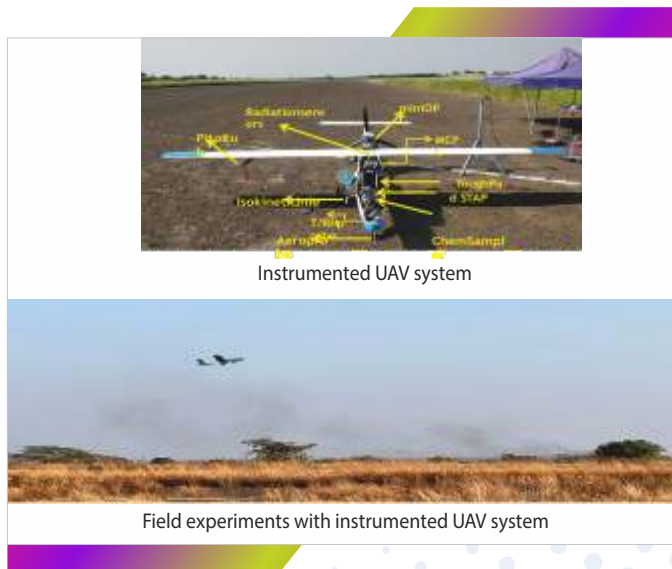
Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Atmospheric Sciences**

# Lower Atmospheric Research using Unmanned Aerial System (LARUS)

## Overview

LARUS is an innovative initiative by IITM that uses drones (UAVs) integrated with miniaturized scientific payload to obtain crucial, yet under-sampled, meteorological and various in situ atmospheric observations in the lower atmosphere. It enables high-resolution data collection on aerosols, clouds, radiation, and turbulence up to 3 km altitude, improving understanding of atmospheric processes. The system supports climate research, air-quality assessment, and weather modification studies, while cost effective and real-time observations strengthen environmental monitoring.



## Functionalities

- Conduct vertical atmospheric profiling across multiple altitudes using UAVs
- Measures aerosols, cloud microphysics, radiation fluxes, and turbulence parameters
- Enables targeted data collection in remote or hard-to-access regions
- Supports real-time transmission of atmospheric data to ground stations
- Facilitates field experiments for climate, weather, and air-quality research
- Assists calibration and validation of satellite and ground-based observations

## Key Features

- Autonomous UAV operations with programmable flight paths
- Modular payload design supporting multiple scientific instruments
- Lightweight, portable system enabling rapid field deployment, high spatial and temporal resolution compared to conventional methods
- Operates at lower cost than manned aircraft, scalable platform adaptable for diverse atmospheric research applications

## Implementation Overview

### Deployed

Adoption: Drone Technology is adopted for high frequency atmospheric measurements. Integrated with science payload, field demonstrated and conducted scientific mission profiles.

### TRL

6-7

### Training Requirement

7 days for Autonomous UAV operations

## Contact Details

**Dr. B. Padmakumari** Project Director

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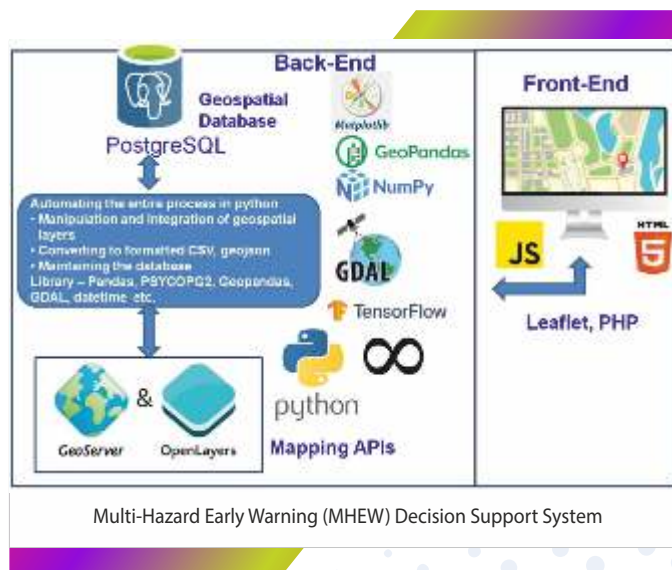
Thematic Area: **Deep Sea & Atmospheric Technologies**

Category: **Weather and Climate**

# Multi-Hazard Early Warning (MHEW) Decision Support System

## Overview

The India Meteorological Department (IMD) is the nodal agency for weather forecasting and early warnings in India. To replace slow, semi-manual systems, IMD developed an in-house, open-source digital platform, reducing reliance on costly foreign systems. The Multi-Hazard Early Warning Decision Support System (MHEW DSS) is a real-time, GIS-enabled platform that integrates data collection, analysis, and dissemination into a single automated system. It replaces fragmented legacy processes with faster, more accurate, and interoperable forecasting. This digital transformation supports IMD's vision of a "Weather Ready and Climate Smart Nation," improving lead time, communication, and decision-making for stakeholders such as farmers, disaster managers, and key sectors.



## Functionalities

- Integrated platform for real-time multi-hazard monitoring and impact-based forecasting for location-specific risk assessment and warnings
- Seamless data integration from satellite, radar, and numerical models, automated alert generation for cyclones, floods, heatwaves, and storms
- Decision support tools for disaster preparedness, response, and recovery & GIS-based visualization for spatial analysis and hazard mapping
- Customizable dashboards for sectoral services and stakeholder requirements
- Early warning dissemination through web, mobile, and all communication systems including social media, indigenous development reducing dependence on foreign vendors

## Implementation Overview

The system uses an integrated geospatial architecture with PostgreSQL/PostGIS, Python automation, and web mapping tools for efficient data processing and visualization. Data from multiple sources are automatically cleaned, processed, and stored, then published via GeoServer. Interactive front-end tools (Leaflet, JavaScript, HTML5, PHP) enable real-time access, analysis, and visualization, ensuring scalable and seamless data dissemination. The DSS also delivers alerts through SMS, email, WhatsApp, graphical bulletins, and CAP-based systems for timely public warnings.

## Contact Details

**Director General of Meteorology**

India Meteorological Department, Mausam Bhavan  
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### Deployed

Yes, it is implemented and operational for IMD and Public users (IMD Geospatial Services)

### TRL

4

### Training Requirement

01 Day and Internal IMD Training for IMD already completed

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***DEEP-TECH MATERIALS &  
ADVANCED ENGINEERING  
TECHNOLOGIES***

Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Hydrogen Energy**

# Solid Oxide Electrolyser Cell Technology for Green Hydrogen Generation

## Overview

CSIR-CGCRI developed kW-scale SOE stacks, integrating indigenously developed cells with engineered stack components and thermally cyclable sealant. SOE stack demonstrated throughput  $\sim 0.3 \text{ Nm}^3/\text{kW/h}$ , indicating capability for efficient hydrogen production from high temperature steam at laboratory scale. The institute has transferred the process know-how to M/s Carborundum Universal (CUMI) and the collaborative effort between CSIR-CGCRI and CUMI forms the cornerstone for realization of India's indigenous 4 kW SOE prototype and subsequently 16 kW Make-in-India SOE generator.

Key target beneficiaries: Ms/ Carborundum Universal, (CUMI)






PSUs: IOCL, HPCL, BPCL.

Strategic sector: DAE



Figure: (a) R-SOE Cell making facility under single roof (Clean & Laminated flow bench room) (b) Half cells 100x 1.5mm & 100x 0.3-0.5mm, (c) Batch & continuous tape caster process, (d) Half-cells handed over to CUMI Full-cells handed over to CUMI, (e) Spray-pyrolysis assisted nano-sol infiltrated process, (f) Infiltrated Fuel electrode supports having functional layers

## Functionalities

-  SOE functional fuel electrode component materials that can split high temperature steam to hydrogen
-  SOE functional air electrode component materials can effectively evolve oxygen as the product from anode exhaust
-  SOE large area single cell of dimension 100x size can generate H<sub>2</sub> flux of 0.3Nm<sup>3</sup>/cm<sup>2</sup>/h having an approximate current density of 1.0 A.cm<sup>-2</sup>
-  kW scale SOE stack demonstrated throughput  $\sim 0.3 \text{ Nm}^3/\text{kW/h}$
-  CGCRI and CUMI is scaling up the technology to 4 kW indigenous prototype and 16 kW SOE generator to catch up commercial deployment

## Key Features

- Energy efficiency for SOE system can reach as high upto 35kWh/kg of H<sub>2</sub>
- SOE system can operate in modular generator 15- 30 kW scale and may range upto 1 MW
- High quality of high temperature operation in the range of 700- 800 oC can effectively utilize the electricity and heat combined efficiency and CHP may lead to 95% and above for large systems leading to reach to Carnot's efficiency.
- SOE can take up electrochemical valorization of CO<sub>2</sub> and Co<sub>2</sub> and steam to generate value added product like CO and syn gas to produce synthetic diesel

## Contact Details

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Scientist F and Chair Energy Materials and Devices

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## Implementation Overview

Deployed	TRL	Training Requirement
Yes	6	30

Thematic Area: **Deep-tech materials and Advanced Engineering technologies**

# Indigenous Portable Raman Spectrometer

## Overview

An indigenously developed portable Raman spectrometer enabling rapid, non-destructive chemical and material identification. Designed under the Make in India initiative, it supports quality control, forensic analysis, pharmaceuticals, and defense applications. The system reduces dependency on imported instruments while offering cost-effective, field-deployable solutions for real-time analysis across industrial and research sectors.



## Functionalities



**Rapid identification of chemicals and compounds in real-time**



**Non-destructive analysis without sample preparation requirements**



**Portable operation suitable for field and on-site applications**

## Key Features

- Indigenous design reducing reliance on imported instruments
- Compact, lightweight and user-friendly interface system
- High sensitivity with reliable spectral accuracy

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
Yes	7-8	2-3 days

## Contact Details

Director,  
CSIR-AMPRI, Bhopal

Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Standardization**

# Bharatiya Nirdeshak Dravya (BND): Catalyzing Economic Growth through Standardization

## Overview

Bharatiya Nirdeshak Dravyas (BNDs) are Indian certified reference materials (CRMs) trademarked by CSIR, developed by CSIR-National Physical Laboratory with domain experts. They ensure accuracy, traceability, and reliability in chemical and bio-measurements. BNDs support calibration, method validation, and quality assurance. They aid biopharma and health technologies, enabling precision therapeutics. They benefit pharmaceuticals, food safety, environmental monitoring, metallurgy and others. For industry, laboratories, and regulators, BNDs enhance data credibility, reduce import dependence, and strengthen national quality infrastructure under *Make in India*.



## Functionalities



**Trusted measurements:** Calibrate instruments and validate methods with reliable, SI-traceable reference standards.



**Quality you can trust:** Ensure compliance, consistency, and enable barrier-free trade across industries.



**Powering self-reliance:** Indigenous CRMs supporting biopharma, precision therapeutics and "Make in India vision".

## Key Features

- **Globally aligned standards:** Harmonized with international benchmarks, ensuring worldwide acceptance of Indian measurement results.
- **Fit-for-purpose design:** Matrix-matched, application-specific CRMs tailored for diverse and emerging sectoral needs.
- **Reliable and sustainable supply:** Indigenous production ensuring consistent availability, cost-effectiveness, and long-term quality assurance.

## Implementation Overview

### Deployed

180+ BNDs are being commercialized across sectors; used by industry, labs, and regulators.

### TRL

### Training Requirement

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**





# CSIR PRIMA ET11 – A Compact Electric Tractor

## Overview

CSIR-CMERI's Compact Electric Tractor (PRIMA ET11) is an indigenous, eco-friendly solution designed for small and marginal farmers. It replaces diesel with clean electric power, reducing fuel costs and pollution while supporting India's sustainability goals. Easy to operate, including for women, it can be charged at home and used for multiple farm activities. The technology promotes affordable mechanization, improves productivity, and enables greener, energy-efficient farming practices in rural India.



## Functionalities

-  Performs ploughing, tilling, and hauling efficiently, supporting multiple farm operations with versatile attachments.
-  Operates on rechargeable electric power, reducing fuel costs, emissions, and dependence on diesel.
-  Provides 4–6 hours of field operation; easily charged using a standard home power socket.
-  Enables Vehicle-to-Load (V2L) functionality, powering irrigation pumps and other farm equipment.

## Key Features

- Fully indigenous design using locally developed components and technologies
- Women-friendly ergonomics with easy controls and reduced physical effort
- Advanced lithium-ion battery with long life and deep discharge capability
- Robust build with efficient transmission ensuring durability and cost-effectiveness

## Implementation Overview

Deployed	TRL	Training Requirement
Yes; The technology has undergone extensive field validation through a nationwide roadshow from Jammu to Kanyakumari, covering over 11 locations.	6	-

## Contact Details

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Mechanical Engineering Research Institute  
M.G. Avenue, Durgapur, West Bengal – 713209

Thematic Area: **Deep-Tech materials & advanced engineering technologies**

# Fire Retardant Intumescent Coating for Steel and GI Duct Applications

## Overview

Steel and GI structural materials when exposed to fire starts losing its structural strength (at temperature above 500o C) leading to risk of collapsing structures. A fire-retardant intumescent paint is a coating that reacts to heat by swelling several times its original thickness, producing a carbonaceous char that act as an insulating layer to protect the substrate. CSIR-CBRI developed and Low smoke and low toxicity fire retardant intumescent coating that can protect humans as well as structure also.



## Functionalities

- No flame spread
- Not easily ignitable
- Environment friendly coating
- Economical cost
- Low heat generation
- Less smoke generation
- Water based FRIC

## Key Features

- No flame spread: Class-1 as per BS 476 part 7
- Low heat generation: I<12 as per BS 476 part 6
- "P" Not easily ignitable as per BS 476 part 5
- Low smoke as per ASTM E 662 (D1.5 <100) (D4.0 <200)
- Optimum char expansion up to 40 to 50 times
- High thermal stability
- Insulates the surface
- Prevent the penetration of heat.
- Does not modify the intrinsic properties of substrate
- Manufactured using ecofriendly chemicals

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, various sites (more than 35)	09	01 day

## Contact Details

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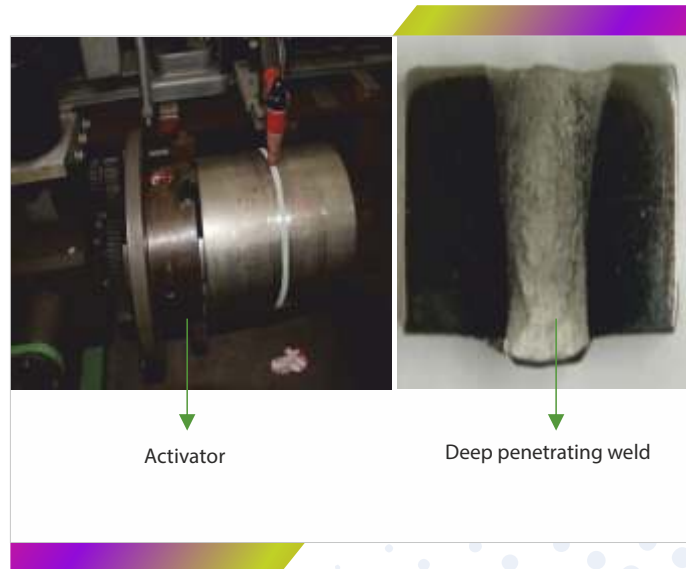
Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Materials science and applied engineering**

## A Penetration Enhancing Flux Formulation for Tungsten Inert Gas (TIG) Welding of Austenitic Stainless Steel and Its Application

### Overview

Activated TIG welding is a novel variant and overcome the limitations of conventional TIG welding. The process involves application of thin coating (~15 µm thick) of activated flux in the form of paste on the joint area prior to welding and the process is found to produce a dramatic increase (300%) in penetration of up to 12 mm in single pass autogenous welding. Welds produced with A-TIG process meets the radiographic, chemical and mechanical requirements. Deep penetration welds obtained passes non-destructive tests DPI, UT and RT.



### Functionalities

- A-TIG process enables single pass welding of higher thickness plates
- Straight sided joint and no bevel preparation involved
- Mitigates variable weld penetration caused due to heat-to-heat variations
- Enhanced productivity
- Reduced consumption of filler wire on large thickness welding (20 mm thick)
- Significant reduction in the cost of fabrication (more than 50%)

### Key Features

- No degradation in microstructure, mechanical properties and corrosion resistance of welds
- Significant reduction in residual stresses and distortion in weld joint
- Significant enhancement in creep rupture life of weld joint
- Process well suited for welding pressure vessels, pipes, tubes, shell structures, tube to tube sheet welding, gas cylinders, SS pipe welding in ships, submarines etc.

### Implementation Overview

Deployed	TRL	Training Requirement
Yes (Nuclear, Thermal power plants, Chemical and Pharmaceutical industries)	> 8	1 day

### Contact Details

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Mobile: +91-9444129504  
E-mail: subbi@igcar.gov.in

Thematic Area: **Deep-Tech materials & advanced engineering technologies**  
Category: **Materials science and Applied engineering**

# A Method for Diffusion Bonding of Piezoelectric Crystal to Metal Wear Plate

## Overview

A diffusion bonding method was developed to join a lead zirconate-titanate (PZT) piezoelectric crystal with a metal wear plate for high-temperature ultrasonic transducers. The process involves contacting noble-metal-coated PZT with the wear plate, then heating under pressure at 270 °C in vacuum to form a metallic bond. The noble metal interlayer ensures durability, withstanding prolonged exposure up to 250 °C and repeated thermal cycling, resulting in a robust, high-performance piezoelectric-metal assembly.



Metal wear plate diffusion bonded to PZT crystal

## Functionalities



Under-sodium viewing of components of Fast Breeder Nuclear Reactors.



For processes related to molten-salt applications

## Key Features

- Operates reliably up to 250 °C with repeated thermal cycling.
- Stronger than adhesives; resists delamination under vibration, shock, wear.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, one	> 8	30 days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Chemical, Radiochemical, Hazardous and isolated Enclosure Prohibited for human access.**

## Leak Tight Flange and Gasket assembly for Instrumentation /Power Cables for Chemical and Radiochemical Facility / Hazardous Enclosure/ Isolated Enclosure

### Overview

Leak tight flange and gasket can be used in Chemical, Radiochemical, Hazardous and isolated Enclosure Prohibited for human access and also can be used in vacuum application. It will enable routing bunch of data cables or power cables across walls ensuring leak tightness without any sealant. A specially designed feedthrough& gasket would hold the cables air tight, preventing the spread of hazardous air outside.



Leak tight feed through flange installed in a hot cell at IGCAR

Typical bunch of cables with gasket

### Functionalities

- Sealing is achieved without any adhesive.
- Replacement of a single or multiple cable(s) or gasket is achieved
- Minimum man hour operation.
- Facilitates for enhancing the plant life
- Compatible for cable with very rough surface.
- Continuous cabling is possible - less joints, minimum loss.
- Minimum bolt force for achieving leak tightness.
- Retrieval of gasket after installation of gasket is made easy.
- Area of gasket contacting the cable is optimized to have better leak tightness & replacement.

