12th PHARMA PRO&PACK EXPO 2026

INDIAN PHARMA COMPENDIUM 2026

Vol. 2, Issue. 4

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12th Pharma Pro&Pack Expo 2026 gets underway in Hyderabad, spotlight on pharma machinery innovation

LAXMI YADAV, MUMBAI

12th Pharma Pro&Pack Expo 2026, South India's premier exhibition for pharma processing and packaging machinery, got underway at HITEX Exhibition Centre in Hyderabad from July 9–11. The three day event brought together industry leaders, solution providers, and decision makers under one roof to drive collaboration, unveil new launches, and forge strategic partnerships shaping the future of pharmaceutical manufacturing.

Jointly organised by the Process Plant and Machinery Association of India and Messe München India, the three-day trade fair serves as the go-to platform for manufacturing, packaging, automation, and supply chain solutions in the pharmaceutical sector.

Hyderabad: India's Pharma Capital

Hyderabad's rise as the "Pharma Hub of India" is no accident. With over 2,500 companies powering a USD 1.6 billion industry and exports exceeding USD 500 million, the city has become a magnet for investment in pharmaceuticals, life sciences, and biotechnology. The upcoming Green Pharma City project promises to further accelerate this trajectory, creating new employment opportunities and reinforcing Hyderabad's role as a global pharma powerhouse.

The city is home to industry titans such as Dr. Reddy's Laboratories, Aurobindo Pharma, Bharat Biotech, Laurus Labs, and Hetero, alongside a thriving ecosystem of contract manufacturers, research organisations, and generics producers. For international visitors, Hyderabad offers unmatched access to decision-makers and buyers, making it the ideal stage for a global trade fair.

Scale and Scope

The 2026 edition of Pharma Pro&Pack Expo is set to be the biggest yet, spanning more than 30,000 sqm of exhibition space and featuring over 350 exhibitors alongside 350 hosted buyers. With 1,000+ buyer–seller meetings scheduled, the event will showcase 50+ global brands and introduce dedicated pavilions for software solutions, start-ups, and innovation launches which will highlight the sector's digital

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transformation, with AI, robotics, IoT, and MES automation. This will extend the expo's reach, ensuring it becomes a comprehensive hub for collaboration, technology launches, and industry networking.

The organisers have also lined up expert-led technical sessions, panel discussions, and conferences designed to address manufacturing challenges, compliance standards, and operational efficiency strategies.

Spotlight on Conferences

Beyond the exhibition floor, the conference agenda has emerged as a defining feature of the expo, offering deep insights into the future of pharma manufacturing.

Day 1 opened with a technical training session on "Advanced Particle Engineering", led by Klaus Nicolajsen Moeller, Global Head of Sales & Service, Glatt. This was followed by a high impact session on "Unlocking the Hidden Factory: Digitalisation in Pharma Manufacturing", delivered by Kushagra Goyal, Lead – Digital, ACG Engineering. Both sessions underscored how science and digitalisation are reshaping formulation, processing, and compliance.

Day 2 featured a keynote by Chakravarthi AVPS, Global Ambassador – World Packaging Organisation, on "Future Ready Pharma Manufacturing: Innovation, Quality, Sustainability and Patient Centric Packaging". A panel on Future Ready Pharma Packaging: Technology, Sustainability and the Fight Against Counterfeits brought together leaders from Mankind Pharma, Aurobindo Pharma, Dr. Reddy's Laboratories, and Graviti Pharma, highlighting how smart packaging and anti counterfeiting measures are redefining supply chains. Later, Dr. Sanjit Singh Lamba, Managing Partner, Trillium Consulting, presented a case study on "Building Resilient Pharma Supply Chains in an Era of Global Uncertainty", followed by a panel on "Resilient Pharma Supply Chains: Cold Chain, Last Mile and Vendor Reliability" with experts from Hetero, Jodas Expoim, AAPM Lifesciences, and Dr. Reddy's.

Day 3 looked ahead to "India Pharma 2030", with a panel moderated by Mohit Shrivastava, Coherent Market Insights, featuring leaders from Aurobindo Pharma, Ferring Pharmaceuticals, Novartis, and Dr. Reddy's Laboratories. Discussions centred on scaling next generation manufacturing ecosystems and operational excellence. The day also included a keynote by Abhijeet Kale, Senior Consultant, Coherent Market Insights, presenting a forward looking industry analysis for 2026–2033.

Together, these sessions set the intellectual tone of the expo, blending technical depth with strategic foresight.

Industry Voices

The expo has earned a reputation for purposeful engagement. "Every discussion here felt purposeful. Visitors were not just curious—they were ready to explore solutions that could be implemented immediately. That level of engagement is rare and deeply rewarding," said Mahendra R Mehta, MD of Parle Global Technologies, reflecting on his experience.

For visitors, the event has become a learning ground. "With its growing range of exhibitors and product showcases, it provides shop floor personnel and students practical exposure, benefiting the industry and preparing the next generation of professionals," noted Madan Mohan Reddy, Whole Time Director, Aurobindo Pharma.

Who's Who of Pharma

The exhibitor and visitor lists read like a who's who of the global pharma industry. Companies such as Pfizer, Novartis, Sanofi, Sun Pharma, Biocon, Zydus Lifesciences, Intas Pharmaceuticals, Cipla, Lupin, and Bharat Biotech are participating, alongside niche innovators and contract manufacturers.

Visitor profiles span formulations (40%), bulk drug manufacturers (25%), APIs (14%), contract manufacturing (9%), CROs (4%), drug discovery (3%), generics (3%), and excipients (2%). This diversity ensures that the expo is not just a showcase but a crossroads for collaboration across the pharma value chain.

Networking Platforms

The Hosted Buyer Programme and Buyer-Seller Forum are designed to maximise efficiency, enabling pre-scheduled, high-impact meetings between exhibitors and buyers. Meanwhile, multi-city roadshows have already sparked conversations in India's pharma clusters, setting the tone for a high-impact expo.

The Start-up Pavilion is expected to be a major draw, offering visibility to emerging companies in processing, packaging, and software solutions. The Software Pavilion will highlight AI, robotics, IoT, and MES automation—technologies that are increasingly central to modern pharma manufacturing.

Networking Platforms

The Hosted Buyer Programme and Buyer-Seller Forum will enable pre-scheduled, high-impact meetings, while multi-city roadshows are already sparking conversations in India's pharma clusters. The Start-up Pavilion is expected to be a major draw, offering visibility to emerging companies in processing, packaging, and software solutions.

Guided by Experts

The event's direction is shaped by a National Advisory Committee (NAC) comprising senior leaders, policymakers, and industry experts. Names such as Shirish Belapure (IPA), Kaushik Desai (IPMMA), Abhay Kumar Srivastava (Mankind Pharma), Madhu Sundar (Dr. Reddy's), and Prashant Sharma (Zydus Lifesciences) lend credibility and strategic weight to the expo.

