GOVERNMENT OF INDIA
MINISTRY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

RAJYA SABHA
UNSTARRED QUESTION NO-771
ANSWERED ON 05.02.2026

"Research and regulation in synthetic biology"

771: Smt. Sangeeta Yadav :

Will the Minister of ***Science and Technology*** be pleased to state:

(a) whether the Government has taken note of recent global developments in synthetic biology highlighting its potential to redesign biological systems for healthcare, agriculture, industry and climate solutions;

(b) the manner in which the Department of Scientific and Industrial Research (DSIR), is supporting research, industrial applications and indigenous innovation in synthetic biology;

(c) the details of institutions, startups and industries currently engaged in such research;

(d) the safeguards in place to address ethical, biosafety and biosecurity concerns; and

(e) the manner in which such research aligns with India's goals of sustainability and technological self-reliance?

ANSWER

MINISTER OF STATE (INDEPENDENT CHARGE) FOR THE MINISTRY OF SCIENCE AND TECHNOLOGY & EARTH SCIENCES

(DR. JITENDRA SINGH)

(a) Yes, as part of the BioE3 Policy (**B**iotechnology for **E**conomy, **E**nvironment and **E**mployment) for '*Fostering High-performance Biomanufacturing'*, synthetic biology programme is being developed for biomanufacturing of bio-based products.

b) Within DSIR, the constituent laboratories of Council of Scientific and Industrial Research (CSIR) are supporting research, industrial applications and indigenous innovation in synthetic biology. Research works in synthetic biology being under taken in CSIR-NCL,

Pune aims to design strains for multiple chemical classes of compounds from Polyhydroxyalkanoates (PHA), and pigments like violacein and vanillin. CSIR-CFTRI, Mysuru is carrying out the projects for scale-up of sustainable production of squalene and linalool, using engineered *Saccharomyces cerevisiae*. CSIR-CIMAP, Lucknow is working on a project for production of high-value terpenes through synthetic biology. A pilot plant facility for bio-processing related to synthetic biology applications is being developed at CSIR-CIMAP, Lucknow. Several extramural funded research projects are also being implemented in these laboratories.

c) The DBT's Public Sector Unit, Biotechnology Industry Research Assistance Council (BIRAC) has been supporting research, industrial applications and indigenous innovation in synthetic biology through a dedicated "Program on Synthetic Biology". Two calls for proposals were announced in this area by BIRAC and several hands on trainings and webinars have been organized. Under this call the institutions, startups and industries supported include: IIT, Madras for hyaluronic acid; iBRIC NII, New Delhi for delta-decanolactone/ delta-dodecanolactone; Fermentech GSV Pvt Ltd for nicin; CIMAP and M/s. Amnion Biosciences Pvt Ltd for alpha- farnesene; Hi Tech Biosciences India Ltd and IISc Bengaluru for steroid drug intermediate; SRM Institute of Science and Technology for homobutanol; ICGEB, New Delhi for high value metabolites; CSIR-CIMAP, Lucknow for sandalwood sesquiterpenes; Jananom Private Limited and IBAB, Bengaluru for rose oxide; CSIR-CFTRI for anthocyanin and Saha Institute of Nuclear Physics for an efficient CRISPY Brick for yeast synthetic metabolic engineering. Further, Biofoundries setup at iBRIC+ institutes, NCCS, Pune and ICGEB, New Delhi under the BioE3 Policy, aim at rapid strain engineering and development of microbial chassis for biomanufacturing of biobased products.

d) Yes, there are safeguards in place to address ethical, biosafety and biosecurity concerns related to research work being carried out in national research institutions, startups and industries. In India, biosafety-related safeguards are governed by the Rules, 1989 (The Rules for the Manufacture, Use/Import/Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells) of the Environment (Protection) Act, 1986. These rules explicitly define 'Genetic Engineering' and encompass new gene technologies like Synthetic Biology. The Environment (Protection) Act, 1986, is administered by the Ministry of Environment, Forests and Climate Change (MoEF&CC). The Review Committee on Genetic Manipulation (RCGM) oversees safety aspects of

research and development involving hazardous microorganisms, Genetically Engineered (GE) organisms, cells, and products, evaluating projects for risks to health and the environment, and issuing guidelines and SOPs for GE organism work. Institutional Biosafety Committees (IBSCs) are crucial bodies within organizations handling Genetically Modified Organisms (GMOs) or hazardous microbes, implementing biosafety protocols, facilitating safe research, and ensuring compliance with national guidelines.

e) Yes, the research involving biomanufacturing of biobased products using emerging technologies such as synthetic biology tools under BioE3 Policy aims to bridge the gap between research, industrial application, and sustainable economic goals. The Policy is aligned with India's vision of Green Growth (announced in the Union Budget 2023-24) and also with the clarion call of the Hon'ble Prime Minister on 'Lifestyle for Environment (LiFE)' that envisions collective approach towards sustainability. The various initiatives under the Policy also align with the Hon'ble Prime Minister's vision of 'Net-Zero' carbon economy of the country. Further, the setting up of Biomanufacturing Hubs, Biofoundries, Bio-AI Hubs aims to strengthen Make-in-India and drive biotechnology sector's contribution to GDP and export potential, thus aligning with the "Viksit Bharat 2047" goals.

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