### Key Features

- Sealing is achieved without any adhesive.
- Any single Cable/gasket are replaceable.
- It can withstand leak tightness up to 1 Bar using helium as medium.
- Helium leak tested for vacuum application @ 2.0 x 10<sup>-5</sup> mbar l/s.
- Both side access not required for replacing cables.
- Designed to convert axial bolt force effectively into radial force.
- Maximum number of cables routed per unit area of gasket.
- Compatible for cable with very rough surface also.
- Minimizes strain in unwanted direction.
- Effective transfer of applied force on cable, hence easy replacement.
- Less cost by avoiding expensive adaptors.

### Implementation Overview

Deployed	TRL	Training Requirement
Yes, 80.	> 9	5 days

### Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Remote applications in domains prohibited for human access**

## Remotely Operated Self- Locking Fixture for Installation of Wall Mounted Fittings Inside Chambers Prohibited for Human Access

### Overview

Remotely operated self-locking, leak tight self-guided mechanism for mounting fittings like small motors, CCD camera, sensors, lighting fixtures, gauges, etc., from outside and to the inside wall of any isolated chamber having wall of any thickness & blindfold. Replacement operation can be completed in a short time. The product would be most suitable for plants handling hazardous material like, nuclear industry, chemical industries, pharmaceutical industries, deep sea exploring vessels, fertilizer plants, etc.



Remotely Operated Self-Locking Fixture installed inside hot cell of wall thickness 1.8 meter

### Functionalities

- Remote installation of fittings to the inside wall of isolated chamber from outside.
- Blind fold installation of fittings, demanding no viewing arrangement or illumination inside the chambers.
- Equipped with self-locking feature and no separate mechanism is required to secure the fittings.
- Designed with self aligning features enabling to be operated with semi-skilled operators.
- Designed to minimize the friction while replacing the old fittings with new.
- By using guide rod of required length fittings can be mounted in chambers of any wall thickness.

### Key Features

- Simple mechanism, compact, robust, easy to install, operate, maintain remotely.
- The unit is adaptable to chambers with varying wall thickness.
- Ideal for chambers where human access inside is prohibited.
- Has only one maintenance prone part, is accessible for maintenance.
- Replacement of fitting completed in a couple of minutes.
- Leak tightness - helium leak tested @ 1.0 Kg./sq.cm.
- Leak tightness - air soap solution tested @3.0Kg./sq.cm.
- The unit adaptable to chambers with varying wall thickness.
- Ideal for chambers where human access inside is prohibited.

### Implementation Overview

Deployed	TRL	Training Requirement
30	> 8	3 days

### Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Manufacturing**

# A Method for Increasing the Life of Cutting Tools

## Overview

Plasma Nitriding is an advanced surface treatment technology that enhances the hardness, wear resistance, fatigue life, and corrosion resistance of metal components by diffusing nitrogen into the surface using glow discharge plasma. The process improves the durability and performance of engineering components while maintaining dimensional accuracy and reducing distortion. It benefits automotive, aerospace, tooling, power, and manufacturing industries by increasing component lifespan, reducing maintenance costs, improving operational efficiency, and supporting high-performance industrial applications with environmentally cleaner processing compared to conventional heat treatment methods.



## Functionalities

- **Surface hardening of metal components using nitrogen diffusion through plasma**
- **The nitrogen ions from plasma bombards the surface and diffuse into the work piece matrix**
- **Improvement of wear resistance, fatigue strength, and corrosion resistance**
- **Enhancement of component life and operational reliability**
- **Uniform treatment of complex-shaped engineering components with minimal distortion**
- **Environment-friendly surface treatment with better process control and energy efficiency**

## Key Features

- Provides high surface hardness with improved wear and fatigue resistance
- Ensures minimal distortion and maintains dimensional accuracy of components
- Suitable for complex geometries with uniform surface treatment
- Offers cleaner and more energy-efficient processing compared to conventional methods
- Enhances component lifespan, reducing maintenance and replacement costs

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
Yes, 05	7	15 days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Manufacturing**

# Thermal Plasma Technology for Producing High-Quality Metal Oxide Nanopowders

## Overview

Thermal Plasma Synthesis of Metal Oxides is an advanced high-temperature process in which metal or metal precursor feedstocks are injected into a thermal plasma jet/flame and rapidly vaporized, reacted, and quenched to form metal oxide powders. The extremely high plasma temperatures enable synthesis of high-purity, nano-/submicron-sized oxide particles with controlled morphology and phase composition. The process supports production of a wide range of oxides such as alumina, titania, zirconia, silica, and specialty ceramic powders. Rapid quenching prevents excessive grain growth, allowing formation of metastable phases and fine particle size distributions.



## Functionalities



**Synthesis of high-purity metal oxide nanopowders using thermal plasma**



**Production of nanoparticles with controlled size, composition, and morphology**



**Single integrated system for nanopowder generation and collection**



**Scalable production suitable for industrial and research applications**



**Development of functional nanomaterials for energy, electronics, coatings, catalysts, and healthcare applications**

## Key Features

- High-purity nanopowder production with precise control over material properties
- Faster synthesis process compared to conventional nanoparticle production methods
- Ability to produce uniform and fine-sized nanoparticles at industrial scale
- Versatile technology suitable for a wide range of metal oxide materials and applications
- Energy-efficient and advanced processing route for high-performance nanomaterial manufacturing

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	7 days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Manufacturing**

# “AGASTYA” Liquid Nitrogen Cooled Cryopump Technology for High Vacuum Applications

## Overview

“AGASTYA” A Liquid Nitrogen Cooled Cryopump Technology is adsorption based advanced vacuum generation technology that uses extremely low temperatures produced by liquid nitrogen to capture and remove gases from vacuum chambers. The system enables clean, oil-free, and high-vacuum operation essential for applications in fusion research, semiconductor manufacturing, space simulation, cryogenics, and scientific experiments. It is efficient for pumping of nitrogen, Air, water vapor for producing high vacuum in large vacuum chambers. The technology doesn't have any moving parts and offers high pumping efficiency, reduced contamination, and reliable vacuum performance. It benefits research laboratories and industries by supporting precision manufacturing, advanced scientific research, and high-performance vacuum-based processes



## Functionalities

- Produces vacuum by capturing gas molecules within its cooled cryopanel surfaces
- Uses Liquid Nitrogen as cooling liquid for producing cryogenic temperatures.
- Gas molecules available in the application vacuum system are trapped to the cryopanel surfaces following cryo-condensation, cryo-sorption and cryo-trapping principle
- Efficient pumping and trapping of heavy gas molecules such as water vapor
- Reduction of vacuum contamination for sensitive scientific and industrial applications
- The system provides ~ 4000 l/s pumping speed for nitrogen/air and > 15000 l/s pumping speed for water vapor for a 400 mm opening
- Reliable and energy-efficient cryogenic vacuum pumping using liquid nitrogen cooling

## Key Features

- Highly effective in pumping heavy gases, especially water vapor and condensable gases
- Provides clean, oil-free, and contamination-free vacuum operation
- Uses liquid nitrogen cooling for efficient cryogenic gas trapping
- Suitable for high and ultra-high vacuum applications in advanced industries and research
- Offers reliable performance with low maintenance and improved vacuum quality

## Implementation Overview

Deployed	TRL	Training Requirement
6	7	: 7 days

## Contact Details

**Dr. Nirav I Jamnapara**  
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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Cryoengineering and Specialized Refrigeration Technology**

# A Liquid Nitrogen Based Portable Refrigeration System for carrying Refrigerated Goods

## Overview

SHIVAY (Sheetal Vahak Yantra) Technology is an innovative refrigeration solution which utilizes liquid nitrogen(LN<sub>2</sub>) for cooling during transportation of Fruits &Vegetables (F&V) for farmers. SHIVAY systems can take farmers' product to far off markets, keeping freshness intact, because of control on temperature, humidity and inert atmosphere. LN<sub>2</sub> is a by-product of oxygen production plants, with substantial surplus generation capacity in India.

SHIVAY is an appropriate technology to act as bridge in the existing cold-chain. It can be used to transport goods in refrigerated condition in cost effective way.



20 Feet SHIVAY System during Road Trials

## Functionalities



Transport of F&V, fish and pharma products in temperature range (-20 to +20 Deg C) with humidity control and optional inert atmosphere.



This system can be mounted on any truck or built directly onto vehicle chassis. Also suitable for KISAN Rail.



A typical 20 feet SHIVAY container has carrying capacity up to 6 tons of F&V.

## Key Features

- The system has lower risk of breakdowns and has lower maintenance requirements.
- Components used for this technology are available locally in the commercial market.
- SHIVAY offers a 100% eco-friendly, reliable, and alternative to conventional freon gas based refrigerated systems.

## Implementation Overview

Deployed	TRL	Training Requirement
3	7	: 7 days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Advanced Manufacturing Technology**

# Laser Additive Manufacturing System using Powder Bed Fusion (LAM-PBF) System

## Overview

Laser Additive Manufacturing System using Powder Bed Fusion (LAM-PBF) enables the precise printing of complex metallic components with tailored density and microstructure. The system uses a laser to melt the powder spread on a substrate and build the component in a layer-by-layer fashion directly from a solid model. It enables lightweight design, rapid manufacturing, and reduced material wastage. It has transformed the aerospace, nuclear, and healthcare sectors by enabling customized, high-performance parts, enhancing supply chain resilience, and improving design flexibility.



Laser Additive Manufacturing System using Powder Bed Fusion System

## Functionalities



Produces complex, near-net-shape metallic components with high precision and minimal material wastage.



Supports rapid prototyping and custom design with high repeatability and design flexibility.



Enables microstructure control as per demand and tailored mechanical properties.



Provides logistic freedom and it is greener technology

## Key Features

- High-precision fabrication of complex geometries with minimal post-processing.
- Tailorable microstructure and properties through controlled laser processing.
- Efficient, material-saving production with strong design freedom.

## Implementation Overview

Deployed	TRL	Training Requirement
5 Units.	7	10 Days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Functional and Structural Materials**

# Advanced Materials for High-Performance Electronic and Structural Applications

## Overview

Advanced materials integrate superior mechanical, electrical, and thermal properties to enable next-generation devices and systems. They support miniaturization, high-temperature operation, and energy efficiency across electronics, aerospace, and renewable energy sectors.



## Functionalities



Provides enhanced strength and thermal stability for components



Enables high-speed, low-loss electronic performance



Supports lightweight, corrosion-resistant structural designs

## Key Features

- High conductivity and mechanical resilience
- Tailored microstructure for specific applications
- Compatible with semiconductor and composite fabrication processes

## Implementation Overview

### Deployed

Pilot production in semiconductor and aerospace industries

### TRL

6-7 (Validated prototypes in operational environments)

### Training Requirement

5-7 days for material engineers and technicians

## Contact Details

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director.sspl@gov.in

**Potential Impact:** Enhances durability, efficiency, and miniaturization in electronics, aerospace, and energy systems through innovative material design and processing.

Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Extreme Environment Protection Systems / High-Altitude Protective Wear**

# HIMKAVACH: extended cold weather clothing system for extreme high-altitude military operations

## Overview

HIMKAVACH is a second-generation indigenous Extended Cold Weather Clothing System (ECWCS) developed by DRDO for Indian Armed Forces operating in Himalayan high-altitude and glaciated regions. It provides modular thermal protection from +10°C to -60°C using a seven-layer system based on the IREQ principle, ensuring insulation, moisture management, wind proofing, waterproofing, camouflage, and ergonomic comfort under varying operational and metabolic conditions.



## Functionalities



Multi-layer thermal insulation for extreme cold and sub-zero operations



Moisture wicking, breathability, and sweat evaporation management



Windproof, waterproof, snow-protective, and camouflage-enabled protection

## Key Features

- Seven-layer modular adaptive insulation architecture
- IREQ-based scientifically optimized thermal regulation system
- Indigenous, ergonomic, rugged, and field-repairable design

## Implementation Overview

### Deployed

Yes (developed for Indian Armed Forces deployment in Northern, Eastern, and Central Himalayas and glacier warfare operations)

### TRL

TRL 9 (Operationally validated and deployment-ready defence system)

### Training Requirement

NA

## Contact Details

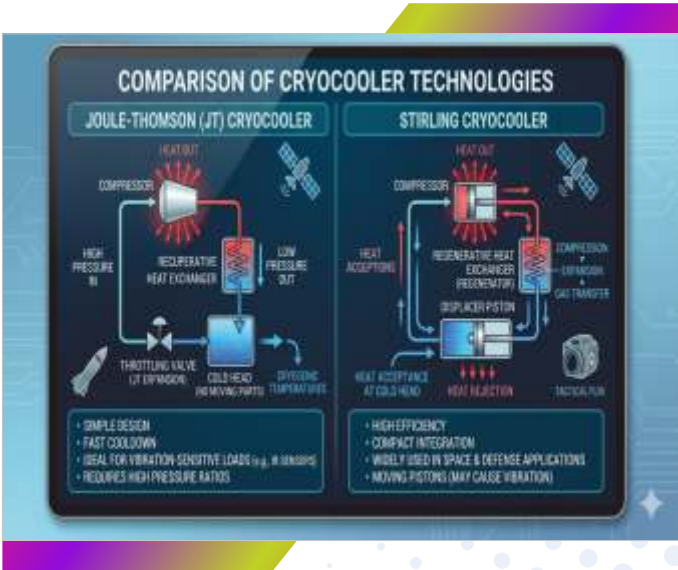
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Thematic Area: **Deep-Tech materials & advanced engineering technologies**  
Category: **Thermal Management and Cryogenic Systems**




# Joule-Thomson (JT) and Stirling Cryocooler Systems for Infrared and Space Applications

## Overview

JT and Stirling cryocoolers are advanced refrigeration systems that achieve cryogenic temperatures for sensitive detectors and instruments. They enable continuous cooling without consumable cryogenes, supporting long-duration missions and high-precision sensing in defense, space, and scientific applications.



## Functionalities

-  Provides cryogenic cooling for infrared and superconducting sensors
-  Maintains stable low temperatures for space payloads
-  Enables long-term, maintenance-free operation in harsh environments

## Key Features

- Compact, lightweight, and energy-efficient design
- Closed-cycle operation with high reliability
- Rapid cooldown and precise temperature control

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, in defense and space imaging systems	7-8 (Demonstrated in operational environment)	5-7 days for system operators and maintenance engineers

**Potential Impact:** Provides compact, efficient cooling for infrared sensors, space payloads, and superconducting electronics, enhancing performance and reliability in defense and aerospace systems.

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Imaging & Sensing Devices**

# Short-Wave Infrared (SWIR) Camera Technology for Advanced Imaging Applications

## Overview

SWIR cameras capture images in the 0.9–1.7  $\mu\text{m}$  wavelength range, revealing details invisible to standard cameras. They enhance visibility in low-light, fog, and smoke conditions, benefiting defense, industrial quality control, agriculture monitoring, and medical imaging.



## Functionalities



Detects hidden defects in materials and products



Provides clear imaging in low-light or obscured environments



Enables precision monitoring in agriculture and food processing

## Key Features

- Operates in 0.9–1.7  $\mu\text{m}$  wavelength band
- Penetrates fog, smoke, and low-light conditions
- Non-destructive inspection with high accuracy

## Implementation Overview

### Deployed

Limited deployments in defense surveillance and industrial inspection

### TRL

6–7 (Prototype validated in relevant environment)

### Training Requirement

3–5 days for operators and technicians

**Potential Impact:** Enables clear imaging beyond visible light, supporting defense, industrial inspection, agriculture, and medical diagnostics.

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

# Automatic Chemical Agent Detector & Alarm (ACADA)

## Overview

The ACADA system is designed to detect chemical warfare agents (CWA) and toxic industrial chemicals (TICs) by sampling ambient air using Ion Mobility Spectrometry (IMS). It incorporates two highly sensitive IMS cells for continuous, simultaneous monitoring of nerve, blister, blood, and choking agents. A fixed-point, man-portable system, ACADA can operate on battery or be vehicle-mounted. It provides audio-visual and remote alarms, detects very low +agent concentrations within a minute, and features an expandable, user-updatable chemical data library for war and peacetime use.

System is inducted into Services.



## Features

- Fixed point man portable CWA detector with battery
- Can also be mounted on vehicle
- Audio & Visual alarm
- Detect very low concentrations of the Nerve, Blister, Blood and choking agents within a minute
- Pre-programmed expandable chemical data library, updated based on user's requirements

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Optically Switchable Glass Windows**

# Affordable Smart Window: High-Tech Privacy at the Price of Regular Glass

## Overview

This smart visibility control device enables selective-area toggling between translucent and transparent states via refractive-index matching between etched glass and a novel liquid composition. Unlike electrochromic/PDLC/SPD devices, it requires zero power for state retention, offers lower processing costs, and provides a unique “curtain effect” for adjustable privacy. Targeted at zero-energy buildings and smart windows, it delivers 85% transparency, broad thermal stability, and eco-friendly operation, significantly reducing the need for artificial lighting and energy costs.



(A) Opaque State, (B) Curtain effect to bring the transparency in the selected area, (C) complete curtain raise to bring full transparency

## Functionalities

- **High transparency modulation delivering  $\Delta T$  ~ 80% (5% translucent to 85% transparent)**
- **Low-power operation requiring electricity only during active switching (not for retention)**
- **Self-cleaning translucent state avoiding residual droplets on optimized roughened glass**
- **Fast switching capability achieving state change in 5-30 seconds**
- **Refractive index matching between etched glass and liquid composition for transparency**
- **Power-free state retention with no electricity needed to maintain opacity or transparency**

## Key Features

- Selective-area transparency switching with a unique curtain effect
- Power-free state retention, Refractive index matching for high transparency (85%)
- Low-cost, recyclable, and scalable materials
- No residual droplets or dripping effect, Superior to PDLC/SPD/electrochromic in cost

## Implementation Overview

Deployed	TRL	Training Requirement
1	7	7 days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Utility**

# Ammo Watch – A paper-based ammonia gas selective sensor with electrical readout and a method for manufacturing the same

## Overview

This is a paper-based, solid-state gas sensor with high potential in the electronics industry. It can selectively detect ammonia gas at concentrations as low as 1 ppm.



## Functionalities



A cheap, paper electronics-based solid-state gas sensor



Works at room temperature



Uses perovskite halide  $\text{CH}_3\text{NH}_3\text{PbI}_3$  (MAPI) as the active sensor

## Key Features

- Ammonia gas selectively with a detection capability of better than 1 ppm
- Needs less than a few nanowatt power for its operation
- Cost effective and easy to manufacture.

## Implementation Overview

Deployed	TRL	Training Requirement
No	5	Not Applicable

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Biopharma and Health Technologies**

# Gelatin Modified Bioink for 3D Bioprinting

## Overview

Scire Chitra GelMA-UVS Bioink is a patented, biocompatible bioink designed for 3D bioprinting of mammalian tissue models, including liver, kidney, pancreas, skin, brain, and heart. Compatible with all commercially available bioprinting systems, its unique UVS formulation protects cells during photocrosslinking making it a cutting-edge choice for advanced bioprinting applications. The bioink also enables the biofabrication of functional tissue and organ-like structures using patient-derived cells and hold promise for applications in regenerative medicine, including tissue repair, organ replacement and restoration of impaired biological functions.