Their involvement ensures that the event remains relevant to industry needs while anticipating future trends.

Growth Trajectory

Visitor numbers have shown strong momentum, rising from 7,374 in 2024 to 13,367 in 2025. Exhibitor participation has also grown steadily, reflecting the expo's expanding influence. With Hyderabad's thriving ecosystem and the expo's increasing scale, 2026 is expected to set new benchmarks in attendance and business outcomes.

Outlook: More Than a Trade Fair

Pharma Pro&Pack Expo 2026 is poised to be more than just a trade fair. It is set to become a catalyst for collaboration, innovation, and investment in India's pharma machinery sector. For exhibitors, it offers unmatched visibility; for visitors, it provides practical insights and networking opportunities; and for the industry at large, it signals the next phase of growth in pharma processing and packaging.

As Hyderabad prepares to welcome the world, the expo underscores a simple truth: India's pharma machinery industry is not just keeping pace—it is setting the pace.

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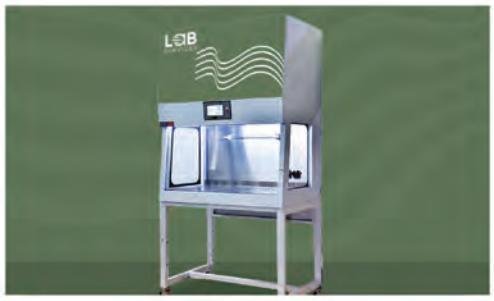


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Beyond generics: Building next generation of Pharma India innovation, trust, patient-centricity: Chakravarthi AVPS

FOR decades, India has earned global recognition as one of the world's most reliable suppliers of affordable, high-quality medicines. This achievement has positioned the country as a trusted healthcare partner for millions of patients worldwide.

Yet the future of healthcare demands a broader vision. Scientific innovation, advanced drug-delivery systems, intelligent packaging, digital health, resilient supply chains, sustainability, and patient-centric care are redefining the pharmaceutical landscape. Tomorrow's leaders will be distinguished not merely by the medicines they manufacture, but by the healthcare solutions they create.

Few professionals have observed this transformation from as many perspectives as **CHAKRAVARTHI AVPS** — Global Ambassador of the World Packaging Organisation and Chairman of the Federation of Pharma Entrepreneurs (Telangana & Andhra Pradesh). A passionate advocate for patient-centric healthcare, pharmaceutical innovation, and responsible packaging, his mission is to build trust across the healthcare ecosystem.

Through decades of engagement with industry, regulators, academia, and global healthcare platforms, Chakravarthi has consistently advanced one central philosophy: every innovation in healthcare should ultimately improve patient outcomes. As he puts it: "India's greatest contribution to global healthcare will not be measured by the number of medicines we manufacture. It will be measured by the number of lives we improve through innovation, quality, trust and patient-centricity."

In this exclusive conversation with **LAXMI YADAV** of PharmaClick, he shares his vision for India's next chapter — one that moves beyond generics towards innovation, trust, intelligent packaging, and integrated healthcare solutions.

More than an interview, this is an invitation to reimagine the future of Indian pharmaceuticals.

From volume to innovation, India's next chapter

Q1. India has long been celebrated as the "Pharmacy of the World" because of its leadership in generic medicines. What will it take for India to become a global innovation powerhouse developing new molecules, biologics and advanced drug delivery systems?

Chakravarthi AVPS: Volume built India's reputation. Innovation will define India's future.

India's journey over the past four decades has been remarkable. We have earned the confidence of the world by making quality medicines affordable and accessible to millions of patients. Becoming the "Pharmacy of the World" is not merely an industrial achievement—it is India's contribution to global public health.

But every successful nation eventually reaches a point where it must redefine its next aspiration. I believe Indian pharma has reached that moment.

The future cannot be driven by volume alone. It must be driven by value—through scientific innovation, differentiated products, biologics, advanced drug delivery systems and patient-centric healthcare solutions. In my view, India should now aspire to become not just the 'Pharmacy of the World', but the 'Innovation Partner of the World'.

Innovation, however, should not be viewed only through the lens of discovering new molecules. It also includes developing better biologics, novel drug delivery platforms, intelligent packaging, connected healthcare technologies and advanced manufacturing processes that improve patient outcomes.

Having had the privilege of interacting with scientists, regulators, healthcare professionals and industry leaders across many countries, one lesson has become very clear to me: the world's most successful healthcare ecosystems innovate through collaboration rather than operating in silos.

To make this transition, four priorities deserve our collective attention.

First, we must strengthen collaboration between academia, research institutions, start-ups and industry so that scientific discoveries move more rapidly from the laboratory to the patient.

Second, we need to encourage responsible risk-taking in research. Breakthrough innovation demands long-term investment, supportive policy and the confidence to pursue ambitious ideas.

Third, we should leverage India's unique strengths by bringing together pharmaceutical science, engineering, digital technologies and patient-centric design. Tomorrow's healthcare leaders will be those who successfully integrate these disciplines.

Finally, we must continue strengthening the foundation on which India's global reputation has been built—quality, regulatory excellence, ethical manufacturing and trust. These are no longer competitive advantages; they are global expectations.

India possesses extraordinary scientific talent, entrepreneurial energy and manufacturing capability. If we combine these strengths with a shared national vision, I am confident that India can lead the next era of global healthcare innovation.

India's next success story will not be measured by the volume of medicines we produce, but by the value we create for patients, healthcare systems and society.

Supply Chain Resilience: Healthcare Security

Q2. Despite PLI schemes, India continues to depend significantly on imported APIs and key starting materials. How can we realistically reduce this dependence without compromising competitiveness?

Chakravarthi AVPS: Supply chain resilience is no longer a procurement issue. It is a healthcare security issue.

The Production Linked Incentive (PLI) scheme has undoubtedly given fresh momentum to domestic manufacturing. However, rebuilding an ecosystem that evolved over several decades cannot happen overnight. We should therefore view this as a long-term strategic journey rather than a short-term target.

In my view, the conversation should move beyond reducing dependence on one country. The larger objective is to build resilient, diversified and globally competitive supply chains.

The first priority is strengthening India's manufacturing ecosystem for critical APIs and key starting materials. Financial incentives are important, but equally important are reliable infrastructure, efficient logistics, affordable utilities, faster approvals and a stable policy environment. Competitiveness is created by the entire ecosystem, not by incentives alone.

