Strengthening India's Biotech Systems - The Case for Collaborative Innovation and policy support

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In a world increasingly defined by biological risk and therapeutic urgency, India's ambition to become to surpass $300 billion by 2030 is both timely and necessary. As the global center of gravity in life sciences shifts from scale to speed, modularity, and agility, the next phase of India's biotech growth must be anchored in three interlocking pillars of innovation-centric collaboration, translational technology transfer, and deep academic-industrial partnerships.

India's biopharma sector, now valued at $58.4 billion, is expanding at 8.6 per cent annually and contributes over one-third of the country's bioeconomy growth.

But this growth cannot be fulfilled through linear capacity expansion or legacy infrastructure. Instead, we need a quantum shift—driven by an indigenous ecosystem of precision platforms, Single-Use Technologies (SUTs), and a new era of cross-sector partnerships that fuse the rigor of research with the agility of entrepreneurship.

Rethinking Biotech Infrastructure with SUTs

India's current biomanufacturing capabilities remain overly reliant on imported bioprocessing platforms. In 2023–24, the fiscal year's import of critical raw material for biopharma industry runs in multiple crores. This dependence not only limits agility but also exposes our supply chains to geopolitical and regulatory friction.

Single-use technologies (SUTs) being disposable, cleanroom-flexible, and validation-ready—are now central to how the world makes high-value biologics, mRNA vaccines, ADCs, and cell and gene therapies.

SUTs are also significantly more resource-efficient, cleanroom-flexible, and scalable, they reduce water and energy use by 46%, lower carbon emissions by 35 per cent, and cut CapEx by up to 40 per cent compared to traditional stainless-steel systems.

India could grow pharma exports from $25 billion to $120 billion by 2047, but this will require a shift from bulk generics to complex biologics and specialty products.

That shift hinges on upstream R&D alliances and translational partnerships that can accelerate tech transfers. Building corridors of collaboration where SUT developers, CDMOs, research institutes, and digital bioprocess teams operate in co-located clusters with shared validation, QA, and fill-finish infrastructure remain crucial to this vison.

Success is already visible in models like the UK's Vax-Hub and the distributed mRNA platforms in Singapore and South Korea. India's version must be rooted in its strengths—but built for global integration

The Missing Middle - Academia-Industry Synergy

One of India's most under-leveraged assets is its academic capital. We produce 1.5 million STEM graduates annually, yet biotechnology patents remain low. The disconnect between academic research and commercial relevance give us a window to explore.

We need new partnership models that incentivize translational science.

With over 10,000 biotech startups, a growing base of IP filings, and ambitious national missions like BioE3 and the Biomanufacturing PLI scheme, the scaffolding is in place. India needs to unlock the flow of ideas, talent, and capital across institutional silos.

The India-US Biotechnology Collaboration under the TRUST initiative offers a promising template. Through co-funded projects, IP-sharing frameworks, and cross-border incubators, such initiatives can unlock dual benefits of advancing therapeutic innovation while embedding India more deeply into the global biopharma supply chain.

Without Scale-Ready Systems, Innovation Remains Inert Capital

Despite high-end innovation in pockets, India continues to lag in tech transfer readiness. The solution lies in building “innovation bridges”: dedicated Biofoundries, PPPs around pilot plants, and modular testbeds for rapid prototyping using SUTs and other biomanufacturing platforms.

The industry remains optimistic to apply this approach with the newly introduced Bio E3 and Bio-RIDE schemes with a focus on indigenous infrastructure, Bio Foundries, AI-enabled Bio Hubs especially for high-growth segments like mRNA, recombinant proteins, and biosimilars.

The Role of Policy - Incentivizing Risk

India's Production Linked Incentive (PLI) schemes and National Biopharma Mission are building a conducive environment for India's biopharma.

We must further explore outcome-linked R&D bonds, co-investment funds for academia-industry consortia, and preferential procurement for indigenous biomanufacturing tech, including SUTs.

Public R&D programs, vaccine manufacturing missions, and health security stockpiles must prioritise validated domestic SUT platforms—de-risking demand for Indian manufacturers and signaling long-term intent to the private sector.

The path forward is not about replacing global partners, it is about showing up at the table with infrastructure parity and co-creation readiness. India's scientific base has already earned the world's attention. Its manufacturing systems must now earn their trust. If we invest in this ecosystem now, we won't just 'Make in India' but we will innovate for the world.

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