Scire Chitra GelMA-UVS Bioink

## Functionalities



Protects living cells from ultraviolet exposure during bioprinting, enhancing cell viability



Enables ambient-temperature storage and printing, simplifying handling and operational requirements



Supports advanced disease modeling, drug discovery, and personalized medicine applications



Suitable for cutting edge research, scalable for industrial production and commercialization.

## Key Features

- UV-protective gelatin-modified bioink ensuring enhanced cell viability
- Ambient-temperature storage and bioprinting capability
- Compatible with mammalian cells including human cells for bio fabrication of functional tissue
- Can be used for predictive 3D in vitro tissue models as alternative to animal testing
- Cost-effective production using locally sourced biopolymers in India

## Contact Details

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## Implementation Overview

Deployed	TRL	Training Requirement
100 units/year	9	7 days

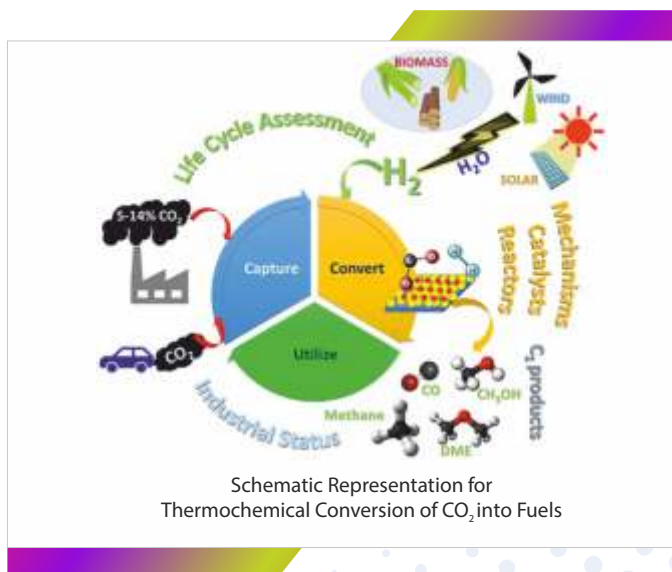
Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Advanced Catalytic Materials for Carbon Capture and Utilization (CCU)**

# A Catalyst for Thermochemical Reduction of CO<sub>2</sub>

## Overview

This technology involves the development of advanced heterogeneous catalysts for thermochemical conversion of CO<sub>2</sub> into fuels such as methanol. It enables efficient utilization of greenhouse gas emissions while integrating with renewable hydrogen systems. The innovation targets sustainable fuel production, reduction of carbon footprint, and circular carbon economy, benefiting energy, chemical, and environmental sectors.



## Functionalities



Catalyzes the conversion of CO<sub>2</sub> into methanol.



Operates under thermochemical conditions compatible with industrial reactor systems.



Integrates with renewable hydrogen sources for sustainable fuel production.

## Key Features

- High activity and selectivity toward desired carbon-based products.
- Enhanced stability under high-temperature and high-pressure reaction conditions.
- Scalable catalyst design suitable for industrial carbon utilization processes.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes	7	5-7 days

## Contact Details

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Thematic Area: **Deep-Tech materials & advanced engineering technologies**

Category: **Green Materials, Sustainable Graphene Production**

# Large Scale Synthesis of Few Layer Graphene from Agricultural Waste Biomass

## Overview

This patented innovation enables single-step pyrolysis of waste biomass using a common activating agent to produce few-layer graphene, bypassing solvent-based exfoliation. It transforms agricultural waste into high-value material for batteries, supercapacitors, electronics, and coatings, promoting waste-to-wealth with low-cost scalability and environmental benefits.

## Functionalities



Produces few-layer graphene from waste biomass.



Serves as electrodes in batteries/supercapacitors



Applied in paints, coatings, sensors, composites

## Key Features

- Single-step, solvent-free pyrolysis process.
- Low-cost, scalable green production.
- High-quality few-layer graphene output

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	6	30 Days

## Contact Details

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***ELECTRONICS/  
SEMICONDUCTORS/  
ENERGY***

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Energy**

# A Novel Energy Efficient Domestic Burner for Piped Natural Gas (PNG) and its Implementation for Clean Cooking Transition

## Overview

Piped Natural Gas, mainly methane, is being widely used in India as cooking gas but often burnt in retrofitted LPG stoves, which compromises efficiency and safety. To address this, CSIR-Indian Institute of Petroleum (CSIR-IIP) has developed a dedicated PNG domestic burner. This self-aerated, partially premixed burner achieves over 68% thermal efficiency as per IS 17153 and offers up to 25% fuel savings. Designed using CFD and validated experimentally, it delivers 1.5 - 2.25 kW output at competitive cost for large-scale deployment.

## Functionalities

-  **Up to 25% Improved thermal efficiency over retrofitted LPG burners**
-  **Designed for safety against flame lift and flashback**
-  **Prevents fuel loss and unnecessary GHG emissions**
-  **Available in capacities covering the full range of India cooking burners**
-  **Conforms to BIS 17153 specifications**

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, the technology has been transferred to forty-two (42) stove manufacturing MSME companies of India. The technology has been commercialized and the product is already available in the market.	9	1 day

The developed technology is fully indigenous, validated through extensive laboratory studies and field trials, and has already been deployed in over 10,000 households across multiple states in India. Efforts are currently underway to scale its implementation across the entire City Gas Distribution (CGD) network. Distinct branding and specialized packaging of the PNG stove have further enhanced the visibility of CSIR-IIP nationwide. The technology has also contributed to women's empowerment, with one of the key licensees operating under the brand name "Real flame," led by a woman entrepreneur who is India's only woman stove manufacturer and a member of the World LPG Association. The licensee company is BIS-approved and actively engaged in the manufacturing and supply of CSIR-IIP PNG burners to CGD companies, supported through MoUs and collaborations with distributors, marketing agencies, and direct marketing agents.



Fig.: The novel energy efficient domestic PNG burner and its impact

## Key Features

- Indian Patent Application No.: 201711046975; Grant No.: 461166
- The burner can replace approximately 1.5 crore inefficient retrofitted burners currently in use across India.
- The technology offers an annual fuel saving potential of about ₹5,000 million, along with a reduction of nearly 1 million tons of CO<sub>2</sub> emissions.
- The technology has strong potential to boost the MSME sector, with an estimated market size of ₹10,000 million.
- The burner aligns with national initiatives such as "Make in India" and the "Swachh Bharat Mission."

## Contact Details

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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Safe drinking water**

# Self-Powered Mobile Van for Water Purification/Desalination to Provide Safe Potable Water

## Overview

Mobile water desalination and purification plant, running on the engine power of the van itself. It can treat turbid/flood and contaminated water using indigenously developed membrane technology to make the water potable on spot during natural calamities.



## Functionalities



Indigenous TFC/UF membrane ensures uniqueness and reliability



Capacity to desalinate 2000 LPH brackish water & 500 LPH capacity two pass SWRO



Sustainable water solution for rural and disaster-hit regions

## Key Features

- Dual desalination: 2000 LPH brackish, 500 LPH seawater.
- Compact mobile van design for remote terrain accessibility.
- No electricity required at site, enabling flexible deployment.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes; successfully deployed in many natural calamities in the country; licensed Tech Know how to industry. Supply of Vans to Kerala Water Authority.	6	1 day

## Contact Details

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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Manufacturing**

# High Voltage Power Supplies Based on Pulse Step Modulation Topology

## Overview

Pulse step modulation (PSM) based high voltage power supplies are inherently fast and have low stored energy. They are extremely popular with Accelerators/Transmitters using RF energy. High Power RF Tubes need High Voltage for Bias. Accelerators using Electrostatic Extraction and Acceleration directly use High Voltage. (e.g., Ion Source for Neutral Beam Injectors, Electron beam). These applications require voltage range extending from 30 - 100kV. Output power up to 10MW. The Source should be a Constant Voltage Source, stable in long term. Should have Low Ripple and Low Stored Energy. Should have a very fast Turn-Off Time (micro second order) for low fault energy dump. Should have programmable rise time around few tens of micro seconds to milliseconds. Should support power modulation 1 kHz and beyond.



7.2 MW, 96kV  
HVPS operational  
at SPIDER facility,  
ITALY



2.5 MW, 100kV  
HVPS operational  
at LEHIPA facility,  
BARC

## Functionalities

- Voltage up to 100kV accurate within 1%, programmable rise/fall (micro to milliseconds), can be customized for specific voltage or voltage range
- Output Power up to 10MW (Pulse, modulating & Continuous Duty), can be customized for specific power and duty
- Low Ripple (< 1%), Fast Turn-Off Time ( $\mu$ S order) and low dump Energy (< 20J)
- Overshoot within 2%, settling time in few msec
- Fast DSP & FPGA based Controller and Fiber Optic Interface
- High redundancy and repeated Breakdown withstand capacity
- EM compatibility as per IEC standard
- Remote Monitoring, Operation and Control
- Completely Indoor versions with Cast resin transformers

## Key Features

- Provides stable and precisely regulated high-voltage output
- Ensures safe and reliable operation for sensitive equipment and systems
- Fast response and accurate control under varying load conditions
- Compact, energy-efficient, and suitable for continuous operation
- Applicable for research, industrial processing, plasma systems, accelerators, and high-voltage testing applications

## Implementation Overview

Deployed	TRL	Training Requirement
4	7	15 days

## Contact Details

**Dr. Nirav I Jamnapara**  
Head, Projects & Technology Transfer Section  
Institute for Plasma Research  
Near Indira bridge, Bhat Village  
Gandhinagar-382428, Gujarat  
Ph: 079-2396 4038

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Manufacturing**

# Feedback-Controlled Modular High Voltage DC Power Supply (FCM-HVPS) Technology

## Overview

Feedback-Controlled Modular High Voltage DC Power Supply (FCM-HVPS) is an advanced high-voltage power technology designed for precise, stable, and reliable DC power delivery in demanding scientific and industrial applications. The system uses multiple modular DC-DC converter blocks integrated with high-frequency transformers, rectifiers, and fast switching controls to achieve accurate feedback-based voltage regulation. The technology can operate in grounded as well as floating high-voltage modes up to 100 kV DC. It offers rapid fault detection, fast voltage cut-off during breakdowns, controlled energy discharge, and automatic voltage recovery, ensuring safe, efficient, and reliable operation for plasma systems, accelerators, high-voltage testing, and advanced research applications.



Two DC power supplies of ratings -11kV, 35A & 35kV, 15A are developed and are in operation at the Institute for Plasma Research (IPR) since 2015.

## Functionalities

-  **Precise generation and regulation of high-voltage DC power up to 100 kV**
-  **Real-time feedback control for stable and accurate voltage output**
-  **Operation in grounded as well as floating high-voltage modes**
-  **Fast detection and protection against short-circuits and electrical breakdowns**
-  **Automatic voltage recovery with controlled energy discharge for safe operation in critical applications**

## Key Features

- Modular design for different requirements
- True feedback control of the output voltage
- Fast output cut-off during output faults ( $< 10 \mu\text{Sec}$ )
- Low dumped-energy during breakdown or short circuit in load ( $< 10 \text{ Joules}$ )
- Continuous duty and modulated ( $\leq 5 \text{ Hz}$ ) operation up to full power
- Ability to float at high potential (up to 100kV)
- Fast voltage rise and fall time. ( $< 1 \text{ ms}$ )
- Low output voltage ripple ( $< 2\%$ )
- Ability to withstand & allow repeated breakdowns (short-circuits) at output (200 nos.)
- Local as well as remote mode operation

## Contact Details

**Dr. Nirav I Jamnapara**  
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Ph: 079-2396 4038

## Implementation Overview

Deployed	TRL	Training Requirement
1	7	15 days

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Manufacturing**

# Wideband hybrid high power MW level CW radiofrequency (RF) combiner/ splitter

## Overview

Wideband Hybrid High-Power MW-Level CW RF Combiner/Splitter is a passive microwave power management device designed to combine or split continuous-wave radio frequency power at megawatt levels over a broad frequency bandwidth. It enables efficient distribution or summation of high-power RF energy while maintaining phase and amplitude balance between ports. The technology typically employs hybrid coupler architectures with precision impedance matching, high-power coaxial/waveguide structures, and advanced thermal management for continuous operation. It is critical in high-power RF systems where multiple amplifier sources must be combined or power must be distributed to several loads with minimal insertion loss. This technology has Coupling flatness better than 0.6 dB over frequency band ~ 35 to 65MHz, Isolation and return loss better than ~ 24 dB between 36 to 65 MHz and Power dissipation less than 10%.



## Functionalities

- Combining multiple high-power RF sources into a single high-power output
- Splitting megawatt-level RF power efficiently among multiple loads or systems
- Maintaining phase and amplitude balance across output/input ports
- Enabling low-loss RF power transmission over a wide frequency range (35–65 MHz)
- Providing high isolation and impedance matching for stable and reliable RF system operation
- Supporting continuous-wave (CW) high-power operation with effective thermal management
- Minimizing reflected power and improving overall RF power transfer efficiency
- Suitable for high-power RF applications in accelerators, fusion systems, plasma heating, and industrial RF systems

## Key Features

- Wideband operation over approximately 35–65 MHz frequency range
- Capability to handle continuous-wave megawatt-level RF power
- Excellent coupling flatness better than 0.6 dB across the operating band
- High isolation and return loss better than 24 dB for stable RF performance
- Low power dissipation with less than 10% loss during operation
- Efficient phase and amplitude balancing between ports
- Robust high-power coaxial/waveguide design with advanced thermal management
- Reliable and low-loss RF power combining and splitting for critical high-power applications

## Implementation Overview

Deployed	TRL	Training Requirement
1	6	15 days

## Contact Details

**Dr. Nirav I Jamnapara**  
Head, Projects & Technology Transfer Section  
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Near Indira bridge, Bhat Village  
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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Manufacturing**

# A MW LEVEL CW SINGLE or DOUBLE POLE DOUBLE THROW (SPDT or DPDT) COAXIAL RADIO FREQUENCY (RF) SWITCH

## Overview

MW-Level CW SPDT/DPDT Coaxial RF Switch is a high-power microwave switching device designed to route continuous-wave radio frequency energy at megawatt power levels between alternate transmission paths in coaxial RF systems. It enables rapid and reliable switching of RF power between loads, sources, or antenna/launcher lines while maintaining low insertion loss and high isolation. The technology employs robust coaxial geometries, precision electromechanical or pneumatic actuation, arc-resistant contacts, and advanced cooling arrangements to withstand intense electromagnetic and thermal stresses. Such switches are critical in systems requiring redundancy, load sharing, fault isolation, or dynamic routing of high-power RF energy.



## Functionalities

- Routing megawatt-level continuous-wave RF power between alternate transmission paths
- Switching RF power between loads, sources, antennas, or launcher lines
- Enabling dynamic RF power distribution and system reconfiguration
- Providing fault isolation and redundancy in high-power RF systems
- Supporting load sharing and protection of critical RF equipment
- Maintaining low-loss RF transmission with high isolation between channels
- Ensuring reliable operation under high electromagnetic and thermal stress conditions.

## Key Features

- Compact, Cost effective and Fast switchover
- Maintain constant characteristic impedance after switchover
- Isolation and return loss better than ~ 26 dB between 36 to 65 MHz
- Safe for voltage breakdown at MW level RF power

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
1	6	15 days

## Contact Details

**Dr. Nirav I Jamnapara**  
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Institute for Plasma Research  
Near Indira bridge, Bhat Village  
Gandhinagar-382428, Gujarat  
Ph: 079-2396 4038

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Power Electronics**

# Voltage DC Power Supply with Full Range 24 Pulsed Input and Ripple Free Output for RF Amplifiers

## Overview

A novel solid-state modular -36 kV, 24 A DC power supply employing 72 DC-DC converter modules has been developed, demonstrating 24-pulse input and low ripple output. Its input and output sections are independent, ensuring stable performance despite line variations or module failures. Active redundancy enhances availability without requiring highly reliable modules. The design is simple, cost-effective, and well suited for stringent high-power RF amplifier requirements, delivering robust and efficient operation across the full operating range.



## Functionalities



Superior input and output performances at lower cost, compared to the HVDC schemes employed worldwide



Achieves full range 24-pulsed input as well as ripple free output capability simultaneously, irrespective of input line variations, set output voltages and number of faulty DC-DC converters.



This technology can be used for development of HVDC power supplies

## Key Features

- Full range 24 pulsed input system.
- Full range ripple free output capability.
- High system availability with active redundancy.

## Implementation Overview

Deployed	TRL	Training Requirement
No	7	15 days

## Contact Details

Head, AIC RRCAT PI-HUB FOUNDATION,  
RAJA RAMANNA CENTRE FOR ADVANCED  
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PO:CAT, INDORE (MP) 452013  
Email: info@aicpihub.in  
Phone: 0731-248 7480

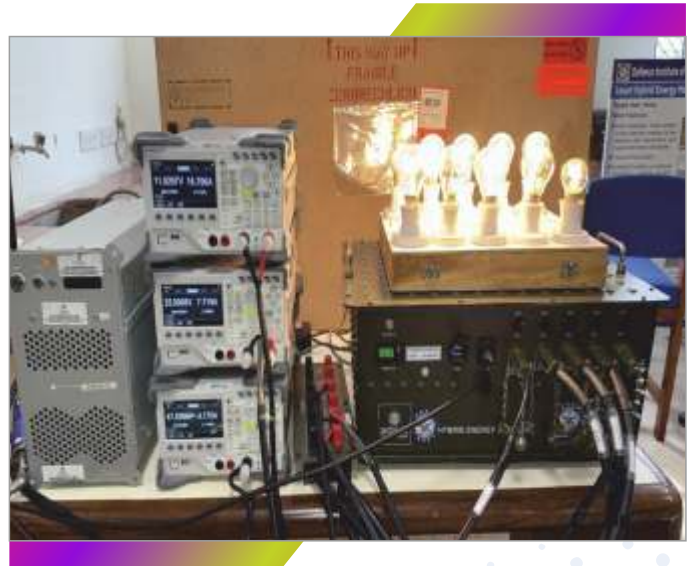
Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Energy management**

# Smart Hybrid Energy Management System (SHEMS)

## Overview

Smart Hybrid Energy Management System(SHEMS) is an intelligent system for energy uninterrupted power availability for soldier in forward area. It draws power from available sources in situ and delivers in AC/DC desired denominations.