Second, we should diversify our sourcing strategy. Supply chain resilience comes from multiple trusted partner-

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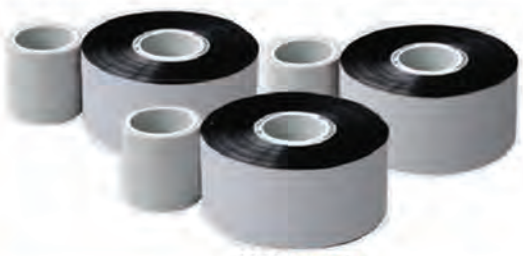

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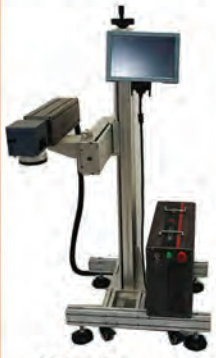

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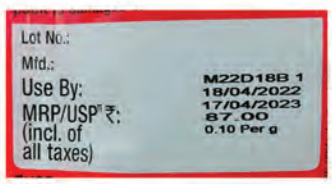

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ships across geographies rather than dependence on any single source.

Third, innovation must play a much bigger role. Process chemistry, biotechnology, continuous manufacturing and green manufacturing technologies can improve both competitiveness and sustainability while reducing long-term vulnerabilities.

Equally important is collaboration. Industry, academia, research institutions and government must work together with a shared long-term vision. Strategic capabilities cannot be built in isolation.

Recent global disruptions have reminded us that resilient supply chains are becoming one of the strongest competitive advantages. Companies and countries that consistently deliver reliability, quality and continuity will naturally earn greater confidence in global markets.

India already enjoys a strong reputation as a trusted pharmaceutical manufacturing destination. If we continue investing in capability, innovation and resilience, today's challenge can become tomorrow's strategic advantage.

My message is simple: self-reliance should not mean isolation. It should mean building resilient capabilities while remaining confidently connected to the global healthcare ecosystem.

India's Greatest Export: Trust

Q3. India has set an ambitious target of US$50 billion in pharmaceutical exports by 2030. With increasingly stringent regulatory expectations, ESG requirements, digital audits and geopolitical uncertainty, is the Indian pharmaceutical industry structurally ready to achieve this target?

Chakravarthi AVPS: The next US$20 billion in pharmaceutical exports will not come from selling more medicines. It will come from earning greater global trust.

I believe the US$50 billion export target is both ambitious and achievable. However, the path to reaching it will be very different from the one that brought us here.

A decade ago, global competitiveness was driven largely by cost and manufacturing capacity. Today, customers, regulators and healthcare systems expect much more. They evaluate companies on quality systems, regulatory compliance, supply chain resilience, sustainability, digital traceability and corporate governance. In other words, they are buying trust as much as they are buying medicines.

In my view, India's next phase of export growth should be guided by what I call the Four Cs.

Compliance must become a culture rather than an audit exercise. Companies that consistently exceed regulatory expectations will always enjoy a long-term competitive advantage.

Credibility is built over years through consistent quality, transparency and reliability. In healthcare, reputation is one of the most valuable assets a company—and indeed a nation—can possess.

Competitiveness can no longer depend only on price. It must increasingly come from innovation, advanced manufacturing, intelligent packaging, digital transformation and operational excellence.

Collaboration is equally important. Government, industry, academia, research institutions and technology companies must work together to create an ecosystem that accelerates innovation and global competitiveness.

Sustainability will also become an increasingly important differentiator. However, while pursuing greener manufacturing and packaging solutions, we must never lose sight of our primary responsibility—protecting the patient. Sustainability and patient safety are not competing priorities; they must advance together.

India has already demonstrated that it can manufacture for the world. The next opportunity is to innovate for the world, collaborate with the world and earn the world's enduring confidence.

My message is simple: the future of pharmaceutical exports will not be determined only by the products we ship. It will be determined by the trust we build.

- Every package protects a medicine. Every medicine protects a patient. Therefore, every package ultimately protects a patient.
- Innovation must always be responsible.
- Sustainability must always be scientific.
- Technology must always remain human-centred.
- The true measure of our success will never be the number of medicines we manufacture.
- It will be the number of lives we improve.
- Engineering Trust. Protecting Patients.
- India's Greatest Export: Trust
- Patient Safety and Sustainability Advance Together

Chakravarthi AVPS

Packaging: A Clinical Responsibility, Not a Commercial Activity

Q4. You have often said that packaging should begin with molecule development rather than product launch. Why is packaging still treated as an afterthought, and how would early packaging design improve patient safety, product stability and patient compliance?

Chakravarthi AVPS: A medicine does not begin protecting the patient when it reaches the pharmacy. It begins the day we start designing how that medicine will be protected.

One of the biggest misconceptions in our industry is that packaging is something we think about after developing the medicine. I have never believed that.

To me, packaging is an integral part of pharmaceutical science.

A medicine's journey is long. It travels through manufacturing, transportation, warehousing, hospitals, pharmacies and finally into the hands of the patient. Throughout this journey, the packaging system protects the product from moisture, oxygen, light, contamination and physical damage. If that protection fails, even an excellent formulation can lose its intended therapeutic value.

That is why I strongly believe packaging engineers should be involved from the earliest stages of product development. When formulation scientists, packaging engineers, regulatory experts and manufacturing teams work together from day one, they can develop the medicine and its packaging as one integrated healthcare solution rather than as two separate components.

This integrated approach delivers multiple benefits. It strengthens stability studies, reduces development timelines, minimises costly redesigns and helps avoid regulatory challenges later in the product lifecycle.

Equally important is the patient's experience.

Good packaging is not simply about containing a medicine. It should help patients take the right medicine, at the right dose and at the right time. Calendarised blister packs, child-resistant yet senior-friendly designs, intuitive labelling and patient-centric compliance packaging all contribute to better adherence, fewer medication errors and improved therapeutic outcomes.

As healthcare evolves towards biologics, personalised medicine and self-administration, packaging will play an even greater role. Drug delivery devices, connected packaging and digital adherence technologies will increasingly become part of mainstream therapy rather than specialised innovations.

I believe the time has come for our industry to recognise packaging not merely as a manufacturing function but as a scientific discipline and a clinical responsibility that directly influences product quality, patient safety and treatment outcomes.

Every package protects a medicine, but ultimately every package protects a patient.

Patient Safety and Sustainability Advance Together

Q5. Europe is demanding more sustainable pharmaceutical packaging, while healthcare regulations rightly impose strict limits on recycled materials coming into direct contact with medicines. How can Indian exporters balance sustainability with uncompromising patient safety?

Chakravarthi AVPS: The greenest package is meaningless if it compromises the medicine it is meant to protect.

Sustainability has rightly become a global priority, and the pharmaceutical industry has an important responsibility to contribute towards a greener future. However, unlike many other industries, we have one additional responsibility that can never be compromised—protecting the patient.

That is why I believe sustainability in pharmaceuticals must always be guided by science.

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In our industry, packaging is not simply a container; it is part of the product's protective system. It safeguards medicines from moisture, oxygen, light, contamination and physical damage throughout their journey from the manufacturing facility to the patient. Any change in materials or package design must therefore be supported by robust scientific evidence, comprehensive stability data and regulatory acceptance.

