

“CSIR's strategic priorities will focus on indigenisation, healthcare innovation, and bio-based economic growth”

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National Science Day is celebrated every year on February 28 to spread the message of the importance of science and its application in the country. Over the years, the Council of Scientific and Industrial Research (CSIR) has been playing a critical role by actively pursuing international collaborations to strengthen India's science and technology (S&T) capabilities and support developing nations through capacity building and technology partnerships. In an exclusive conversation with BioSpectrum, Dr N Kalaiselvi, Director General, CSIR; and Secretary, Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India elaborates upon the future of scientific growth in India.



What are your strategic priorities for CSIR in 2025, particularly in the realms of life sciences research? Are you considering partnerships with other countries to promote scientific research?

In 2025, CSIR's strategic priorities will focus on indigenisation, healthcare innovation, sustainable energy, waste-to-wealth solutions, and bio-based economic growth. Efforts in healthcare include developing an indigenous paracetamol process line and commercialising a sickle cell anaemia diagnostic kit. In energy, CSIR is advancing hydrogen storage technologies and carbon fibre composites. Waste-to wealth innovations will see wider implementation of eco-friendly construction, road laying and road repair materials, biodegradable plastics, and kitchen-to-kitchen biogas systems. Additionally, CSIR is promoting aroma, floriculture, seaweed, and essential oil-based industries to enhance sustainability and rural livelihoods.

CSIR has bilateral agreements with leading institutions in France (CNRS, Institut Pasteur), Germany (DAAD, Fraunhofer), Norway (SINTEF), USA (NIH, Mayo Clinic, St. Jude Hospital), Russia (Skoltech, Russian Academy of Science), Israel (DDR&D), and others. Multilaterally, CSIR engages in Horizon Europe's MSCA SE programme and is expanding ties with Norway, Russia, and BRICS nations.

CSIR also supports research in developing countries through doctoral and postdoctoral fellowships with The World Academy of Sciences (TWAS) (30 slots annually) and technology partnerships with Ethiopia, Nepal, Bhutan, Guyana, and the Dominican Republic.

Union Budget 2025 has significantly increased funding for science and research. How is CSIR leveraging this opportunity?

The increased funding in Union Budget 2025 is an opportunity for CSIR to strengthen mission-driven research in critical areas such as biopharmaceuticals, green hydrogen, bio-based materials, and next-gen therapeutics. A major portion is being allocated to technology translation, ensuring that innovations move from labs to industry faster.

Would you like to highlight major research projects that are taking place within CSIR institutes (in the life sciences space) that would lead to novel/innovative product developments in the coming times?

Some of our most promising projects include CSIR-Healthcare theme's RNA Therapeutics Platform, advancing RNA-based vaccines and personalised medicines; AI-driven Drug Discovery Programme, which is accelerating drug repurposing for neglected diseases; GM Cotton Initiative, a breakthrough in insect-resistant and climate-resilient cotton crops; Indigenous CAR-T Cell Therapy, aimed at making next gen cancer treatments affordable in India; and Herbal Biopharmaceuticals, developing plant-derived therapeutics for neurodegenerative diseases.

What are the key challenges facing life sciences research and innovation in India, and how can those be addressed?

Life sciences research and innovation in India face several critical challenges, which need systematic and sustained efforts to overcome. One of the primary challenges is funding. Life sciences research is capital-intensive, requiring significant investment in infrastructure, laboratory equipment, and long-term studies. Compared to fields like engineering or physical sciences, life sciences demand larger financial outlays for experimental research, clinical trials, and regulatory approvals. Enhancing public and private sector funding for biotechnology, drug discovery, and health sciences is crucial to fostering breakthrough innovations.

Another major challenge is the shortage of skilled professionals in emerging areas like synthetic biology, genomics, and bioinformatics. Despite India's strong talent pool in STEM, there is a gap in high-end expertise required for cutting-edge life sciences research. Strengthening graduate and doctoral training programmes, expanding interdisciplinary collaboration, and increasing industry-academia partnerships can help bridge this gap.

Additionally, the "Valley of Death" remains a persistent issue in life sciences, more so than in other fields. The transition from basic research to commercialisation is hindered by high R&D costs, long development timelines, regulatory complexities, risk of failure, and scalability challenges. Many promising innovations fail to secure investment beyond the proof-of-concept stage, limiting their journey to real-world applications. To address this, strengthening translational research support, expanding biotech incubators, and streamlining regulatory frameworks is essential. While it is difficult to resolve all these challenges immediately, the Government of India is actively working towards solutions. The recently introduced BIOE3 policy is a significant step in this direction.

How is CSIR supporting the growth of life sciences-based startups in India, especially in the unreached areas of the country?

CSIR plays a pivotal role in nurturing life sciences-based startups across India. Through its specialised incubation centres and innovation hubs, CSIR is facilitating cutting-edge biotech and life sciences entrepreneurship. The Atal Incubation Centre at CSIR-CCMB (AIC-CCMB) in Hyderabad, established under the Atal Innovation Mission (AIM), is one of India's premier life sciences incubators. It provides state-of-the-art laboratory facilities, mentorship, and funding support to biotech startups working in genomics, molecular diagnostics, regenerative medicine, and agriculture biotechnology. AIC-CCMB has incubated over 50 startups that are developing innovative solutions in healthcare, agriculture, and biotechnology, fostering a collaborative ecosystem that links startups with researchers, investors, and industry leaders.

Similarly, CSIR-IIIM Startup Centre in Jammu is promoting life sciences entrepreneurship in northern India, particularly in the field of medicinal plant research, phytopharmaceuticals, and Ayurvedic formulations. This initiative is instrumental in advancing drug discovery and biotechnology innovations suited to the regional ecosystem, thereby creating scientific entrepreneurship opportunities and driving economic growth in Jammu and Kashmir.

In addition, the recently established CSIR-Innovation Complex in Mumbai serves as a multidisciplinary innovation hub, providing high-end scientific infrastructure, including molecular biology labs, cell culture facilities, and advanced analytical tools. It supports biotech and healthcare startups through technology transfer, commercialisation assistance, and

collaborations with hospitals and pharmaceutical industries, accelerating product development and regulatory approvals. Beyond these dedicated incubation centres, CSIR is actively fostering life sciences startups nationwide by offering technical training, industry-academia linkages, funding facilitation, and regional innovation ecosystems to ensure inclusive scientific entrepreneurship. Through these efforts, CSIR is empowering innovators, generating employment, and strengthening India's bioeconomy, making it a crucial player in India's growing startup ecosystem.

Looking ahead, what is your vision for CSIR and its role in India's scientific and technological advancement over the next decade?

CSIR's vision for the next decade includes transforming CSIR into an Innovation Powerhouse, delivering globally competitive technologies, achieving self-reliance in critical sectors including biopharma, clean energy, and sustainable materials, and strengthening international collaborations to ensure India's leadership in emerging scientific domains. CSIR is committed to positioning India as a global leader in scientific innovation.

What advice would you give to young women aspiring for a career in scientific research?

My advice is to be fearless and ambitious as science thrives on curiosity and perseverance. Seek mentorship and collaborate, as building strong networks is essential. Embrace challenges because innovation often emerges from uncertainty, and believe in yourself, knowing your contributions can redefine the future of science. Women bring diverse perspectives and creativity to research, and I strongly encourage them to take leadership roles in STEM.

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