## Functionalities



**Automatic power management**



**Simultaneous delivers of power in AC and DC mode (Difference denominations)**



**Ruggedized System suitable for HA use**



**Autonomous decision making for both demand and Supply side requirements.**

## Key Features

- Smart, Intelligent, Automatic decision making
- Ruggedized, Flexible, stackable
- Suitable for desire climate
- Capable of autonomous function and silent watch
- Multiple modes of usage and Man portable

## Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	7	< 1 Day

## Contact Details

**Dr Atul Grover, Scientist-F**  
Defence Institute of Physiology and Allied  
Sciences (DIPAS), DRDO  
Tel: 9808103289  
Email: atul.diber@gov.in

Thematic Area: **Electronics/Semiconductors/Energy**

## Compact Transhorizon Communication System (CTCS)

### Overview

CTCS is a man-portable terminal that enables beyond-line-of-sight communication using tropospheric radio paths. It provides high-capacity wireless links across hilly and remote terrains, supporting disaster management, network extension, and tactical operations. The system delivers reliable IP connectivity with up to 20 Mbps over 60 km (Tropo/Diffraction) and up to 100 km (LOS). It features sensor-assisted alignment, AI-enabled link prediction software, and two lightweight, easily portable enclosures.

Development completed, 5 Nos of ToTs handed over to Indian Industries, Induction in Indian Army and MHA Agencies is under progress.



### Key Features

- C Band Operation
- Compact Men/Mule Portable Communication System
- High Data Rate (up to 20 Mbps), Low latency IP connectivity
- Beyond Line-of-Sight operation up to 60 kms
- Line-of-Sight operation up to 100 kms

### Contact Details

**Defence Electronics Applications Laboratory**

Post Box No 6, Raipur Road,

Dehradun – 248001

Uttarakhand, India

Phone : 135 - 2787224, 2787083, 2787084,  
2787086, 2787254

Fax : 135 - 2787265, 2787290

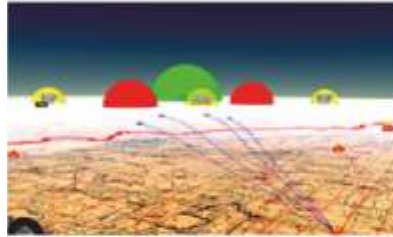
Email : director.deal@gov.in

Thematic Area: **Electronics/Semiconductors/Energy**

## Army Air Defence Deployment Simulation System (A2D2S2)

### Overview

A2D2S2 has been designed and developed by ISSA, DRDO to evaluate the effectiveness of various deployment patterns of Ground Based Air Defence Weapon Systems (GBADWS) deployed to protect the vulnerable areas and vulnerable points (VA/VPs) against Enemy Air Threats. A2D2S2 as a decision support system aids planners in generating optimal deployment solutions for sensors and weapon systems considering real-world deployment site constraints of road, rail and water bodies.



### Key Features

- Multi-Role Training System Configurable over Network | Operational Decision Support System
- Mathematical Models of Sensors and Ground Based Air Defence Weapon Systems (GBADWS)
- Mathematical Models for Assessing Damage to Ground Targets from Aerial Platforms
- Planning and Simulation of Air Threats | Quantitative Evaluation of Mission Effectiveness & Deployment Tactics
- Optimal Deployment of Sensors and Weapon Systems. | Integrated Effective Coverage Analysis Tools
- MoE based Results Analysis. | Auto Generation of AD Layout | 3D Visualization for After Action Reviews

### Contact Details

**Institute for Systems Studies & Analyses**  
Metcalfe House, Delhi -110054  
Phone : 011 - 23812639  
Fax : 011 - 23819033  
Email : director.issa@gov.in

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Smart Battery Technology and Advanced Batteries for Affordable, Reliable Energy**

# Electrode Materials and Cells for Li-ion, Na-ion, and Li-S Batteries for EV Ecosystem




## Overview

A scalable, single-step high-energy milling process to produce Lithium Iron Phosphate (LFP) cathode material with uniform carbon coating, offering high capacity, fast charging, long cycle life, and strong thermal stability suited to India's tropical climate. Developed NVP (cathode material), hard carbon (anode material) for sodium ion batteries and C-S composites for next-generation lithium-sulfur batteries.



Figure: Li-ion Cylindrical Cells and LFP pilot scale manufacturing facility at ARCI's incubator

## Functionalities

-  Production of electrode materials of LFP, NVP, hard carbon, C-S composites for domestic battery manufacturing
-  Scalable single-step process ensuring cost efficiency with reduced environmental impact
-  Indigenous, cost-effective, safe, high-performance batteries for energy storage for EVs, renewables, and grid applications

## Key Features

- Critical mineral-free (Nickel- and cobalt-free) LFP reduces cost and risks.
- Single-step scalable process ensuring uniformity and industrial viability
- High thermal stability for reliable performance in hot climates
- Indigenous technology enables affordability and large-scale energy storage

## Implementation Overview

Deployed

3

TRL

7

Training Requirement

7 days

## Contact Details

**International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI),**  
Balapur P.O, Hyderabad-500005, Telangana, India  
Email: [director@arci.res.in](mailto:director@arci.res.in)

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Solar Energy**

# Broad Band Antireflective Coating (BARC) Technology for Solar Applications

## Overview

Broadband Anti-Reflective Coating (BARC) is a unique innovation providing omnidirectional and superhydrophilic features in a single layer AR coating. Unlike traditional coatings, BARC minimize the light reflection across wide spectral (300 – 1100 nm) range at various incident angles and survives harsh Indian environmental conditions.

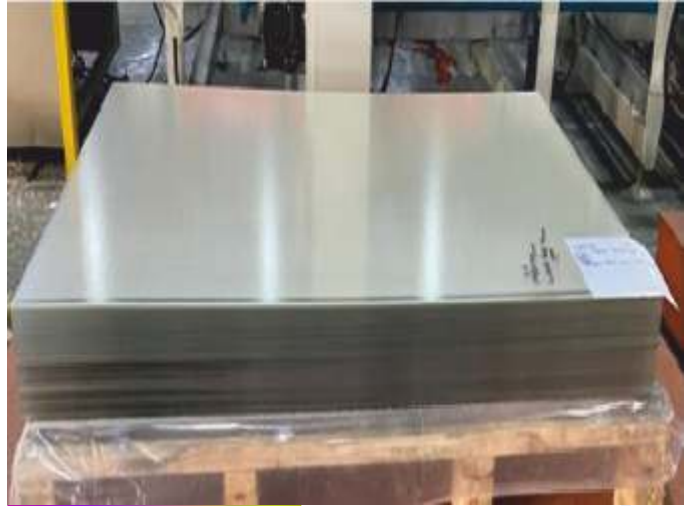


Figure: BARC coated solar glass (size: 1m x 2m) produced by Industry.

## Functionalities



Simple and cost-effective sol-gel method facilitated large-scale solution manufacturing and high-throughput deposition (100000 m<sup>2</sup>/day) for the production of solar cover glass with 93 % transmittance



Minimize the light reflection losses and improves solar glass light transmission in wide range of angle of incidence

## Key Features

- Employs cheaper raw materials and compatible with existing industrial deposition methods
- Improves the efficiency of solar panels by 3-5% and energy yield by 15-20%
- Achieves ultra-low water contact angle < 50 that actively mitigates the soiling effect.

## Implementation Overview

Deployed

1

TRL

9

Training Requirement

5 days

## Contact Details

**International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI),**  
Balapur P.O, Hyderabad-500005, Telangana, India  
Email: [director@arci.res.in](mailto:director@arci.res.in)

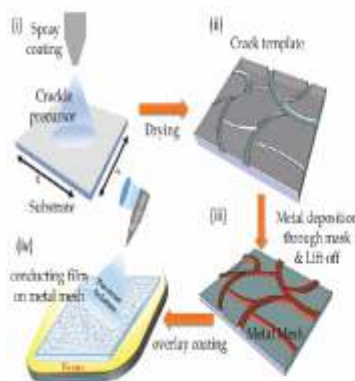
Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Transparent Electronics and Devices (Opto-electronics)**

# A Hybrid Transparent Conducting Electrode and the Method Thereof

## Overview

This innovation is a hybrid transparent conductor combining a low-cost, scalable metal nanomesh (Al or Cu) with a thin oxide overlayer ( $\text{SnO}_2$ ). It achieves 85% transparency and thermal stability up to 500°C—surpassing conventional ITO. The facile, roll-to-roll compatible method reduces cost and oxide thickness ( $\sim 50$  nm). Target beneficiaries (optoelectronics, displays, touchscreens, heaters, EMI shields) gain durable, scratch-resistant, ITO-compatible electrodes with superior conductivity and low haze, enabling market adoption.



## Functionalities



**High-temperature stability:** Maintains 85% transparency and conductivity up to 500°C



**Low sheet resistance:** Achieves  $\sim 1$  ohm/sq for efficient charge transport



**Large-area scalability:** Uses crackle lithography for roll-to-roll compatible production



**Cost-effective fabrication and Compatible with existing ITO-based manufacturing infrastructure**

## Key Features

- Withstands 500°C heat, retains 85% transparency and replaces expensive ITO without factory retooling.
- Ultra-low sheet resistance ( $\sim 1$   $\Omega$ /sq), Reduces oxide thickness, cuts process time/cost
- Scratch and chemical resistance, Low optical haze and Versatile applications like transparent heaters, EMI shields, smart windows, touchscreens, etc.

## Implementation Overview

**Deployed**

1 (Saint Gobain)

**TRL**

5

**Training Requirement**

7 days

## Contact Details

**Dr. Ashutosh K Singh and Pof. G. U. Kulkarni,**  
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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Organic Energy**

# Graphene oxide-doped Polyaniline Nanotubes

## Overview

The present innovation relates to a nanocomposite comprising graphene oxide and a conductive polymer. More particularly, it relates to a process for preparation of organic material comprising polyaniline doped by graphene oxide, wherein the said nanocomposite with well-defined architecture will be utilized as the electrode materials for energy storage in form of supercapacitor.

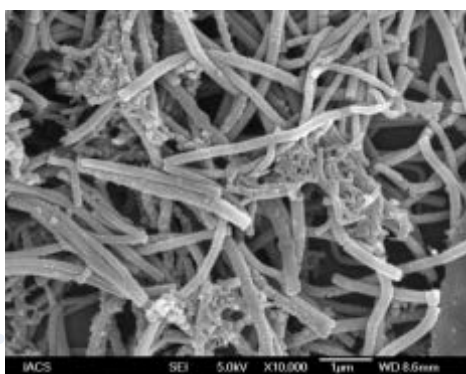


Figure: Well-controlled tubular shape of organic nanostructures observed under Field Emission Scanning Electron Microscope

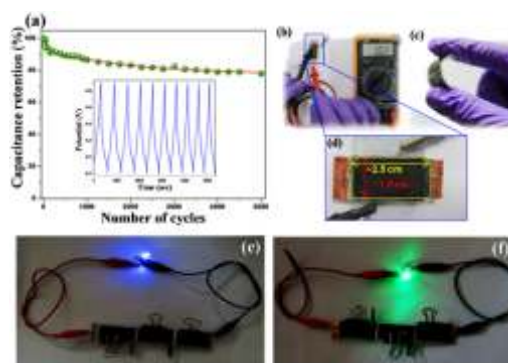


Figure: Cycle stability of handmade supercapacitor made of organic nanostructure and illumination of LED bulbs in series connection

## Functionalities



Preparation of conducting polymer nanostructures (~ 1.00 Kg)



Coin cell type supercapacitor



Cycle stability (charging & discharging) is nearly 20,000 cycles

## Key Features

- No environmental effect on polymer structure
- Preparation of structure via green method
- Key material is organic based or conducting polymer

## Implementation Overview

Deployed

No

TRL

5

Training Requirement

NA

## Contact Details

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- 700032

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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Passive Cooling / Energy-Efficient Materials**

# A Polymer Nanocomposite Paint for Radiative Cooling





## Overview

A polymer nanocomposite coating enables daytime passive radiative cooling by reflecting solar radiation while efficiently emitting heat through the atmospheric window (8–13  $\mu\text{m}$ ). It can achieve sub-ambient temperature reductions of over 5–7°C without electricity, significantly lowering air-conditioning demand. Scalable and sustainable, this technology is well suited for buildings and outdoor applications, helping to mitigate urban heat island effects and advance climate-resilient infrastructure.



Figure: Outdoor field demonstration of radiative cooling coating showing significant surface temperature reduction under direct sunlight, confirmed by infrared thermography

## Functionalities

-  Minimizes heat absorption and surface heating by effectively reflecting solar radiation
-  Enables passive cooling by efficiently emitting thermal radiation through the atmospheric window (8–13  $\mu\text{m}$ )
-  Achieves sub-ambient temperature reductions exceeding 5–7°C under direct sunlight without external energy input
-  Reduces cooling loads and reliance on conventional air-conditioning systems

## Key Features

- Enables zero-energy (passive) cooling without any external power requirement.
- Utilizes a scalable polymer-based material that can be readily adapted into coatings, films, and paints.
- Provides an environmentally friendly solution by eliminating refrigerants and reducing emissions.

## Implementation Overview

Deployed	TRL	Training Requirement
No	7	1 day

## Contact Details

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Phone: +91-08-2208-2619,  
E-Mail: bsaha@jncasr.ac.in

Thematic Area: **Electronics/Semiconductors/Energy**  
Category: **Passive Cooling / Energy-Efficient Materials**

## High Rate NavIC Receiver



### Functionalities



Generation of GNSS navigation solution (Position, velocity in ECEF frame) for extreme high dynamic agile air vehicles: The system is capable of generating reliable and consistent navigation solution at extreme high acceleration up to 20g and very high rotation rate of 10 rps



The system generates derived parameters including latitude, longitude, altitude and flight path angle for guidance/sequencing functions

### Key Features

- No. GNSS channels: 30
- Support for high dynamic: Acceleration: 15 g, Jerk: 20 g/s, Velocity: 15 km/s, Rotation rate: 10rps along roll axis)
- Time to First Fix: 100s
- Time to subsequent Fix: 2s
- Accuracy: 15m, 0.1m/s
- Mass: 500gm
- Power: 6W

### Implementation Overview

The system consists of wrap around antenna in L1 & L5 frequencies, Low noise amplifier and High Rate NavIC receiver. It is an industrial electronics-based design with totally in-house software and hardware. Software realization as per MISRA C standard (For safety critical applications). The system incorporates patented technology for fast satellite signal re-acquisition after short term tracking loss. The system realization, qualification (Including vibration, thermal, EMI, shock tests etc.) and flight testing are completed successfully in ISRO's sounding rockets. 100% solution availability during entire flight duration with good PDOP.

### Contact Details

**ISRO Inertial Systems Unit (IISU)**

Vattiyookavu PO

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Email: [iisu\\_director\\_office@vssc.gov.in](mailto:iisu_director_office@vssc.gov.in)

Thematic Area: **Electronics/Semiconductors/Energy**

Category:

## Portable Bathymetry Profiler System



### Functionalities



Portable immersion type, multi-parameter bathymetry profiler system with multiplatform operability to measure



Water depths up to 100 meters



Surface Dissolved Oxygen (DO)



Water Surface Temperature (ST)



with geo-locations synchronisation manner for wide range of water resources & hydrology applications

### Key Features

- Multi parameter bathymetry system with customization to address specific requirement of water resources applications.
- Compact & water proofed system(IP86), possible to install on ASV and UAV platforms.
- Portable system with low-SWaP (Size 11.8x9.4x4.7 inches, Weight < 4.5 kg and Power typical 5 W)
- User friendly out data format - coma separated values (.csv) which is easier to import into an open-source GIS software like QGIS etc. for bathymetry DEM/contour map generation or to access in a storage database to enables user for further analysis of measurements.
- Cost effective system in comparison to similar imported system

### Implementation Overview

- Bathymetry is a compact multi-parameter acquisition hardware, Supply battery, GNSS Receiver, Acoustic Transducer, GNSS Antenna, with a Dissolved Oxygen(DO) Transducer.
- The acquired raw data is stored in an on-board memory card and a Java based software utility is provided to output data in a user-friendly file format (.csv)
- System uses commercially available off-the-shelf (COTS) components and works on echo sounding principle to measure water depth

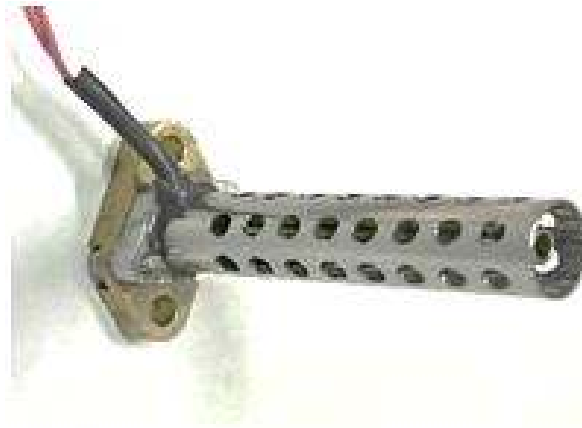
### Contact Details

National Remote Sensing Centre  
Hyderabad

Thematic Area: **Electronics/Semiconductors/Energy**

Category:

## Cryogenic Temperature Sensor (CTS-20K-473K)



### Functionalities



It is a PRTD based temperature sensor, designed for measuring temperature of cryogenic gas and liquids. The sensitive element of the sensor is a platinum wire placed in a protective cover wherein the sensing element is exposed to the environment, hence, it gives a very fast response (< 1 s)

### Key Features

- Operating range: 20-473 K
- Response time (10-90%): 0.15 sec
- Resistance @ 273.15K:  $500 \pm 1 \Omega$
- Accuracy:  $\pm 0.3 \text{ K}$
- Indigenized sensor cost is 20% less than the equivalent imported sensor

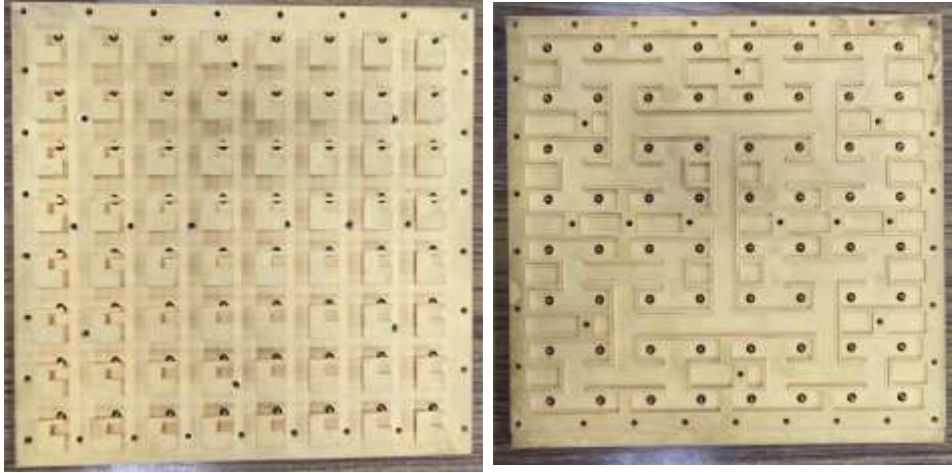
### Implementation Overview

- Propellant temperature measurement at various levels in LOX and LH2 tanks of Cryogenic stages
- Tested in IPRC facility as part of field trial

Thematic Area: **Electronics/Semiconductors/Energy**

Category:

## All-Metal Dual-Frequency High Gain Array Antenna



### Functionalities



A new all-metal dual-frequency right-hand circularly polarized high-gain antenna array is developed to cater for TT&C and Data transmission applications of Lunar and Deep Space missions at X band

### Key Features

- The key development to support the needed requirements is the common all-metal unit cell which can support circular polarization at both X-Band uplink and downlink frequency bands.
- Suspended C shaped unit cell and Suspended Stripline technology minimize the losses in the antenna
- Aperture efficiency of 80% has been demonstrated on a fabricated hardware where a conventional array efficiency is typically 30%.
- An increased gain of 3dB over conventional array of similar aperture.