The opportunity before us is not to choose between sustainability and patient safety. The opportunity is to achieve both.

We should begin by designing smarter packaging that uses only as much material as necessary while maintaining product protection. We should invest in next-generation materials, improve recyclability wherever scientifically appropriate, reduce waste across the supply chain and optimise secondary and tertiary packaging, where significant environmental gains can often be achieved.

Innovation should also focus on manufacturing efficiency, renewable energy, lightweight designs and logistics optimisation. Sustainability is much broader than simply replacing one material with another.

Equally important is collaboration. Regulators, pharmaceutical companies, packaging innovators, material scientists and academia must work together to develop solutions that are both environmentally responsible and scientifically robust. Sustainable healthcare cannot be built through isolated efforts.

As global expectations continue to evolve, India has an opportunity not merely to comply with new environmental standards, but to contribute to shaping future solutions through innovation and responsible leadership.

My message is simple: patient safety and sustainability are not competing priorities. The future belongs to solutions that protect both the patient and the planet.

TRUST: A Layered Approach to

Pharmaceutical Protection

Q6. Despite QR codes and track-and-trace systems, counterfeit medicines continue to reach patients. If digital codes alone cannot eliminate counterfeiting, what physical packaging innovations should India adopt to stay ahead?

Chakravarthi AVPS: Counterfeiters copy technologies. Our responsibility is to stay one generation ahead.

Counterfeit medicines remain one of the greatest threats to global public health. They do not merely damage brands or businesses—they endanger lives. Every falsified medicine that reaches a patient weakens confidence in the healthcare system.

Serialization, QR codes and track-and-trace systems have significantly strengthened supply chain transparency, and they must continue to evolve. However, one important lesson has become increasingly clear: no single technology can eliminate counterfeiting.

The future lies in building multiple,

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complementary layers of protection.

I describe this as the TRUST Framework.

T – Tamper Evidence: Every patient should be able to recognise immediately whether a medicine has been opened, altered or compromised before use.

R – Robust Package Design: Intelligent structural design, proprietary features and precision engineering make counterfeiting significantly more difficult than conventional packaging.

U – Unique Authentication: Microtext, covert security features, forensic markers, laser coding and material-level authentication provide additional layers of protection that are extremely difficult to replicate.

S – Smart Digital Traceability: Serialization, QR codes, interoperable databases and future technologies such as digital product passports and blockchain strengthen visibility throughout the supply chain.

T – Trusted Patient Verification: The final layer is the patient. Packaging should empower patients and pharmacists to verify authenticity easily, access trusted product information and report suspicious products with confidence.

Technology alone will never eliminate counterfeit medicines. Success also depends on effective enforcement, international regulatory cooperation, intelligence sharing and public awareness.

Counterfeiters continuously evolve. Our response must evolve even faster.

The strongest defence against counterfeit medicines is not one security feature—it is multiple layers of protection working together to safeguard every patient.

Next Revolution: Powered by Convergence

Q7. India is a global leader in pharmaceuticals and software, yet Connected Health solutions such as smart packaging, digital adherence technologies and intelligent drug delivery systems remain limited. What is stopping these two ecosystems from coming together, and how can India lead this transformation?

Chakravarthi AVPS: India's next healthcare revolution will begin when scientists, packaging engineers and software developers start solving the same problem together.

Over the past three decades, India has built two extraordinary strengths. We have become a global pharmaceutical powerhouse, and we are equally recognised as one of the world's leading digital technology hubs.

Ironically, these two ecosystems have largely grown in parallel rather than together.

The future of healthcare lies at their intersection.

Around the world, medicines are evolving into integrated healthcare solutions. Smart packaging, connected drug delivery devices, digital therapeutics, remote patient monitoring and AI-enabled adherence platforms are transforming the way patients experience healthcare.

India has every capability to lead this transformation. What we need is greater convergence.

We must create innovation ecosystems where pharmaceutical companies, packaging experts, software developers, AI start-ups, medical device manufacturers, clinicians and academic institutions collaborate from the very beginning of product development.

Innovation rarely happens in isolation. It happens when different disciplines challenge and complement one another.

We also need regulatory frameworks that encourage responsible innovation while ensuring patient safety, cybersecurity and data privacy. Trust will remain the foundation of connected healthcare.

Most importantly, we need to change the question we ask ourselves.

Instead of asking, "How do we manufacture better medicines?", we should increasingly ask, "How do we help patients achieve better health outcomes?"

That single shift in thinking changes everything.

When patient outcomes become the starting point, pharmaceuticals, packaging, engineering, electronics and artificial intelligence naturally come together.

I firmly believe India's next healthcare unicorn may not be a pharmaceutical company or a software company.

It may be a company that successfully combines both.

The future of healthcare will not belong to industries that innovate independently. It will belong to industries that innovate together.

Complete Healthcare Solutions Define the Future

Q8. India manufactures world-class medicines but still imports many high-value drug delivery devices such as auto-injectors, pre-filled syringe components and wearable systems. How can India build a globally competitive precision engineering ecosystem and own the complete healthcare solution?

Chakravarthi AVPS: The future value in healthcare will lie not only in discovering great medicines, but in delivering them more safely, more precisely and more conveniently to every patient.

India has already demonstrated its strength in pharmaceutical manufacturing. The next opportunity is to become equally strong in precision engineering, advanced drug delivery systems and integrated healthcare technologies.

Around the world, healthcare is rapidly moving towards biologics, self-administration, personalised medicine and connected care. Auto-injectors, wearable delivery systems, pre-filled syringes and intelligent medical devices are no longer niche innovations; they are becoming mainstream.

This represents a tremendous opportunity for India.

To realise it, we must stop viewing pharmaceuticals, medical devices, packaging, engineering and digital technologies as separate industries. They are all part of one healthcare ecosystem.

Building this ecosystem requires long-term collaboration between pharmaceutical companies, engineering firms, material scientists, medical device manufacturers, electronics experts, software developers, start-ups and academic institutions. The most valuable innovations of the future will emerge where these disciplines converge.

We must also invest in precision manufacturing, advanced materials, design engineering and specialised skills that support next-generation healthcare technologies. Equally important is creating an environment where research, prototyping and commercialisation can move seamlessly from the laboratory to the marketplace.

If India succeeds in this transition, we will no longer export only medicines. We will increasingly export complete healthcare solutions that combine the medicine, the delivery device, intelligent packaging and digital support into one integrated patient experience.

That, in my opinion, is where the next chapter of value creation lies.

As I look towards the future, I remain optimistic. India has the scientific talent, entrepreneurial spirit and global credibility to lead this transformation. What we now need is the confidence to think beyond traditional boundaries and build healthcare solutions rather than isolated products.