### Implementation Overview

- A 3-D printed antenna is developed and gold coated to implement the design.
- The antenna has a weight of 700gms with 220mm×220mm size
- The All Metal Array Antenna is proposed for Chandrayaan - 4 and LuPeX missions.

### Contact Details

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Thematic Area: **Electronics/Semiconductors/Energy**

Category:

## Pressure regulator with Dual loading arrangement



### Functionalities



Pressure regulators are used for regulating high pressure gas to required set pressure by controlling the flow across the seat. Generally, one pre-set pressure is achieved by regulator, whereas the said regulator is capable to achieve 2 set pressures as per requirement.

### Key Features

- Single regulator providing 2 set pressures.
- Regulator has 2 different type of loading i.e., spring loading and pneumatic pressure loading which provides reference load.
- No limitation on required set pressure
- Large variation between 2 set pressure can be achieved.
- Accuracy of the regulator maintained as in single loading type regulator
- Change in set pressure achieved slowly to avoid slam or surge in pressure
- Resettable type hence set pressure can be changed as per requirement.

### Implementation Overview

- Successfully implemented in GSLV flight from GSLV F08 onwards and in LVM3 flight from LVM3 M1 flight onwards.
- Innovation uprated the Vikas Engine thrust by 6% increasing the payload capacity of vehicle.

#### OTHER REMARKS

Technology in registered under national patent  
(Patent No. 401646)

Thematic Area: **Electronics/Semiconductors/Energy**

Category:

## Li Ion Cells



### Functionalities



Development and qualification of high energy/high power and advanced cell chemistries



Li Ion cells of different capacities ranging from 1.5 Ah to 100 Ah of different chemistries for LV, satellite, aircraft and EV applications. This is an indigenous development

### Key Features

- Cost effective eco-friendly process and cell technologies (Aq binder processing, Na-Ion battery)
- 20 Ah /40 Ah LTO batteries are used for EV applications
- 10 Ah LFP for air craft applications
- NMC/NCA for LV and satellite applications
- Indigenisation of electrode, electrolyte materials, hardware and recycling of raw materials

### Implementation Overview

- Li Ion Cells have flown in GSAT 19 and GSAT 29
- SSLV, PSLV, LVM3 missions have flown with Indigenous Li Ion cells
- Proposed in Gaganyaan missions
- Customised cell technologies for strategic and societal applications (LCA/EV)

#### OTHER REMARKS

Transferred to industries for product ionisation

### Contact Details

Vikram Sarabhai Space Centre  
Thiruvananthapuram,  
Kerala, India, Pin Code:695022

Thematic Area: **Electronics/Semiconductors/Energy**

Category:

## Vikram 3201 processor



### Functionalities



Developed and qualified indigenous processor  
Vikram 3201 for launch vehicle applications

### Key Features

- IEEE 754 hardwired FPU
- Hardware based Trigonometric function accelerators
- 1553 protocol controller
- Dedicated Internal memory with error detection and correction
- Indigenous Hardware and software development

### Implementation Overview

- Flight tested in POEM mission
- Proposed in Gaganyaan missions from G2 onwards

#### OTHER REMARKS

Fabricated through SCL 180 nm CMOS

### Contact Details

Vikram Sarabhai Space Centre  
Thiruvananthapuram,  
Kerala, India, Pin Code:695022

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Indigenous Microprocessors & SoC Technologies**

# DIR - V VEGA Processors: Indigenous Processor IPs

## Overview

Digital India RISC - V (DIR - V) VEGA Processors are a family of indigenous 32/64 - bit RISC - V ISA – based processor IPs developed by C - DAC under the Ministry of Electronics & Information Technology (MeitY) for secure, scalable, and energy - efficient computing. Supporting in - order and out - of - order architecture, VEGA enables applications from IoT and embedded systems to high - performance computing. It provides an end - to - end indigenous ecosystem with SoC integration capabilities, reducing dependency on foreign IP and accelerating development of domain - specific systems for national priorities.

## Functionalities



Configurable 32/64 - bit RISC - V cores supporting embedded, edge, and high - performance computing



Enables SoC integration with caches, MMU, interconnects, and peripheral subsystems



Supports domain - specific customization for IoT, AI/ML, networking, and secure

## Key Features

- Superscalar, in - order and out - of - order RISC - V processor architectures
- Integrated cache hierarchy, MMU, and coherent interconnect support
- Indigenous, scalable, and customizable processor IP ecosystem

## Implementation Overview

### Deployed

Yes, SoC demonstrators, multiple FPGA prototypes, industry, academic and R&D deployments

### TRL

7 - 8 (System prototype demonstrated in relevant and operational environments)

### Training Requirement

3 - 5 days (Processor architecture, toolchain usage, and SoC integration)

## Contact Details

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S Scientist G & Group Head  
Hardware Design Group  
C - DAC Thiruvananthapuram  
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Email: vega@cdac.in

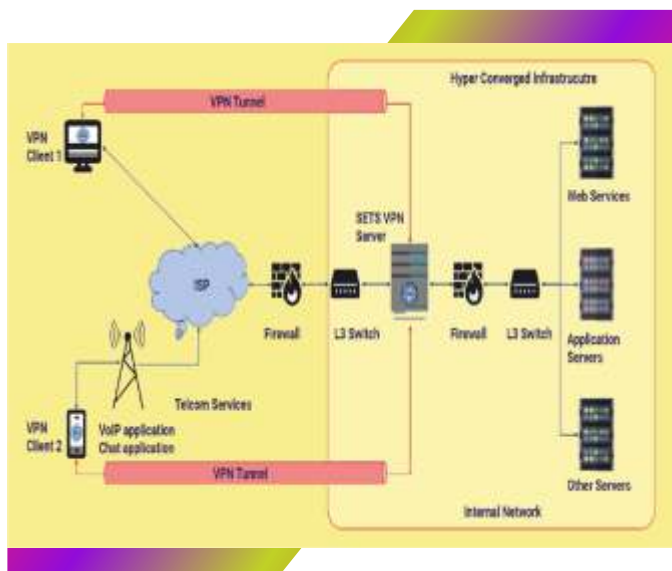
Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

## SETS PQ enabled Virtual Private Network (VPN)

### Overview

SETS VPN is built on the WireGuard protocol that incorporates post-quantum cryptography (PQC) mechanisms to protect communications against threats from future quantum computing attacks, designed to support multiple platforms including Android, Windows, and Linux. The SETS VPN application is developed on top of the WireGuard client, enabling secure remote access VPN functionality across a wide range of devices such as smartphones, tablets, desktops, and laptops. The VPN server is hosted on-premises, creating a secure tunnel between the client and server even over potentially insecure public networks. SETS VPN ensures strong user authentication, protects data confidentiality, and maintains the integrity of information transmitted over the internet.



### Functionalities



**Remote Access VPN (Secure Workforce Connectivity)**



**Site-to-Site VPN (Inter-Branch Communication)**



**Supports horizontal scaling of the VPN servers with active-active load balancing**

### Key Features

- Autoconfiguration of the security parameters for user comfort
- Supports ML KEM for Quantum resistant (PQC) key exchange
- Secure Multi-Factor Authentication support
- Supports Linux (Ubuntu) and Windows (10 and 11)
- User's VPN application activity logging
- Supports Full Tunnel & Split Tunnel Mode
- Obfuscated source code
- SYSLOG/SIEM server support
- Third Party security testing of the solution done

### Implementation Overview

**Deployed**

4 User Agencies - 40000 + users

**TRL**

9

**Training Requirement**

1 day

### Contact Details

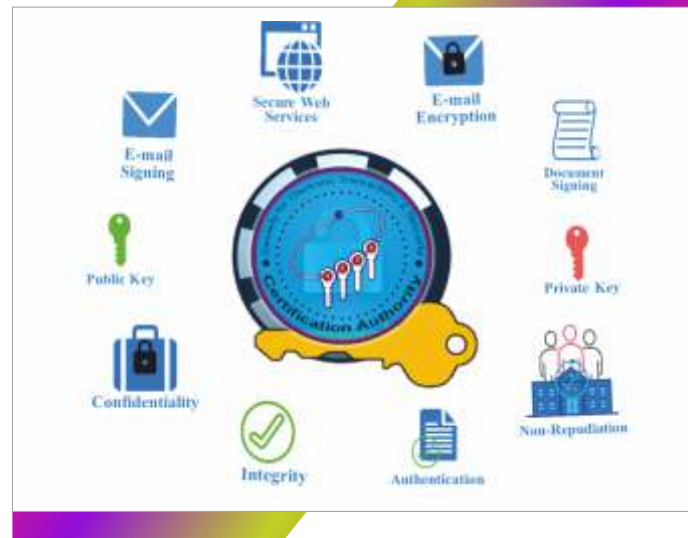
**Ms Preethi,**  
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Thematic Area: **Electronics/Semiconductors/Energy**  
Category: **Cyber Security**

## SETS Certifying Authority Overview

SETS CA software suite offers PKI services to users to secure their digital communication over the public internet. SETS CA also supports Hyperledger Fabric Blockchain Framework & for IoT Applications. SETS CA supports both RSA and ECC cryptosystems. It further extends its support towards Quantum-Safe digital signature schemes using NIST-finalized candidate ML-DSA.



## Functionalities

- Digital Signatures for document signing, e-HRMS, Email Security
- Secure Software Supply Chain - Code Signing
- CA for Hyperledger Fabric Blockchain Framework
- PKI for IoT Applications
- TLS server and client certificates for secure communication
- VPN authentication - IPSec and SSL VPN
- Enterprise Digital Trust Service

## Key Features

- PKI Suite with CRL and OCSP support
- X.509v3 Digital Certificate Support with Classical and PQ Algorithms
- ACME protocol support for TLS server certificates
- TLS server certificate issuance with SAN extension
- Fully containerized for scalability and portability
- Compatible with backend HSMs for CA key protection
- Supports PKCS#11 and PKCS#12 standards for keys and certificate storage
- Desktop client tool for Windows and Linux
- Device Authentication - IoT Platforms

## Implementation Overview

Deployed	TRL	Training Requirement
4 User Agencies	9	1 day

## Contact Details

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Scientist- C  
Krishna L,  
Scientist- C

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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

## SETS-SAAVI

### Overview

SETS-SAAVI (Secure Authentication and Authorization via Verifiable Identity) is a password less, passkey-based authentication framework developed by SETS, built in compliance with the FIDO2 protocol to ensure interoperability across platforms. The framework includes a server-side package with full WebAuthn support for secure registration and authentication workflows. It also features an independent indigenous client-side hardware device designed for strong authentication, providing a robust and phishing-resistant solution for modern digital identity systems.

### Functionalities

- **Weblogin Security**
- **Password-less Authentication**
- **Username-less Authentication**
- **Multi-factor authentication (MFA) with hardware-backed credentials**
- **User Identity Verification**



### Key Features

- Phishing-resistant authentication mechanism
- Replay and MitM attack resistant
- Cross-platform interoperability across web and enterprise systems
- FIPS 140-3 compliant chip for key storage & operation
- Supports ECDSA, Ed25519 digital signatures
- One-Touch authentication
- Device Attestation capability
- Device-based Authentication
- SAAVI user-end device management tool
- SAAVI WebAuthn server side management framework

### Implementation Overview

<u>Deployed</u>	<u>TRL</u>	<u>Training Requirement</u>
No	6	1 day

### Contact Details

**Santhosh Kumar T,**  
Scientist- C  
**Krishna L,**  
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contact@setsindia.net

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

# SETS Quantum Random Number Generator (QRNG)

## Overview

SETS has developed a compact, low-cost Quantum Random Number Generator (QRNG) that generates true random numbers from quantum photon shot noise sources. Unlike conventional pseudo-random generators, it delivers certifiable, future-proof randomness suitable for cryptography, OTP generation, authentication tokens, secure communications, and financial simulations. The plug-and-play architecture integrates easily with existing IT infrastructure and provides reliable high-quality entropy for national cyber security applications.



## Functionalities

- Certifies randomness quality through embedded oracle verification circuitry
- Generates true random bits using multiple independent quantum entropy sources.
- Supports cryptographic and non-cryptographic applications via intelligent application manager.
- Integrates with standard IT infrastructure using plug-and-play interfaces.
- Provides approximately 400 Kbps secure quantum random bit generation

## Key Features

- Multi-source photon shot noise harvesting for stronger entropy.
- Future-proof randomness secure even against quantum computers.
- Compact, low-cost, chip-based practical deployment model.
- Vendor-independent modular source replacement architecture.
- Robust hybrid PCB + ARM processor implementation.

## Implementation Overview

Deployed	TRL	Training Requirement
2 Agencies	5	2-3 Days

## Contact Details

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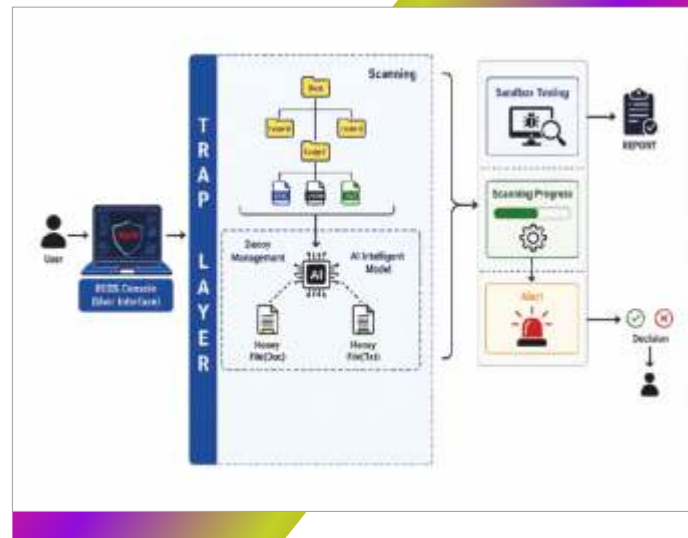
Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

# SETS Ransomware Early Detection Solution (REDS)

## Overview

REDS is an AI-based proactive ransomware early detection solution for the Windows platform, featuring an enhanced graphical user interface, designed to identify ransomware at its earliest stages before any significant impact. It continuously monitors file-level activities and process behavior to detect anomalies such as unauthorized modifications and abnormal executions. Leveraging advanced behavioral analysis within a hybrid framework that integrates both static and dynamic techniques, REDS extracts key features from DLL usage, function calls, and system logs, which are then analyzed using machine learning classifiers to accurately detect early indicators of ransomware.



## Functionalities



**Web Analysis** - A secure, isolated sandbox environment designed for analyzing potentially malicious files, URLs, or web content without risking the host system



**File Analysis** - A dedicated module that allows users to upload files for in-depth security analysis and obtain comprehensive reports



**Trap Layer** - An advanced monitoring layer that continuously observes system activity to detect and respond to threats in real time

## Key Features

- File Level monitoring
- Process monitoring
- Behavioral Analysis
- Framework combination of static and dynamic analysis techniques
- Features extracted from process logs, network logs etc. and fed to machine learning classifiers
- Multilevel checkpoints

## Implementation Overview

Deployed	TRL	Training Requirement
0	6	1 Day

## Contact Details

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Scientist- D

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Thematic Area: **Electronics/Semiconductors/Energy**  
Category: **Cyber Security**




# SETS RAS (Ransomware Analysis as a Service)

## Overview

A web-based ransomware analysis service designed to provide automated and accurate examination of Windows executable (EXE) files, conversion logs, and memory dumps. Leveraging advanced AI-driven detection capabilities, the platform delivers rapid threat identification and behavioral insights with downloadable detailed reports, empowering cybersecurity teams, forensic analysts, and enterprises to detect, investigate, and respond to ransomware attacks efficiently, minimizing data loss and strengthening overall cyber resilience across organizational environments.



## Functionalities

-  **Ransomware Family Identification :** Detects and classifies uploaded EXE files into specific known ransomware families accurately.
-  **Comprehensive Log Analysis:** Examines process, network logs, and memory dumps to uncover behavioral patterns and extract encryption keys.
-  **Downloadable Forensic Reports:** Generates detailed, actionable investigation reports supporting incident response and cybersecurity decision-making.

## Key Features

- AI-powered malware detection engine ensuring accurate and rapid threat identification
- Supports process, network, executable, and memory-based analysis techniques
- Automatic ransomware family identification from uploaded executable files
- Behavioral analysis detecting anomalies in process and network activities
- Encryption key extraction from uploaded memory dump files
- Real-time analysis delivering results within optimized processing time
- High detection accuracy across multiple supported file formats
- Web-based platform accessible without installation across modern browsers
- User-friendly dashboard with file upload functionality for analysis tracking, monitoring, and reporting
- Comprehensive forensic report generation with actionable security insights

## Implementation Overview

Deployed	TRL	Training Requirement
No	6	1 Day

## Contact Details

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contact@setsindia.net

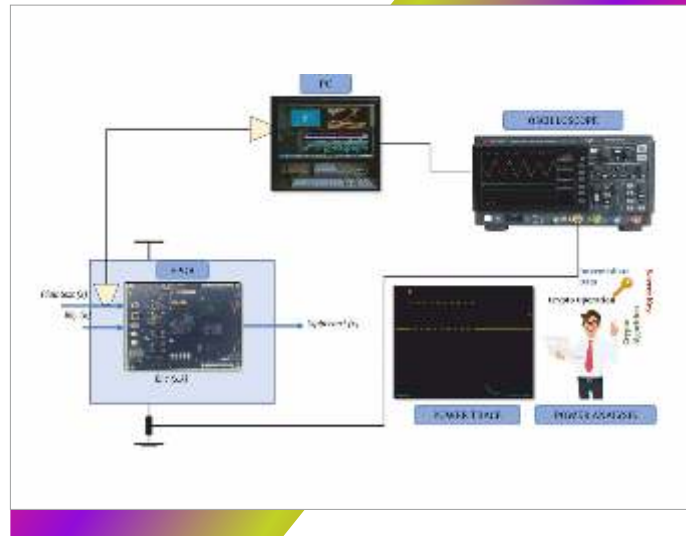
Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

## SETS ANVAYAM

### Overview

SETS-ANVAYAM (ANalysis of side-channel VulnerABilities for securityAssessMent) is a standalone FPGA board for side-channel evaluation developed by SETS. It is a specialized hardware platform designed to measure physical leakages, such as computation time, power consumption and electromagnetic emissions, from FPGA devices during cryptographic operations. SETS has also developed the analysis tool, which facilitates capture, evaluation, security validation, and research in hardware-based cryptographic systems. SETS-ANVAYAM along with the analysis tool can be used to perform compliance testing as per ISO/IEC 17825, a testing method for the mitigation of non-invasive attack classes against cryptographic modules.