Our greatest opportunity is not to become the world's largest pharmaceutical manufacturer. It is to become the world's most trusted healthcare innovation partner. It is a shared responsibility.

Healthcare has given me far more than a profession—it has given me a purpose.

Over the years, I have had the privilege of interacting with scientists, regulators, entrepreneurs, manufacturers, policymakers and healthcare professionals across the world. Those experiences have reinforced one simple belief: every advancement in healthcare must ultimately improve the life of a patient.

As an industry, we often discuss molecules, manufacturing, compliance, exports and technology. These are all important. But they are not the destination.

The destination is the patient.

If every decision we make—whether in research, manufacturing, packaging, regulation, sustainability or digital innovation—begins with the patient and ends with better health outcomes, I am confident that India will not only remain a trusted supplier of medicines but will emerge as a global leader in healthcare innovation.

From bulk drugs to biotech: How India's pharmaceutical capital is shaping global supply chains

DR. SANJAY AGRAWAL

INDIA has long been recognized as the "Pharmacy of the World," supplying affordable medicines to more than 200 countries. Over the past three decades, the country has transformed from being a manufacturer of low-cost generic medicines to becoming a strategic partner in the global healthcare ecosystem. Today, India is no longer just producing Active Pharmaceutical Ingredients (APIs) and bulk drugs- it is rapidly emerging as a hub for biotechnology, biosimilars, vaccine innovation, contract research, and advanced pharmaceutical manufacturing.

At the heart of this transformation lies India's pharmaceutical capital- an interconnected ecosystem spread across states such as Telangana, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, and Himachal Pradesh. Cities like Hyderabad, Ahmedabad, Mumbai, Pune, and Visakhapatnam have become vital contributors to the world's pharmaceutical supply chain.

As global healthcare systems strive to build resilient, diversified, and innovation-driven supply networks after the COVID-19 pandemic, India's pharmaceutical industry is playing a central role in reshaping global medicine manufacturing and distribution.

India's Evolution: From Bulk Drugs to Global Healthcare Leader

The Indian pharmaceutical industry began its journey primarily as a producer of bulk drugs and generic formulations. The Patent Act of 1970 encouraged domestic manufacturing, enabling Indian companies to reverse-engineer medicines and produce affordable alternatives.

Over time, Indian pharmaceutical companies invested heavily in:

- Research & Development
- World-class manufacturing facilities
- Regulatory compliance
- International certifications
- Biotechnology and biologics

Today, India's pharmaceutical industry is valued at over USD 65 billion, with ambitious targets of crossing USD 130 billion by 2030.

India currently:

- Produces over 60,000 generic brands
- Manufactures approximately 20% of the world's generic medicines
- Supplies nearly 40% of generic medicines used in the United States
- Meets around 60% of global vaccine demand
- Houses one of the largest numbers of USFDA-approved manufacturing

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India's pharma machinery industry: Breaking bottlenecks for 2030

LAXMI YADAV

INDIA'S pharmaceutical industry has set itself an ambitious target: doubling from USD 60 billion today to USD 130 billion by 2030. Achieving this requires a decisive shift toward complex biologics, targeted oncology treatments, and biosimilars. These advanced therapies demand high tech machinery—automated aseptic isolators, high capacity freeze dryers, and precision filling lines. Yet in these critical areas, India's domestic machinery faces deep technological bottlenecks.

Drug companies are compelled to source equipment from Western giants such as IMA (Italy) and Syntegon (Germany). Over 85% of high speed blister packaging lines built in Ahmedabad or Mumbai rely on imported programmable logic controllers (PLCs). For plants exporting to US FDA regulated markets, procurement teams explicitly mandate these brands to ensure compliance with data integrity rules like 21 CFR Part 11. Local alternatives are routinely rejected by quality assurance teams due to audit vulnerabilities.

The dependence extends further. Nearly 90% of electronic servo systems used in high accuracy liquid filling lines are imported from Japan or Germany. India lacks the domestic precision manufacturing base to produce critical components such as optical encoders and insulated gate bipolar transistors (IGBTs). Machine vision systems—essential for detecting cracks in vials or missing tablets at speeds of 400 packs per minute—are dominated by Keyence and Cognex, which capture over 75% of contracts in Indian pharma hubs. Domestic firms function largely as integrators, mounting imported camera nodes onto locally fabricated frames.

For biologics and vaccines, sterile product contact surfaces are non negotiable. Import logs show a steady flow of high grade, electropolished German valves into India, underscoring the gap in local metallurgy and surface finishing technologies. These weaknesses highlight why India's machinery ecosystem, despite steady growth in clusters like Hyderabad, Pune, and Ahmedabad, remains dependent on imported sensors, robotics, and specialised steel.

The concentration of power is stark. Five multinational giants control nearly half of India's industrial automation revenue, and in specialised pharmaceutical machinery, their share surges past 80%. Advanced aseptic isolation systems and continuous lyophilisation equipment remain heavily imported. Meanwhile, over 70% of Indian machinery makers are MSMEs, lacking the capital to fund multi year R&D cycles. The result is a fragmented market: large pharma companies can afford cutting edge machinery, while smaller firms struggle with outdated equipment.

To support the country's ambition of reaching USD 130 billion in pharma output by 2030, the government must introduce targeted structural reforms that strengthen domestic capability and reduce supply chain vulnerabilities.

One critical step is the launch of a dedicated component production linked incentive (PLI) scheme. By offering 10–15% financial support for manufacturing high precision automation components locally, India can encourage domestic firms to invest in advanced engineering. This will not only reduce dependence on Western suppliers but also lower production costs for Indian equipment makers.

Equally important is the need for deep tech R&D incentives. The government should provide a 150% weighted tax deduction on capital spent developing advanced systems such as automated inspection modules and continuous manufacturing lines. This measure would lower the financial risk for MSMEs attempting next generation designs, enabling them to compete in areas currently dominated by multinational giants.

From bulk drugs to biotech: How...

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facilities outside the United States

This remarkable journey has made India indispensable to global healthcare.

The Bulk Drug Foundation

Bulk drugs or Active Pharmaceutical Ingredients (APIs) remain the backbone of pharmaceutical manufacturing.

For decades, Indian manufacturers built expertise in producing:

- Antibiotics
- Cardiovascular drugs
- Anti-diabetic medicines
- Pain management drugs
- Anti-cancer APIs
- Anti-infectives

Industrial clusters in Hyderabad, Visakhapatnam, Ankleshwar, and Baddi became major manufacturing centers supported by:

- Skilled workforce
- Chemical engineering expertise
- Cost-efficient production
- Strong export infrastructure

Government initiatives such as the Production Linked Incentive (PLI) Scheme and development of Bulk Drug Parks are further strengthening domestic API production while reducing dependency on imports.

Hyderabad: India's Pharmaceutical Capital

Often referred to as the Bulk Drug Capital of India, Hyderabad has evolved into a globally recognized pharmaceutical and biotechnology hub.