### Functionalities

-  Enable prototype security evaluation for early detection of cryptographic implementation vulnerabilities.
-  Perform non-invasive side-channel testing to identify cryptographic leakage vulnerabilities
-  Support development and validation of countermeasures against side-channel attacks (SCA)
-  Evaluate third-party IP cores and embedded cryptographic implementations on FPGA platforms

### Key Features

- Ready-to-use platform for implementing and analyzing cryptographic algorithms against SCA
- Capability to perform high-Signal to Noise Ratio measurements for power and electromagnetic analysis.
- Engineered to enable advanced academic research and precise experimental studies.
- Developed to facilitate hands-on training and advanced skill development in hardware security.

### Implementation Overview

Deployed	TRL	Training Requirement
No	7	1 Week

### Contact Details

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Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

## SETS SCA as a Service

### Overview

A structured evaluation framework designed to assess the resilience of cryptographic implementations against side-channel attacks, in accordance with ISO/IEC 17825. It establishes standardized methodologies for identifying information leakage through non-invasive channels, including computation time, power consumption, and electromagnetic emissions. The framework supports security validation and helps ensure compliance with ISO/IEC 19790 requirements, particularly for higher security assurance levels 3 and 4.



### Functionalities



Detection of information leakage via timing, power, and electromagnetic channels



Evaluation of crypto modules in compliance with ISO/IEC 17825 and ISO/IEC 19790 standards



Identification of vulnerable points in the cryptographic implementation



Enhancement of the implementation security by adoption of suitable countermeasures during design process

### Key Features

- End-to-end side-channel testing on the crypto module
- Aligned with ISO specific non-invasive security testing requirements.
- Identification of information leakage vulnerabilities in cryptographic implementations.
- Advanced testing using high-resolution measurement equipment and tools.
- Detailed statistical analysis and pre-compliance test reports.

### Implementation Overview

Deployed	TRL	Training Requirement
1 service offered	NA	NA

### Contact Details

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Society for Electronic Transactions and Security (SETS), MGR Knowledge City, MGR Film City Road, CIT Campus, Taramani, Chennai, Tamil Nadu 600113.  
contact@setsindia.net

Thematic Area: **Electronics/Semiconductors/Energy**  
Category: **Cyber Security**

## CAVP As a Service

### Overview

An evaluation framework for validating cryptographic algorithms (FIPS-approved or recommended by NIST) along with individual components against NIST Cryptographic Algorithm Validation Program (CAVP). It supports standardized testing processes and serves as a prerequisite for cryptographic module validation under Cryptographic Module Validation Program (CMVP) FIPS 140-3 / ISO/IEC 19790, enabling compliance with established security standards.



### Functionalities



Pre-compliance testing specified under NIST CAVP



Validation of cryptographic algorithms using corresponding NIST-approved validation systems and procedures



Standards conformance through structured testing methodologies and validation processes

### Key Features

- Evaluate the crypto algorithm before the actual NIST certification process
- Scalable lab setup for testing needs
- Pre-compliance test reports and documentation

### Implementation Overview

Deployed	TRL	Training Requirement
10 services offered	NA	NA

### Contact Details

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contact@setsindia.net

Thematic Area: **Electronics/Semiconductors/Energy**

Category: **Cyber Security**

## Cyber Security Innovation Centre (CISC) Services

### Overview

SETS Cybersecurity R&D Laboratory solution for establishing state-of-the-art, on-premise cybersecurity labs in educational institutions. Amid the escalating cyber threat landscape and acute shortage of skilled professionals, there is a critical need to bridge the gap between theoretical education and practical expertise in areas such as network security (offensive/defensive), cryptography, PKI, PQC, and blockchain.



### Functionalities



Model lab architecture & Secure design,



Setup fully operational lab environment supporting cyber security simulation environment (Offensive and Defensive).



On-Campus Training (Train-the-Trainer program)

### Key Features

- Architecture Design & Planning
- Physical & Virtual Setup
- Development of hands-on competencies among students and faculty across network defense, cryptography, PKI, PQC, and blockchain domains
- Creation of a sustainable talent pipeline of industry-ready cybersecurity professionals.
- State-of-the-Art cybersecurity R&D laboratory equipped with SETS solutions (educational license).

### Implementation Overview

[Current status of deployment/adoption of the technology, including scale-up readiness, field implementation and training requirements in the following format]

Deployed	TRL	Training Requirement
No	Nil	10 days

### Contact Details

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contact@setsindia.net

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***SPACE & GEOSPATIAL  
TECHNOLOGIES***

Thematic Area: **Space and Geo-Spatial Technologies**

Category: **Aviation Meteorology & Weather Instrumentation**

# DRISHTI

## Overview

Drishti Technology is an indigenous, ICAO/WMO-compliant runway visibility measuring system enabling accurate, real-time monitoring under all weather conditions. Deployed across Defence and Civilian airports (TRL-9), it enhances aviation safety, operational reliability, and mission readiness. With 1/3<sup>rd</sup> cost advantage over imports, it has delivered significant foreign exchange savings and been successfully transferred to industry, supporting large-scale deployment, self-reliance, and global export potential



## Functionalities



Real-time runway visibility measurement under low and high atmospheric conditions



ICAO/WMO-compliant data processing for accurate aviation meteorological reporting



Robust, field-deployable system ensuring reliable performance across diverse environments



Direct, design-driven digital pharmaceuticals enabling seamless conversion of powder blends into 3D printed dosage forms in a single step

## Key Features

- Indigenous design with 70–75% cost advantage over imports
- ICAO/WMO compliant accuracy across diverse atmospheric conditions
- Proven TRL-9 system with large-scale Defence and Civil deployment

## Implementation Overview

Deployed	TRL	Training Requirement
Yes - 177 systems functioning across India [IAF: 108, Navy: 12, Army: 3, Civil: 52, HAL: 1, Private: 1]	9	1 month

## Contact Details

**Director,**  
CSIR–National Aerospace Laboratories  
(CSIR–NAL),  
HAL Airport Road, Kodihalli, Bengaluru – 560017,  
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Thematic Area: **Space and Geo-Spatial Technologies**

Category: **Trainer Aircraft**

# Hansa-NG

## Overview

CSIR-NAL's HANSA-3(NG) is a milestone in India's "Swadeshi" aviation, designed to meet modern pilot training needs. This two-seater aircraft features a glass cockpit, a fuel-efficient Rotax engine, and impressive 7-hour endurance. Now certified for day and night operations & with further steps taken to extend its capabilities for IFR operations, it supports Prime Minister Modi's vision of making India a global aviation hub. By advancing local aerospace capabilities, the HANSA-3(NG) plays a crucial role in the journey toward a "Viksit Bharat" by 2047.



## Functionalities

- Pilot training to obtain Private Pilot and Commercial Pilot Licenses
- Bird reconnaissance at airfields mainly for air force and navy
- Cadet training
- Coastal surveillance
- Development of hobby flying culture in the country
- Human resource development at the graduate level which could be directly deployed by the industry by giving practical training on a flying
- Test platform

## Key Features

- India's first all-composite light two-seat airplane ideally suited for ab-initio flying training, sport, and hobby flying
- Glass Cockpit & Digital Engine Monitoring
- Advanced fuel efficient Rotax 912iSc3 Sports engine
- Lightning protected and cleared for DAY and NIGHT VFR Operations
- Bubble Canopy providing clear view and easy cockpit ingress/egress
- Electromechanical Flap Actuation
- Li-ion batteries with BMS
- Provision for Baggage

## Implementation Overview

### Deployed

Yes –

- Type certified by DGCA on 20th February, 2023.
- CSIR-NAL has produced one prototype and one production aircraft. Presently, operational at CSIR-NAL
- 3 more aircraft fabrication are under progress at CSIR-NAL.
- Selection of Production partner M/s Pioneer Clean Amps (PCA), Mumbai. ToT agreement signed on 4th April 2025.
- M/s Pioneer Clean Amps (PCA), Mumbai. Has been Selected of Production partner & will start the production from 2027.

**TRL : 9**

**Training Requirement :** Handholding of production partner by manufacturing of 1 aircraft at CSIR-NAL and 1 aircraft at PCA facility

## Contact Details

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Thematic Area: **Space and Geo-Spatial Technologies**

Category: **Fire Suppression Systems**

# Portable Water Mist Fire Extinguisher (PWMFE) And Modular Fixed Water Mist Fire Suppression System (MF-WMFSS) For Orbital Module of Gaganyaan

## Overview

The fire suppression systems (FSS) developed are intended to be used by the astronauts in the Gaganyaan mission/space missions to extinguish fire inside the capsule that may arise during the mission. There are two types of Fire Suppression System which have been developed for the Orbital Module:

1. Portable Water Mist Fire Extinguisher (PWMFE) which shall be manually operated by the crew member in case of fire emergency and;
2. Modular Fixed Water Mist Fire Suppression System (MF-WMFSS) shall be installed in the in-accessible areas, like avionics bay and shall be activated automatically or remotely by the crew on receiving a fire signal through control panel.



## Functionalities



FSS consists of water and nitrogen in compressed state inside the fire extinguisher. While operating, the compressed nitrogen shall be expelling the water, through the nozzle to generate water mist



The FSS shall be able to douse the maximum rated fire envisaged in the micro-gravity environment. The suppressant delivery method shall ensure adequate dispersion and extinguishing effectiveness to douse the fire

## Key Features

- The operation of the FSS shall not alter the composition of the cabin habitable environment.
- The extinguishing medium used by the FSS is non-toxic and non-corrosive. Further, the medium shall not emit toxic products when applied to a fire.
- Operation of the FSS shall not impair the crew visibility and respiratory function.
- A Safety mechanism shall be provided to prevent inadvertent and unwarranted operation/discharge of the system.

## Implementation Overview

Deployed	TRL	Training Requirement
No	7	5 Days

## Contact Details

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011-23907104, 105,155

Thematic Area: **Space and Geo-Spatial Technologies**

## Range Maritime Reconnaissance (MRMR)

### Overview

Medium Range Maritime Reconnaissance (MRMR): Advanced Multi-Role Maritime Patrol Aircraft (MPA) for Indian Navy capable of undertaking challenging missions - ASW, ASuW, CASEVAC, Para operations, Search & Rescue.

Designed and Developed by CABS DRDO,  
Production by DcPP.  
Platform: Modified C-295.



### Functionalities



Cohesively integrated state-of-the-art sensor suite designed and developed by DRDO - Maritime Patrol Radar, Multi-payload EOIR, ESM, CSM, AIS, ADS-B, IFF, Sonic Suite, Distributed Mission Management Suite, Multifunctional Tactical Console etc



Weapon ready for critical ASW Missions



Operating altitudes: 500ft to 22000ft in all weather and sea conditions for demanding Mission Profiles



Role convertible to undertake Secondary roles

### Contact Details

**Centre for Airborne Systems (CABS)**  
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Thematic Area: **Space and Geo-Spatial Technologies**

# Aerostat System: Nakshatra

## Overview

Aerostat is a lighter than air (LTA) technology-based system to provide a stable airborne platform for payloads at higher altitude to achieve better line of sight for long duration at lower cost. These systems are deployed for a wide variety of military as well civil applications viz. surveillance, intelligence, gathering, monitoring, communication etc. Nakshatra is a medium size re-locatable aerostat with different payloads i.e. COMMINT, EO, ELINT, RADAR etc.



## Functionalities

- 

Lighter-than-air aerostat system providing a stable high-altitude payload platform
- 

Enables long-duration operations with enhanced line-of-sight at low cost
- 

Suitable for military and civil applications including surveillance and communications
- 

Nakshatra is a medium-sized, re-locatable aerostat system
- 

Supports multiple payloads such as COMMINT, EO, ELINT and RADAR

## Contact Details

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Thematic Area: **Space and Geo-Spatial Technologies**

# Guided PINAKA Rocket System

## Overview

Guided Pinaka is an all-weather, indirect fire, highly accurate, low collateral damage, precision guided artillery rocket ammunition capable of engaging targets deep into enemy areas with high precision. The guided Pinaka rocket has a range of 20 – 75 km with an accuracy of  $\leq 40$  m CEP at all ranges. Critical technologies developed in this project includes Canard based control actuated by rotary electromechanical actuators, Unified Avionics Computer (UNIAC) comprising of OBC, INS, GPS receiver, telemetry (PCM+SCP), A dual band GPS+IRNSS antenna, adoption of Pinaka Mk-II Propulsion system, adoption of in-service warhead of Pinaka Mk-I, INS+G2IOM (GPS + GAGAN+ IRNSS) based guidance, , Four guided Pinaka rockets per pod, Upgradation of in-service Pinaka MBRL for launching guided rocket, Fire control software for ACCCS integration



## Key Features

- **Calibre** : 214 mm
- **Length** : 5.175 m
- **Max range** : 75km at MSL & up to 100km at 4000m altitude
- **Min range** : 20 km
- **Accuracy & consistency** :  $\leq 40$  m CEP at all ranges
- **Rocket weight (launch)** : 327kg
- **Rocket weight (ABP)** : 195kg
- **Payload weight** : 120kg (97kg warhead + 23kg Guidance kit)
- **Propellant** : Solid composite
- **Grain Configuration** : Fin-O-Cyl Case bonded

## Contact Details

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Armament Post Pashan

Pune-411021

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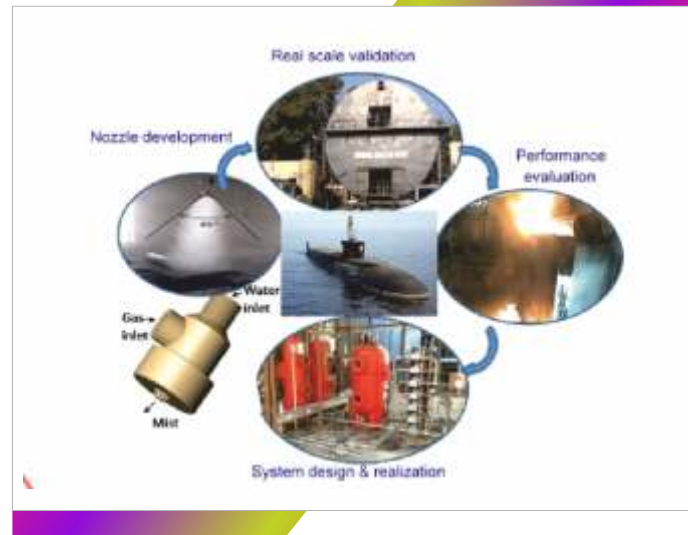
Email : director.adrde@gov.in

Thematic Area: **Space and Geo-Spatial Technologies**

# Low Pressure Water Mist Fire Suppression System

## Overview

The technology was developed in the year 2012 & the system was inducted for submarine application in the year 2016. The water mist-based fire suppression system (WMFSS) is a very efficient and environment friendly halon alternative. The CFEES WMFSS design incorporates low pressure twin fluid water mist technology generating very fine water mist (volume mean diameter <math> < 50 \mu\text{m}</math>). The system has been validated for nuclear submarines for suppression of Class-B pool, spray and flowing fires and class-A fires as per International Maritime Organization Standard (IMO) within 60 s using a specific mist generation rate of 250 g/min-m<sup>3</sup>



## Key Features

- **Low working pressure:** Water supply pressure in the range 2 bar to 4 bar and compressed gas pressure in the range 4 bar to 6 bar
- **Volume Mean Droplet Diameter (DV50) :** 35-50  $\mu\text{m}$  | **Water flow rate per atomizer :** 1.5-2.0 LPM @ water
- **Specific mist generation rate :** 250- 300 g/min-m<sup>3</sup> | **Installation guideline:** Atomizers interspacing ~ 1.4 - 1.6 m; | **One atomizer per 5 m<sup>3</sup> free space volume**
- **Fire suppression time less than 60 seconds with air & less than 30 seconds with Nitrogen as atomizing media. Low maintenance cost & no power requirement**
- **Tested for Class A, Class B & live electrical fire**

## Contact Details

**Centre for Fire, Explosive & Environment Safety (CFEES)**

Brig. S.K. Mazumdar Marg  
Timarpur, Delhi-110054

Phone : 011 - 23813239 (Director), 23907102 (TSO),  
23907103 (Director Secretariat),

Fax : 011 - 23819547

Email : director.cfees@gov.in

RTI(CPIO) : 011 - 23907143, 23907141

Thematic Area: **Space and Geo-Spatial Technologies**

# Multistatic Surveillance System (MSS)

## Overview

Multistatic Surveillance System comprises of three different multistatic technologies namely Passive Coherent Location Radar (PCLR), Multistatic Surveillance Radar (MSR) and Passive Emitter Tracker (PET) for detecting and tracking of aerial targets including stealth & low observable targets. PCLR utilizes opportune FM transmissions. PCLR utilizes opportune FM transmissions. MSR utilizes the operational Radar emissions and PET utilizes onboard emissions of aerial targets to detect and track targets. The target tracks from all three sensors will be associated and presented to the user as a common air surveillance picture. Integrating the outputs of PCL, MSR and PET systems using a track association software module result in consistent tracking of targets.



## Key Features

- Complimentary Technologies utilizing Radar Emissions (Multistatic Surveillance System), Broadcast Emissions (PCLR), Onboard Emission (PET)
- Multistatic Surveillance System is a counter stealth system with PCLR, MSR and PET integrated
- Tracks of PCLR, Pet, MSR will be associated and presented on a common display
- Covert Anti-AMR operation
- Jammer resistant Operation
- Synchronized operation with distributed transmitters and receivers
- Multilateration and Multistatic tracking

## Contact Details

**Electronics and Radar Development Establishment (LRDE)**

CV Raman Nagar, Bengaluru-560093, INDIA

Phone : 080 - 2524 3873

Fax : 80 - 25242916

Email : director.lrde@gov.in

Thematic Area: **Space and Geo-Spatial Technologies**

# DHRUVA STRA (Airborne Anti-Tank Missile)

## Overview

DHRUVA STRA is the Air to Surface version of HELINA for Indian Air Force. It is a fire and forget Air to Surface missile which can be deployed from Advanced Light Helicopter (ALH) / Light Combat Helicopter (LCH). It can be configured with various warheads against multiple classes of surface targets. Firing was demonstrated in both Hover and forward flight modes against static and moving targets from ALH. User trials including High Altitude trials have been completed successfully.