The city hosts hundreds of pharmaceutical companies, research organizations, biotechnology firms, and vaccine manufacturers.

Key strengths include:

Strong Manufacturing Base

Hyderabad contributes significantly to India's pharmaceutical exports through large-scale production of APIs, formulations, vaccines, and specialty medicines.

Biotechnology Ecosystem

Genome Valley, located near Hyderabad, is among India's first organized biotechnology clusters. It houses multinational corporations, startups, research laboratories, and innovation centers working on:

- Biopharmaceuticals
- Vaccines
- Cell therapies
- Gene therapies
- Precision medicine

Research Infrastructure

The region is supported by:

- Contract Research Organizations (CROs)
- Clinical Research Centers
- Universities
- Government research institutes

Together, these create a complete pharmaceutical innovation ecosystem.

The Rise of Biotechnology

The future of healthcare is increasingly moving toward biotechnology.

Unlike conventional pharmaceuticals that rely on chemical synthesis, biotech products are derived from living organisms and include:

- Monoclonal antibodies
- Biosimilars
- Gene therapies
- Cell therapies
- Recombinant proteins
- Vaccines

India has rapidly expanded its biotechnology capabilities through significant investments in infrastructure, research, and manufacturing.

Several Indian companies now produce globally competitive biosimilars, offering affordable alternatives to expensive biologic therapies used in cancer, autoimmune disorders, and chronic diseases.

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From bulk drugs to biotech: How...

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India's Vaccine Leadership

One of India's greatest contributions to global healthcare is vaccine manufacturing.

The COVID-19 pandemic highlighted India's ability to rapidly manufacture and distribute vaccines worldwide.

India supplies vaccines for diseases including:

- Polio
- Measles
- Hepatitis
- Diphtheria
- Tetanus
- COVID-19

Indian vaccine manufacturers partner with international organizations such as WHO, UNICEF, and Gavi to supply millions of doses annually, especially to low- and middle-income countries.

This leadership has strengthened India's reputation as a trusted global healthcare partner.

Contract Development and Manufacturing (CDMO)

Global pharmaceutical companies are increasingly outsourcing manufacturing and research to India.

Contract Development and Manufacturing Organizations (CDMOs) in India provide:

- Drug discovery support
- Clinical trial materials
- Process development
- Commercial manufacturing
- Regulatory documentation
- Packaging and distribution

India offers several competitive advantages:

- Lower manufacturing costs
- Highly qualified scientists
- Regulatory expertise
- Large production capacity
- Faster turnaround times

This has made India an attractive destination for pharmaceutical outsourcing.

Building Resilient Global Supply Chains

The COVID-19 pandemic exposed vulnerabilities in global pharmaceutical supply chains, particularly overdependence on a limited number of manufacturing locations.

Countries and multinational pharmaceutical companies are now seeking:

- Supply chain diversification
- Regional manufacturing hubs
- Trusted regulatory partners
- Reliable API suppliers
- Strategic manufacturing alliances

India has emerged as one of the preferred destinations due to:

- Political stability
- Strong manufacturing ecosystem
- Global regulatory approvals
- Large domestic market
- Export capabilities
- Skilled scientific workforce

Indian pharmaceutical companies are increasingly becoming strategic rather than transactional partners.

Regulatory Excellence

Global pharmaceutical exports demand strict compliance with international quality standards.

Indian manufacturers comply with regulatory authorities including:

- USFDA
- EMA
- MHRA
- WHO-GMP
- TGA
- PMDA

Indian companies continue investing in:

- Digital Quality Management Systems
- Automated manufacturing
- AI-enabled quality monitoring
- Data integrity systems
- Advanced laboratory technologies

This focus on quality has enhanced global confidence in Indian pharmaceutical products.

Digital Transformation in Pharmaceutical Manufacturing

Industry 4.0 technologies are transforming pharmaceutical production.

Modern Indian pharmaceutical facilities increasingly use:

- Artificial Intelligence
- Machine Learning
- Robotics
- IoT-enabled manufacturing
- Predictive maintenance
- Digital twins
- Electronic Batch Records

These technologies improve:

- Productivity
- Regulatory compliance
- Traceability
- Product quality
- Operational efficiency

Digitalization is becoming a competitive advantage for Indian pharmaceutical manufacturers.

Sustainability: The Next Competitive Advantage

Global pharmaceutical buyers now prioritize environmentally responsible manufacturing.

Indian pharmaceutical companies are adopting sustainable practices such as:

- Green chemistry
- Zero Liquid Discharge systems
- Renewable energy integration
- Water recycling
- Waste reduction
- Carbon footprint monitoring

Environmental compliance is increasingly becoming a prerequisite for participation in global pharmaceutical supply chains.

Government Support Driving Growth

The Indian government has introduced several initiatives to strengthen pharmaceutical manufacturing and innovation:

Production Linked Incentive (PLI) Scheme

Encourages domestic production of APIs, key starting materials, and high-value pharmaceutical products.

Bulk Drug Parks

Dedicated industrial parks equipped with common infrastructure to improve manufacturing efficiency.

National Biopharma Mission

Supports innovation in biotechnology, vaccine development, and translational research.

Startup Ecosystem

India's growing biotech startup ecosystem is driving innovation in diagnostics, digital health, drug discovery, and personalized medicine.

These initiatives are accelerating India's transition from manufacturing hub to innovation leader.

Challenges Ahead

Despite impressive growth, several challenges remain:

- Dependence on imported raw materials for certain APIs
- Increasing global regulatory scrutiny
- Rising manufacturing costs
- Environmental compliance requirements
- Talent shortages in specialized biotech fields
- Growing competition from emerging pharmaceutical markets

Addressing these challenges will require continued investments in innovation, infrastructure, skill development, and policy support.

The Road Ahead

The future of India's pharmaceutical industry extends well beyond generic medicines.

Emerging areas of growth include:

- Personalized medicine
- Gene therapy
- Cell therapy
- RNA therapeutics
- Digital therapeutics
- Artificial Intelligence in drug discovery
- Precision manufacturing
- Advanced biologics

India is uniquely positioned to combine affordability with innovation- an advantage few countries possess.

As healthcare becomes increasingly globalized, pharmaceutical supply chains will depend on reliable partners capable of delivering quality, scalability, and scientific excellence. India is steadily becoming that partner.

Conclusion

India's pharmaceutical journey- from manufacturing bulk drugs to leading breakthroughs in biotechnology- reflects one of the most remarkable industrial transformations of the modern era. What began as a cost-driven generic medicine industry has evolved into a sophisticated ecosystem encompassing research, innovation, biologics, vaccines, digital manufacturing, and global regulatory excellence.