## Key Features

- Lock On Before Launch (LOBL)
- 'Fire & Forget' And Top 'Attack capability'
- Homing Guidance with imaging Infra- Red (IIR) SEEKER
- Platform -Advanced Light Helicopter (ALH)/Light Combat Helicopter (LCH)
- SSKP : > 80%
- Length – 1.9 m
- Diameter – 0.16 m
- Operating Altitude- Sea level to 6 km
- Speed : 240 m/s

## Contact Details

**Defence Research & Development Laboratory (DRDL)**

Kanchanbagh, Hyderabad-500058

Phone : 0091 40 24583000

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Email: director.drddl@gov.in

Thematic Area: **Space and Geo-Spatial Technologies**

# AKASH-NG (New Generation Surface-to-Air Missiles)

## Overview

Akash-NG is an advanced surface to air missile for new generation targets having low Radar Cross section (RCS) developed for IAF. The weapon system is capable of search, track and fire while engaging 10 targets simultaneously at ranges up to 30 km. Firing Unit consists of single CCU, single MFR and four launchers with 06 canisterised missiles on each launcher. The system provides longer range of operation, wider kill zone and lesser escape zone compared to Akash missile. The system can operate in two modes –Autonomous & centralized mode.

User trials have been completed successfully. AoN is under progress



## Key Features

- **Single radar with four walls active array for both surveillance and track**
- **Command and control with radio and SATCOM**
- **Engagement of aerial targets having 0.1m<sup>2</sup> RCS**
- **Integrated with IACCS and AFNET**
- **Warhead : Pre-Fragmented**
- **Guidance: Mid course –INS + GPS/IRNSS**
- **Terminal - RF Seeker**
- **Operation: Range - 30 Km**
- **Propulsion: Two pulse solid rocket**
- **Control: Tail control, REMA**

## Contact Details

**Defence Research & Development Laboratory (DRDL)**

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Thematic Area: **Space and Geo-Spatial Technologies**

# VL-SRSAM (Vertical Launch Short-Range Surface-to-Air Missile)

## Overview

VL-SRSAM is ship based Vertically Launched Short Range Surface to Air Missile developed for Indian Navy to protect Naval ships. The weapon system uses Vertical Launch System (VLS) that allows 360° coverage capable of multi-target engagement. This weapon system will be deployed across IN Ships. Ground trials proved the minimum & maximum range, missile controllability, and control & guidance scheme. Hang fire test was conducted to demonstrate platform safety. Successful trials from INS Rana were carried out proving the safe launch, integrated operation and the reaction time.

Development trials were completed successfully and User Evaluation Trials (UET) are in Progress.



## Key Features

- **Range** : 20 km
- **Type** : Surface to Air Missile
- **Mass** : 180 kg
- **Length** : 3.8m
- **Diameter** : 178mm
- **Seeker** : Active Radar Seeker
- **Warhead** : Pre-Fragmented
- **Detonation** : Radio Proximity Fuse
- **Propulsion** : Single Pulse Solid Propulsion
- **Guidance** : Mid-course: INS + DL

## Contact Details

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Thematic Area: **Space and Geo-Spatial Technologies**

## ASTRA Mk-II (Long Range BVRAAM)

### Overview

ASTRA Mk-II is the extended range (160 Km) indigenous Beyond Visual Range Air-To-Air Missile (BVRAAM), designed to engage and destroy highly maneuvering supersonic aircraft. The system is designed to offer 'no-escape zone' capability. It uses Dual Pulse Smokeless Solid Rocket Motor that offers enhanced energy for terminal maneuvers. The system features Active Electronically Scanned Array (AESA) Radar Seeker, Laser Proximity Fuse and capable to offer improved ECCM capability.

Development trials were completed successfully and User trials are in progress.



### Key Features

- **Type** : Beyond Visual Range Air-To-Air Missile
- **Range** : 160 Km
- **Mass** : 190 Kg
- **Length** : 3800 mm
- **Diameter** : 190 mm
- **Seeker** : Active Radar Seeker
- **Launch ALT** : SL-20 Km
- **Warhead** : Pre-Fragmented
- **Detonation** : Radio Proximity Fuse
- **Propulsion** : Dual Pulse Solid Propulsion

### Contact Details

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Thematic Area: **Space and Geo-Spatial Technologies**

# Advanced Light Weight Torpedo (ALWT)

## Overview

The Advanced Lightweight Torpedo (ALWT) is an anti-submarine weapon launched from ships or helicopters. Enemy submarines are detected by onboard sonar, and target data from the Fire Control System enables torpedo launch with preset parameters for optimal target acquisition. Designed to counter evasive manoeuvres, ALWT is guided in both horizontal and vertical planes. It conforms to a 324 mm diameter, measures 2.5–3 m in length, weighs about 300 kg, and is compatible with Indian Navy ships, ALH, and Sea King 42B helicopters.



## Key Features

- **Role** : Anti-Submarine
- **Propulsion** : Pump Jet Propulsion
- **Speed** : Dual Speed
- **Range** : 25 Km
- **Warhead** : Shaped Charge
- **Max. Engagement Range** : 17 Km
- **Launch Platform** : Rotary and Fixed wing A/C

## Contact Details

**Naval Science & Technological Laboratory**  
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Fax : 0891 - 2559464  
Email : director.nstl@gov.in

Thematic Area: **Space and Geo-Spatial Technologies**

Category: **Strategic Applications**

# Novel Powder Metallurgy Process for Fabricating Dispersion Strengthened Tungsten Plates for Strategic Applications

## Overview

The technology pertains to fabrication of tungsten-based missile components such as jet vanes, balancing weights and others using a simple, cost-effective powder metallurgy process. These components act as import substitute, establishing self-reliance and fulfilling the objectives of Atmanirbhar Bharat and Make in India.



Figure: Tungsten plates fabricated by the novel PM process and the actual missile components obtained after machining.

## Functionalities



Fulfils the requirement in missiles like Brahmos, Agni, LRSAM, MRSAM, HELINA, MPATGM etc



Better aerodynamics of missiles and guides the missile to travel in a desired path

## Key Features

- Homogeneous properties throughout the component minimizing operational failures
- Complex hot-rolling process replaced by simple powder metallurgy process
- Components possess 30% greater strength, 20% higher hardness and 50% higher life compared to the imported components.

## Implementation Overview

Deployed	TRL	Training Requirement
Yes, 1	8	10 Days

## Contact Details

International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI),  
Balapur P.O, Hyderabad-500005, Telangana, India  
Email: director@arci.res.in

Thematic Area: **Space and Geo-Spatial Technologies**

# Multibeam ADS-B payload technology development for LEO Satellites



## Functionalities

- Automatic Dependent Surveillance-Broadcast (ADS-B) is the aircraft surveillance technology in which aircraft provide data such as position, velocity, and aircraft identification from on-board aircraft navigation systems.
- On-board Receive Digital Beamforming.
- 29 beams generation from 20 elements.
- Simultaneous capture of ADS-B signals in all beams.
- Simultaneous extraction of ADS-B signals from all beams.

## Key Features

- Provides service beyond terrestrial plane by making use of satellites to provide global coverage.
- Airports Authority of India (AAI) can get continuous service with real-time end-to-end message delivery with ADS-B payload.
- $\pm 60$  deg FOV from single satellite.
- Multichannel ADS-B signal decoder.
- Compact Form Factor.
- Small form factor to support plug and play approach.

## Implementation Overview

TRL 6 achieved. Hardware Implementation

- 4 x 5 receive phased array antenna at L-Band.
- #20 nos. of Integrated PSFs and LNAs.
- #20 channels digital processor.

All hardware DVM has been realized.

Testing and checkout Implementation

1. Amplitude and Phase calibration of all 20 channels completed.
2. Pattern measurement (semi-anechoic chamber) in radiation mode completed.
3. Dynamic range of signal across all the channels tested.

### OTHER REMARKS

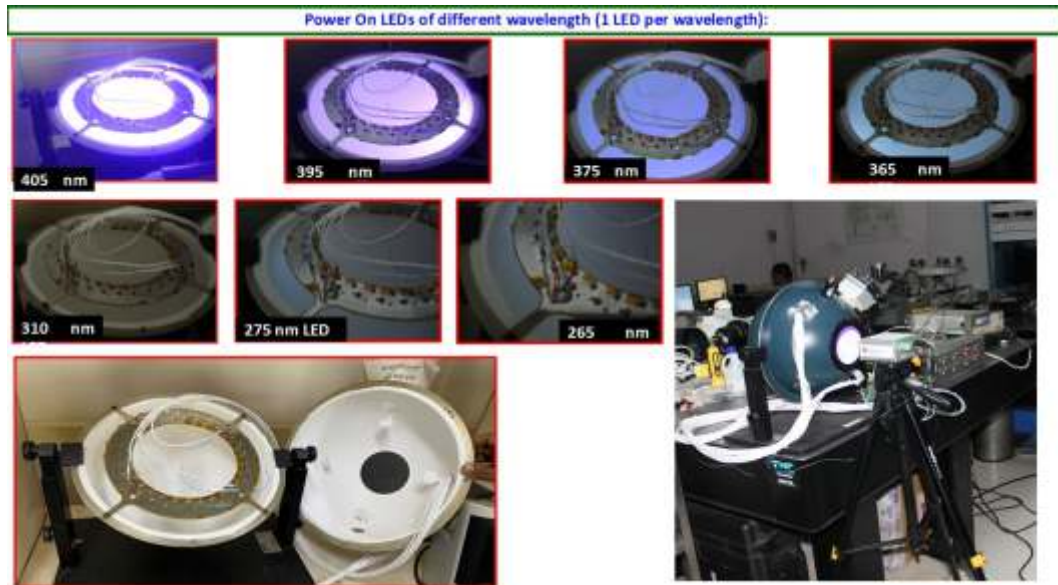
Design verification model of ADS-B payload is precursor to actual payload, which is planned in MDA-SAR and ADS-B satellite constellation missions.

## Contact Details

Space Applications Centre  
Jodhpur Tekra, Ambawadi Vistar P.O.  
Ahmedabad - 380015

Thematic Area: **Space and Geo-Spatial Technologies**

## UV Calibration Source



### Functionalities



Used for UV calibration of coming payload for Venus Mission and Exo-world and astronomical payloads

### Key Features

- No such end-to-end source available in world.
- Caters complete UV range.
- Indigenous, compact, programmable UV calibration source.
- >98% Uniformity (Lambertian) & >99% stability (for entire UV range)
- Miniaturized source, can be accommodated on optical bench.
- Continuous & Pulsed mode operation.
- Programmable for different illumination levels and frame rates operation.
- Low cost, to be realized with commercially parts & presently available resources.

### Implementation Overview

- TRL 8 achieved.
- Hardware realized.
- Tested for all 7 wavelengths.
- Achieved sat. rad. requirement for 365 nm

### Contact Details

Space Applications Centre  
Jodhpur Tekra, Ambawadi Vistar P.O.  
Ahmedabad - 380015

Thematic Area: **Space and Geo-Spatial Technologies**

# Man Pack Terminal for Satellite communication



## Functionalities



Man Pack terminal with voice/video/text message connectivity without internet through Android app.

## Key Features

- Low weight and easily deployable
- Time to less than 5 minutes
- Field-replaceable components

## Implementation Overview

TRL 7 achieved.

Hardware demonstrated.

### OTHER REMARKS

No monopoly of any individual subsystem/vendor

## Contact Details

Space Applications Centre  
Jodhpur Tekra, Ambawadi Vistar P.O.  
Ahmedabad - 380015

Thematic Area: **Space and Geo-Spatial Technologies**

# ISRO CORIOLIS RESONATOR GYROSCOPE (ICRG)



## Functionalities

Coriolis Resonator Gyroscopes are miniature inertial sensors used to detect angular turning rate. ICRG uses MEMS based sensing element, which is vacuum packaged to obtain high sensitivity. It measures the angular rate and converts it to digital signal. The sensor has a stability of  $0.1^\circ/\text{sec}$  for 4 hours and can be used for Aided navigation with short periods of outages and also for rate feedback. This will be used for 3D vehicle stabilisation. Owing to its MEMS construction, the Gyro has high environmental survivability.

## Key Features

- Tactical Grade Gyroscope – Indigenous capability – TRL 8
- Si-MEMS based vacuum packaged sensing element.
- Processor based closed loop electronics
- Collaborative development with IISc-CENSE
- DC power in (5V/0.7W) – Digital RS485 output
- Internal Temperature compensation available.

## Implementation Overview

- MEMS sensing element developed by IISU-IISc collaboration
- Assembly packaging technology- Precision technology developed by IISU
- Electronics with digital output implemented on PCB-designed and developed by IISU.
- Temperature compensation software resident in sensor.

## Contact Details

**ISRO Inertial Systems Unit (IISU)**  
Vattiyoorkavu PO  
Thiruvananthapuram - 695 013  
Director: Shri L. Sowmianarayanan  
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Thematic Area: **Space and Geo-Spatial Technologies**

# HEMISPHERICAL RESONATOR GYROSCOPE (HRG)



## Functionalities

Hemispherical Resonator Gyroscope is a high accuracy angular rate of turn sensor used for long duration autonomous navigation. It has a drift of less than  $0.01^\circ/\text{hr}$ , making it an ideal choice for Launch Vehicle and Spacecraft applications. It has associated precision electronics which generates the rate output as digital data. The gyro is capable of high-rate operation and tight pointing accuracy.

## Key Features

- Strategic Grade Gyroscope – EM sensor realized, TRL 7 completed.
- Machined Quartz based hemispherical resonator is the sensing element.
- Deep vacuum sealing for higher Q of resonator – leading to higher accuracy.
- Processor based electronics for generating RS485 based digital output.
- Low part count – Improved turnaround – No wear out
- Present State of Art Inertial sensor for precision applications.

## Implementation Overview

- Quartz Machining process developed indigenously
- High stability finish processing of machined Quartz is developed for specific requirement of HRG
- Long duration deep vacuum-based packaging - critical technology needed for performance was developed with industry participation
- Processor based low amplitude signal processing

## Contact Details

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Thematic Area: **Space and Geo-Spatial Technologies**

# Indigenously developed 5.4kW Hall Effect Thruster (IH 15 series) with 300mN rated thrust

## Functionalities



Electric Orbit Raising (EOR) of GSAT class satellites



North South Station Keeping (NSSK) operations of satellites

## Implementation Overview

- 300mN based Electric Propulsion System (EPS) will be demonstrated in Technology Demonstration Satellite-01 (TDS-01), which is an experimental mission to demonstrate various indigenously developed technologies.
- The EPS capability for EOR and NSSK operations will be demonstrated in TDS-01.
- The thruster will be operated at 4kW power level for EOR and 2kW for NSSK.
- TDS-01 satellite will be launched in Sub-GTO transfer orbit and raised to GTO orbit using on-board Chemical Propulsion.
- The Electric Propulsion requirement starts from GTO to GSO transfer and once in orbit, for Station Keeping Operations.
- A total of 3 plasma thrusters are used in TDS01, one at central deck (EOR) and 2 are at north and south panels (NSSK).
- 300mN based EPS technology is planned to be used for the All-Electric Propulsion System (AEPS) satellites in the near future.

## Other Remarks

- 14 Nos of thrusters were realized till date including QMs and FMs.
- More than 3000 hrs of hot firing completed for these 14 thrusters.
- Qualification completed successfully for 2 thrusters and life test completed for 1000 hours



## Key Features

- Fully indigenized Hall Effect Thruster with 300mN rated thrust at 5.4kW power
- Thruster consists of anode unit (thrust producing unit) and cathode unit (electron source)
- Configured with 2 cathodes for redundancy
- Anode unit is configured with hybrid acceleration channel, electromagnets as magnetic system, gas distributor and Xenon feed system.
- Electron source is hollow cathode with dispenser type emitter (porous tungsten impregnated with Barium Oxide, Calcium Oxide and Aluminium oxide).

## General Specifications

- Propellant : 99.999% pure Gaseous Xenon
- Mass : 15+ 0.5 kg
- Throttle range : 1.0 - 6.3kW
- Thrust : 50 - 360mN

## Implementation Overview

- Quartz Machining process developed indigenously
- High stability finish processing of machined Quartz is developed for specific requirement of HRG
- Long duration deep vacuum-based packaging - critical technology needed for performance was developed with industry participation
- Processor based low amplitude signal processing

Thematic Area: **Space and Geo-Spatial Technologies**

# 800N Throttleable engine for lunar lander



## Functionalities



The engine is developed as main landing engine for Chandrayaan missions. The engine is a throttleable engine with precision thrust control to meet various thrust demands at all stages of mission. By making use of the throttling feature, engine can also be used for attitude control of the lander.

## Key Features

- The engine features throttling in which the thrust of the engine can be varied from 100% to 45% on command.

## Implementation Overview

- The engine was employed in Chandrayaan-2 and Chandrayaan-3 missions and will be used in future landing missions like Chandrayaan-4 and Chandrayaan-5/LuPEX missions.

### OTHER REMARKS

- The engine is first of its kind in ISRO with the capability of throttling down and will be widely adopted in future missions.