The country's pharmaceutical capital continues to fuel this progress by attracting investments, nurturing talent, and fostering collaboration between industry, academia, and government. As the world seeks resilient and diversified healthcare supply chains, India is no longer just a supplier of medicines- it is a strategic architect of the future of global healthcare.

By balancing affordability with innovation, expanding its biotechnology capabilities, and strengthening sustainable manufacturing practices, India is redefining its role in the international pharmaceutical landscape. The transition from bulk drugs to biotech is not merely an industrial evolution; it is a testament to India's growing influence in shaping healthier, more resilient global supply chains for generations to come.

(The author is a leading pharmaceutical consultant and editor-in-chief of IJMToday)

Centre mandates QR code for vaccines, antimicrobials and anti-cancer medicines in phased manner

OUR BUREAU, MUMBAI

In an effort to strengthen the quality, and safety of India's pharmaceutical supply chain, the ministry of health and family welfare has notified amendments to the Drugs Rules, 1945 to expand the ambit of Schedule H2 and bring additional categories of drugs under the QR Code-based track and trace framework, in a phased manner.

Under the amended provisions, all vaccines, antimicrobials, narcotic and psychotropic drugs covered under the Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985, and all anti-cancer drugs have been included under Schedule H2 of the Drugs Rules, 1945.

With this amendment, manufacturers of these drug formulations will be required to print or affix a Bar Code or Quick Response (QR) Code on the primary packaging label of the product or, where there is inadequate space, on the secondary packaging label, said the Ministry in a press release.

Recognising the need to provide adequate time to industry and other stakeholders for implementation, the Ministry has prescribed phased timelines for compliance. The provisions relating to vaccines, narcotic and psychotropic drugs, and anti-cancer medicines shall come into force from 1 July 2027, while the provisions relating to antimicrobials shall become effective from 1st July, 2028.

The QR code shall store information that can be accessed through software applications to facilitate authentication and verification of the product throughout the supply chain.

The QR code will contain key product information including the unique product identification code, generic and brand names, name and address of the manufacturer, batch number, manufacturing and expiry dates, manufacturing licence number, and details of excipients, wherever applicable.

The requirement for QR code-based identification was earlier applicable to the top 300 pharmaceutical brands in the country. The present amendment significantly expands its coverage to include all vaccines, antimicrobials, anti-cancer medicines and narcotic and psychotropic drugs, thereby broadening the scope of traceability and strengthening safeguards against the circulation of counterfeit and substandard medicines.

The enhanced traceability mechanism will facilitate authentication of medicines at various stages of the supply chain and enable improved tracking and verification of drug products. The measure is expected to strengthen regulatory oversight and support efforts to curb the distribution of spurious medicines in the market. It will also contribute to the national fight against anti-microbial resistance (AMR) by enabling better identification and monitoring of counterfeit and

Future of pharma formulation, digital manufacturing, continuous processing & smart plants

RAVI SHET

THE pharmaceutical industry is on the brink of a transformative era, driven by advancements in formulation technologies, digital manufacturing, and continuous processing methodologies. As the demand for more efficient, cost-effective, and personalized medicines grows, pharmaceutical companies are increasingly turning to smart plants that leverage the Internet of Things (IoT) and automation to enhance operational efficiency.

Evolution of Pharmaceutical Formulation: Trends and Innovations
Historical Context of Pharma Formulation

Pharmaceutical formulation has come a long way since the days of apothecaries whipping up potions in dusty basements. The origins date back to ancient civilizations, where natural remedies ruled. As science evolved, so did the complexity of formulations, leading us to sophisticated drug delivery systems today. From the alchemical quest for the elixir of life to the precision of modern biopharmaceuticals, the journey has been nothing short of a magic show, minus the top hats and rabbits.

Emerging Technologies in Formulation Science

Fasten your seatbelts, because the future of formulation is taking off! Innovations like nanotechnology and 3D printing are revolutionizing how we develop medications. These technologies allow for precision dosages and the creation of complex drug structures that were once deemed impossible. With advances in artificial intelligence and machine learning, we're even seeing smarter formulations that can adapt to improving patient outcomes. Who knew pills could be so high-tech?

Personalized Medicine and Custom Formulations

Gone are the days of one-size-fits-all prescriptions. Welcome to the era of personalized medicine, where treatments are tailored to individual genetic profiles and health conditions. Custom formulations are emerging to complement this trend, allowing for unique blends of active ingredients designed just for you. This not only increases efficacy but also minimizes side effects. It's like having a bespoke suit, but for your health!

The Rise of Digital Manufacturing in Pharma
Defining Digital Manufacturing in the Pharmaceutical Context

Digital manufacturing in pharma is like upgrading from a flip phone to the latest smartphone—leaving old school behind for a world of data-driven decisions and efficiencies. It involves integrating digital technologies into the production process, using software and automation to optimize every aspect of drug manufacturing. Think of it as the digital toolkit that turns traditional methods into sleek, data-savvy operations.

Key Technologies Driving Digital Transformation

What's fuelling this digital revolution? Technologies like artificial intelligence, machine learning, and big data analytics are paving the way. These tools enable real-time monitoring of production processes, predictive maintenance, and optimized supply chains. As a result, we can produce drugs faster, with fewer errors, and meet the precise needs of the healthcare community. If the pharmaceutical industry were a car, digital manufacturing would be the turbo boost that gets it zooming down the fast lane!

Continuous Processing: A Game Changer for Drug Production
Understanding Continuous Processing vs. Batch Processing

In the battle of the processes, continuous processing is stepping in as the heavyweight champion. Unlike batch processing—which resembles a multi-step cooking recipe that makes you wait for each layer to bake—continuous processing keeps the momentum going, allowing for a steady stream of raw materials into the manufacturing process. This unbroken flow means quicker production and faster time to market, so get ready for a smoother ride!

Benefits of Continuous Processing in Pharma

The advantages of continuous processing are like the cherry on top of an already delicious sundae. It significantly reduces production times, cuts down on waste, and improves the quality of end products. Plus, with a constant stream of ingredients, there's less risk of human error. In a nutshell, it enhances overall efficiency and lowers costs, which means more money left over for research and development, now that's something to celebrate!

Challenges and Solutions in Implementing Continuous Processing

Of course, nothing worth having comes easy, enter the challenges. Transitioning from batch to continuous processing may require substantial investment and a rethink of existing workflows. However, these hurdles can be tackled with proper planning, staff training, and investing in the right technology. Collaboration between stakeholders from manufacturing to regulatory bodies is essential to ensure a smooth transition. With some grit and innovation, we can turn challenges into stepping stones for success!

Smart Plants: Integrating IoT and Automation in Pharma
The Concept of Smart Manufacturing in Pharmaceuticals

Welcome to the age of smart plants! This concept is all about integrating the Internet of Things (IoT) with manufacturing processes to create a more intelligent, connected production environment. Smart manufacturing collects and analyzes real-time data from machinery and processes, allowing for unprecedented visibility and control. It's like having a manufacturing system that can think and adapt on its own, an innovation that even science fiction could only dream about a few decades ago!