Thematic Area: **Space and Geo-Spatial Technologies**

## Electromechanical Actuator for SS2 and SS3



### Functionalities



Developed and qualified indigenous Electromechanical actuator for second and third stages of SSLV

### Key Features

- Quadruplex BLDC torque motor,
- Triplex potentiometer for feedback
- Operating voltage 60V and 50 A
- Force of 2.1 ton

### Implementation Overview

Successfully flight tested in SSLV missions

#### OTHER REMARKS

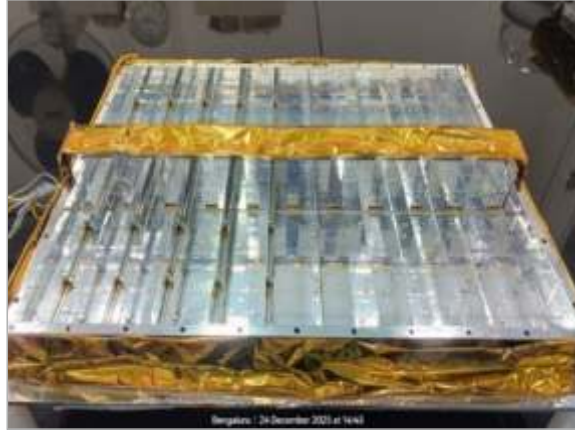
All the major components are indigenously developed and realised in the country

### Contact Details

Vikram Sarabhai Space Centre  
Thiruvananthapuram,  
Kerala, India, Pin Code:695022

Thematic Area: **Space and Geo-Spatial Technologies**

# Thermal Louvers for Spacecraft Thermal Management



## Functionalities



Modulates effective emittance of the radiator from a low value to a high at constant temperature



In-situ regulation of operational set-points



Requirement of heater power can be reduced and hence better mass utilization of the spacecraft mostly in inter-planetary missions like Moon and Mars



Flexibility in thermal design, acts like a switch maintains radiator temperature constant irrespective of heat load on the radiator

## Key Features

- Complete passive and on-ground tunable set point Modulates effective emittance of radiators from a low value ( $\epsilon = 0.1$ ) to a high value ( $\epsilon = 0.7$ )

## Implementation Overview

Bimetal coil used for passive thermal louvers:

- High differential co-efficient of thermal expansion
- Alloy 1: Fe and Ni
- Alloy 2: Mn, Cu and Ni

Works linearly between  $-25$  to  $125^{\circ}\text{C}$  temperature

### OTHER REMARKS

Thermal Louvers application in a typical Lunar landing mission like Chandrayaan-5

### HEATER POWER DURING LUNAR NIGHT:

Heater power = 605 W (without Louver)  
= 180 W (with Louver)

Challenges: More thermal radiating area

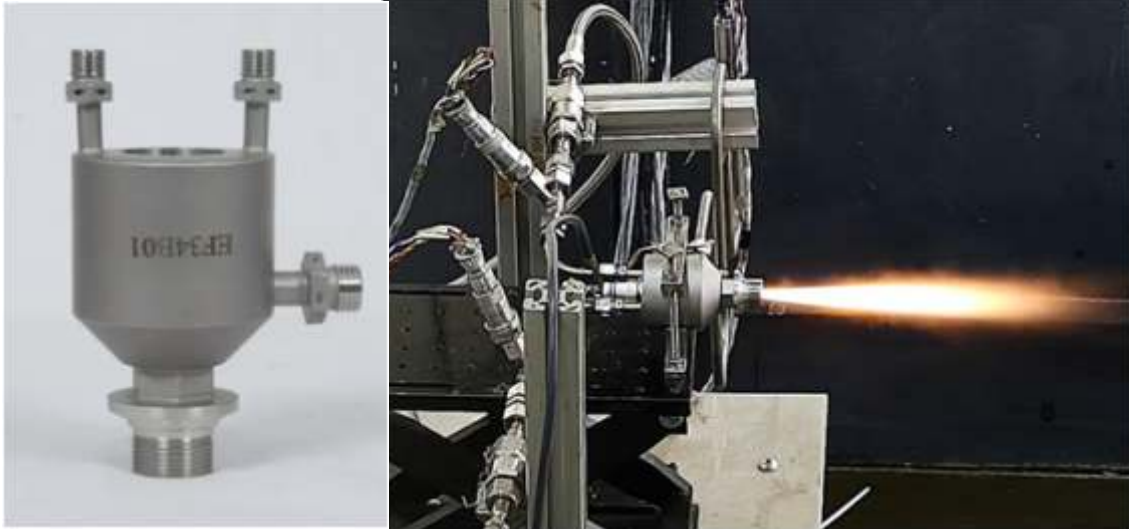
Additional mass & volume

## Contact Details

U R Rao Satellite Centre, Bengaluru

Thematic Area: **Space and Geo-Spatial Technologies**

# Spark Torch Igniter of LOX-Methane Engine



## Functionalities



Spark torch igniter is a device used to initiate the combustion process in non hypergolic rocket engines. Gaseous oxygen and gaseous fuel is premixed and injected to a combustion chamber and ignited using a spark plug. The hot combustion product is guided to the required location (Thrust chamber or Gas Generator) to initiate the combustion of the main propellants. This development facilitates multiple starts of liquid stages and provides larger flexibility in the mission planning.

## Key Features

- Multiple restart capability
- Non toxic propellants
- Reliable and Compact
- Lower refurbishment time for reusable engines

## Implementation Overview

- Successfully developed at LPSC.
- Demonstrated the working by standalone tests.
- Ignition of CUS Steering engine (LOX-LH2), Ignition of Single element thrust chamber of LOX-Methane engine and Ignition of Subscale GG of LOX-methane engine is successfully carried out to demonstrate the functionality of the igniter.

Thematic Area: Space and Geo-Spatial Technologies

# High Intensity Surface Discharge Spark Plug (SDSP)



## Functionalities



Spark plug is a vital component of torch igniter. Surface Discharge Spark Plug (SDSP) featured with semiconductor disc between cathode and anode requires only 1/5th of breakdown voltage in comparison with air discharge spark plug and generates the plasma. SDSP can be operated at breakdown voltage of  $\sim 2$  KV while air discharge spark plugs need breakdown voltage  $\sim 10-15$  KV. This reduced voltage enables the use of spark plug based torch igniter for LOX-Methane and LOX-Hydrogen based rocket engine applications without causing electromagnetic interference (EMI) issues with nearby electronic packages.

## Key Features

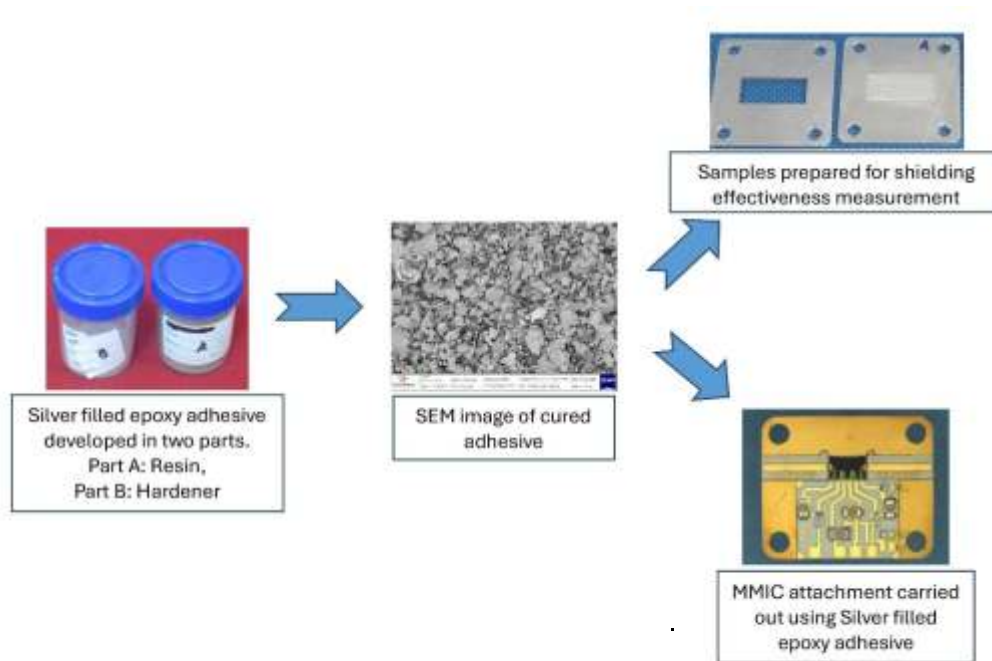
- Lower breakdown voltage ( $\sim 2$  kV instead of  $\sim 10-15$  kV)
- Break down voltage insensitive to ambient pressure.
- High intensity than air discharge spark plugs
- Improved reliability.

## Implementation Overview

- Successfully developed at LPSC in association with IIST and VSSC.
- Demonstrated the working through standalone tests at LPSC.
- Ignition of LOX-Methane pilot igniter successfully conducted using SDSP
- Proposed to be implemented in upper stages of LVM3, NGLV and LMLV
- Qualification by 2027

Thematic Area: **Space and Geo-Spatial Technologies**

# Silver filled Epoxy adhesive



## Functionalities



The silver-filled epoxy resin system is a two-part adhesive or bonding material consisting of epoxy resin and hardener, with silver particles acting as the filler. The epoxy is used for electrical conductivity, thermal conductivity, and adhesion properties.

## Key Features

- This material finds extensive applications in diverse fields, including electronics, aerospace, medical, energy storage, and the automotive industry, where it serves as a replacement for traditional solder materials for joining dissimilar substrates. Additionally, it is used for bonding electrical components, heat sinks, sensor attachments, solar cell manufacturing, and shielding against Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI), as well as for repairing PCBs and addressing plating defects.

## Implementation Overview

- TRL 8
- Developed adhesive characterized by various testing methods such as Lap shear test, Differential Scanning Calorimeter (DSC), Thermogravimetric Analysis (TGA), Thixotropic index, Shore D hardness, EMI attenuation, Thermal conductivity, Volume resistivity and Outgassing property measurement.

## Contact Details

Space Applications Centre  
Jodhpur Tekra, Ambawadi Vistar P.O.  
Ahmedabad - 380015

Thematic Area: **Space and Geo-Spatial Technologies**

# Earth Storable Stage Turbo Pump Speed sensor (ESS-TP)



## Functionalities



It is an inductive speed sensor used in all the earth storable stages of launch vehicles for Turbo Pump speed measurement (upto 20,000 RPM)

## Key Features

- RPM range: 500-20000 rpm,
- Operating temperature: -55 to 150 oC
- Indigenized sensor cost is less than 40% of the equivalent imported sensor

## Implementation Overview

- Rotational speed measurement (RPM) of turbopump in earth storable stage (Vikas Engine) of PSLV, GSLV and LVM3
- Inducted in PSLV, GSLV & LVM3 launch vehicles

Thematic Area: Space and Geo-Spatial Technologies

## Vibration Sensor



### Functionalities



Vibration sensors are used to measure vibration levels at various locations in launch vehicle structures. It is a delta shear type sensor working on piezoelectric principle where charge is generated across Piezoelectric crystals as they are stressed.

### Key Features

- Charge sensitivity(@ 160 Hz):  $20 \pm 10\%$  pC/g
- Mounted resonance frequency: 28 kHz (approx.)
- Max. operational sinusoidal vibration (peak): 10000 gpk
- Indigenized sensor cost is 60% less than the equivalent imported sensor

### Implementation Overview

- Vibration level measurement during engine testing at IPRC
- Tested in IPRC facility as part of field trial

Thematic Area: **Space and Geo-Spatial Technologies**

# Development and realisation of 24-bit $\Sigma\Delta$ Analog to Digital converter



## Functionalities



Developed and qualified indigenous 24-bit sigma delta ADC for miniaturisation of launch vehicle telemetry systems

## Key Features

- 16 core simultaneous ADC in single chip
- Inbuilt current excitation
- Inbuilt voltage reference
- Gain offset calibration engine
- SPI interface for high-speed data exchange

## Implementation Overview

- Flight tested in SSLV and TV missions
- Proposed in Gaganyaan missions for IDAQ systems

### OTHER REMARKS

- Fabricated through SCL

## Contact Details

**Vikram Sarabhai Space Centre**  
Thiruvananthapuram,  
Kerala, India, Pin Code:695022

Thematic Area: **Space and Geo-Spatial Technologies**

# Electromechanical Actuator for LVM3



## Functionalities



Developed and qualified indigenous  
Electromechanical actuator for first stage of LVM3

## Key Features

- Quadruplex BLDC torque motor,
- Quadruplex LVDT for feedback
- Operating voltage 270V and 440 A
- Force of 27 tonnes
- World's most powerful space grade electric actuation system

## Implementation Overview

- Successfully flight tested in LVM3 M6 mission
- Proposed in first stage control of HLVM3 missions

### OTHER REMARKS

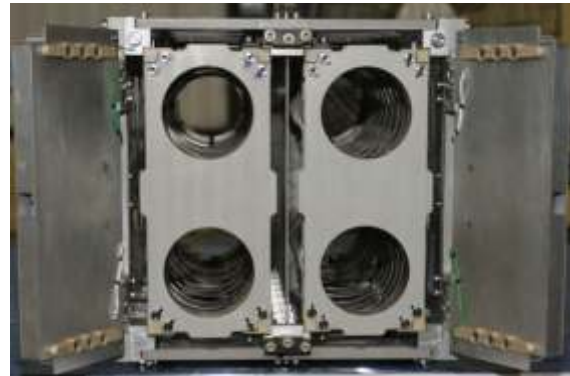
- All the major components are indigenously developed and realised in the country

## Contact Details

Vikram Sarabhai Space Centre  
Thiruvananthapuram,  
Kerala, India, Pin Code:695022

Thematic Area: **Space and Geo-Spatial Technologies**

## Unipod satellite dispenser



### Functionalities



Developed and qualified satellite dispensers for clustered deployment of 1U, 2U, 3U class nano satellites



Designed as per Calpol CubeSat dispenser standards

### Implementation Overview

- Successfully flight tested in PSLV C 56 missions for deploying customer satellites

### Key Features

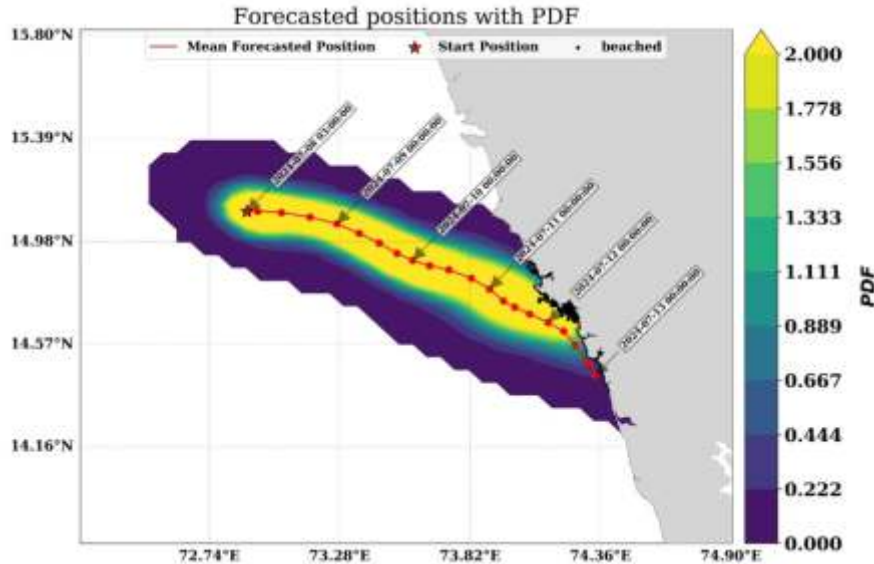
- Non pyro hold and release mechanism
- Rattling arresting mechanism
- Deployment within 500 nseconds
- Two types of mounting schemes
- Payload capacity 6 kg class 3U satellites – 4 Nos
- Total mass < 9 kg

### Contact Details

Vikram Sarabhai Space Centre  
Thiruvananthapuram,  
Kerala, India, Pin Code:695022

Thematic Area: Space and Geo-Spatial Technologies

# Drifter tool for Naval operation



## Functionalities



Drifter tool is software for aiding to Search & Rescue operations of Indian Navy-NODPAC Kochi



It provides forecasted locations (Probability maps) of Search object at sea for next five days using the lagrangian drift model and numerical model data

## Implementation Overview

- Drift tool-Software package in python installed at NODPAC-Kochi.
- Surface currents from Space Applications Centre (SAC) installed high-resolution numerical models is used.
- Surface winds from National Centre for Median Range Weather Forecasting (NCMRWF) numerical models is used.

### OTHER REMARKS

- Software is constantly updated based on the requests and feedbacks from NODPAC-Kochi

## Key Features

- Combined Probability map of Search object is provided for the next five days
- Daily Probability map of Search object is also provided.
- Uses Lagrangian technique which is more suitable for Search and Rescue applications.
- Interaction of Search object with the coastline is made possible by using high-resolution coastline data
- Surface currents and Surface winds from high-resolution numerical models is used.

## Contact Details

Space Applications Centre  
Jodhpur Tekra, Ambawadi Vistar P.O.  
Ahmedabad - 380015

Thematic Area: **Space and Geo-Spatial Technologies**  
Category: **Ionosphere probing HF**

# Digital Ionosonde: HF radar for probing Ionosphere

## Overview

A digital ionosonde is a high - frequency (HF 1 - 20MHz) sweeping radar that measures ionospheric electron density, height, and dynamics, often using 2 kW peak transmitter power and phase - coded pulse compression. Digital Ionosonde designed and developed by SAMEER are crucial tools for real - time ionospheric imaging during disturbed space weather conditions and for optimizing high - frequency (HF) communications. ISRO, Indian Institute of Geomagnetism, SPL & universities are a few of the beneficiaries.



## Functionalities



**Ionosonde emits HF waves to measure electron density in Ionosphere**



**Ionosonde has circular polarized delta antenna 21 - meter height for transmitting bi - phase coded pulsed radio waves with peak power of 1KW for vertical Ionospheric sounding**



**Exploits advanced techniques for signal analysis such as pulse coding, pulse compression, coherent integration etc., recent technological devices and PC resources to bring down the transmitting power of the RF Signal and to maintain a favorable S/N ratio**



**The digitized received signal is processed in real time to obtain signal Phase, Doppler Shift, Amplitude and from these observable parameters Angle of Arrival, wave Polarization, Ionospheric drift information are derived. Conventional Ionogram in the 1 - 20 MHz range are displayed in real time mode**



**The Radar controller and data analysis software is user friendly and the derived data products and graphical displays are on - par with commercially available systems**

## Key Features

- Operates in Frequency: 1 to 20MHz
- Height range - 1000 meters with range resolution of 5 Km
- Transmit power 2 KW
- Measures Ionogram w. r. t height, Skymap, MUF, electron density & Ionospheric drift

## Contact Details

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Program Director(Corporate) - R & TM),  
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E - mail: rajesh1@sameer. gov. in  
Website: www. sameer. gov. in

## Implementation Overview

Deployed	TRL	Training Requirement
Indigenously designed and developed Digital Ionosonde system is installed at Indian Institute of Geomagnetism, Prayagraj	7/8	5 days





**PARTICIPATING MINISTRIES / DEPARTMENTS**

- |  |   |   |  |
|--|---|---|--|
|  <p>संस्कृत एवं हिन्दी<br/><b>Department Of Atomic Energy</b></p>   |  <p>Government of India<br/><b>Ministry of Science &amp; Technology</b><br/><b>Department of Biotechnology</b></p> |  <p>सिद्धान्त एवं औद्योगिक अनुसंधान परिषद्<br/>Council of Scientific &amp; Industrial Research<br/>(विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार)<br/>Ministry of Science &amp; Technology, Govt. of India</p> |  <p>Government of India<br/><b>Defence Research and Development Organisation</b></p>                |
|  <p>इलेक्ट्रॉनिक्स एवं सूचना प्रौद्योगिकी विभाग<br/><b>MINISTRY OF ELECTRONICS AND INFORMATION TECHNOLOGY</b></p> |  <p>भारत सरकार<br/><b>पृथ्वी विज्ञान मंत्रालय</b></p>  |  <p>भारतीय कृषि अनुसंधान परिषद्<br/><b>INDIAN COUNCIL OF AGRICULTURAL RESEARCH</b><br/>Ministry of Agriculture and Farmers Welfare</p>   |  <p><b>icmr</b><br/><b>INDIAN COUNCIL OF MEDICAL RESEARCH</b><br/>Creating the future with care</p> |
|  <p>इसरो <b>ISRO</b></p>  |  <p><b>M F P I</b><br/><b>MINISTRY OF FOOD PROCESSING INDUSTRIES</b><br/>GOVERNMENT OF INDIA</p>                   |  <p>नवीन एवं नवीकरणीय ऊर्जा विभाग<br/><b>MINISTRY OF NEW AND RENEWABLE ENERGY</b></p>  |  <p>औषध विभाग<br/><b>Department of Pharmaceuticals</b></p>  |
|  <p>विज्ञान एवं प्रौद्योगिकी विभाग<br/><b>DEPARTMENT OF SCIENCE &amp; TECHNOLOGY</b></p>                          |  <p>Office of the Principal Scientific Adviser to the Government of India</p>                                      |    |  |

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