IoT Applications in Pharma Production

IoT applications are popping up in pharma facilities like popcorn in a microwave. From monitoring equipment performance to ensuring product quality, IoT devices keep the production process under a watchful

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Revolutionizing patient care: Innovative packaging solutions for cell and gene therapies

DHANASHREE THOMBARE

Cell and gene therapies (CGT) are among the most exciting advances in modern medicine. These treatments use living cells or genetic material to fight diseases like cancer, genetic disorders, and rare conditions that traditional medicines often cannot cure. Imagine editing a faulty gene or using a patient's own modified cells to target tumors—these are real possibilities today. However, bringing these therapies from the lab to the patient is incredibly challenging. One of the biggest hurdles is packaging. Special packaging keeps these delicate, living products safe, potent, and sterile during manufacturing, storage, shipping, and delivery.

This article explores why packaging matters so much for cell and gene therapies, the key challenges involved, current solutions, innovations, and what the future holds. Written in simple terms, it aims to help students, aspiring pharma professionals, and readers understand this critical part of the journey.

What Makes Cell and Gene Therapies Special?

Unlike regular pills or injections made from chemicals, cell and gene therapies contain living cells or viruses (like viral vectors) that carry genetic instructions. These products are highly sensitive. They can lose effectiveness if exposed to the wrong temperature, light, pressure, or even tiny contaminants. Many must stay at ultra-low or cryogenic temperatures—often below -150°C, sometimes using liquid nitrogen vapor—to keep cells alive or genetic material stable.

There are two main types:

Autologous therapies: Made from a patient's own cells (personalized, small batches).

Allogeneic therapies: Made from donor cells (can be scaled up for more patients).

Packaging must support both while ensuring "chain of identity" (tracking the product back to the right patient) and "chain of custody" (who handled it and when). A single mistake can make the therapy useless or unsafe.

Major Challenges in Packaging CGT

Packaging cell and gene therapies is far more complex than for standard drugs. Here are the main issues:

1. ***Extreme Temperature Requirements***: Products often need cryogenic storage and transport. Materials can become brittle, crack, or lose seal integrity at such low temperatures, leading to leaks or contamination upon thawing.

2. ***Maintaining Sterility and Container Closure Integrity (CCI)***: Any breach can introduce microbes or particles. Packaging must stay sealed through freeze-thaw cycles, shipping shocks, and handling.

3. ***Biocompatibility and Low Extractables/Leachables***: Packaging materials should not release chemicals that harm cells or trigger immune responses. This is especially critical for direct contact with living cells.

4. ***Breakage and Product Loss***: Glass vials can shatter at low temperatures. Each dose is extremely valuable and often personalized, so losing even one is costly and delays treatment.

5. ***Scalability and Automation***: Early clinical trials use small, manual processes, but commercial production needs automation-friendly designs for larger volumes, especially allogeneic therapies.

6. ***Supply Chain and Logistics***: Therapies travel from collection sites to manufacturing facilities and back to hospitals, often across countries. Time out of controlled conditions is limited, and real-time monitoring is essential.

7. ***Regulatory and Traceability Demands***: Strict rules from agencies like the FDA require detailed testing for stability, particulates, and labeling. Patient-specific labeling adds complexity.

These challenges make packaging a key factor in the success of CGT programs. Delaying packaging decisions can lead to costly redesigns or failed trials.

Types of Packaging Solutions
Primary Packaging (direct contact with the product):

Cryobags: Flexible bags made from materials like ethylene vinyl acetate (EVA) or polyolefin. They are common for autologous cell therapies because they are customizable, support closed systems, and handle cryopreservation well.

Polymeric Vials: Made from cyclic olefin polymer (COP) or copolymer (COC), such as Daikyo Crystal Zenith®. These are break-resistant, have low extractables, and maintain integrity at cryogenic temperatures better than glass. They are increasingly used for scalability.

Other options: Rigid containers or specialized cryovials designed for automation.

Secondary and Tertiary Packaging:

- Protective shippers, insulated containers, and overwraps for added protection.
- Dry ice or liquid nitrogen dry shippers for transport, with hold times of several days.

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Revolutionizing patient care: Innovative...

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Advanced Features:

- Integrated sensors for real-time temperature, shock, and location monitoring via GPS and cloud systems.
- Tamper-evident labels and RFID for traceability.
- Single-use systems to reduce contamination risks and speed up processes.

Companies like West Pharmaceutical Services, Cold Chain Technologies, and World Courier provide tailored solutions, including qualified cryogenic shippers and monitoring.

Innovations Driving Progress

The industry is innovating rapidly to overcome challenges:

Break-Resistant Materials: Polymer vials reduce breakage risks and improve drug recovery (less sticking to surfaces). Studies show they preserve viral vector functionality better in some cases.

Automation-Ready Designs: Nested vials in tubs or trays allow high-speed filling while maintaining sterility.

Improved Cryopreservation: Better materials minimize supercooling issues and ensure consistent freezing/thawing rates, which directly affect cell viability.

Smart Packaging: Temperature indicators, data loggers, and blockchain-like tracking for chain of identity enhance safety and compliance.

Sustainable Options: Efforts to develop more eco-friendly materials address the environmental impact of single-use plastics and energy-intensive cold chains, though this remains a work in progress.

Fill-finish processes (filling and sealing) are also becoming more efficient with specialized equipment for sensitive products.

Regulatory Considerations

Regulators emphasize patient safety. Packaging must demonstrate:

- Container closure integrity at intended temperatures.
- Low particulates and leachables.
- Stability data under real and simulated shipping conditions.
- Proper labeling for hazards and traceability.

Guidance evolves quickly, with agencies providing more flexibility for CGT while maintaining high standards. Early engagement with regulators on packaging is highly recommended.

The Future of CGT Packaging

As more therapies gain approval and allogeneic options scale up, packaging will focus on standardization,

cost-effectiveness, and point-of-care solutions. We may see more closed, automated systems from collection to infusion, reducing vein-to-vein time (the period from cell collection to patient treatment).

Artificial intelligence could optimize supply chains, predict excursions, and personalize logistics. Hybrid packaging combining the flexibility of bags with the robustness of vials might become common.

Ultimately, better packaging means faster, safer delivery of life-changing treatments to more patients worldwide.

Packaging solutions for cell and gene therapies are the unsung heroes of this medical revolution. They protect fragile living medicines through extreme conditions, ensure traceability for personalized treatments, and enable scaling from rare disease cures to broader applications. While challenges like temperature sensitivity, sterility, and logistics remain, innovations in materials, monitoring, and automation are paving the way forward.

With continued collaboration between manufacturers, suppliers, and regulators, packaging will help turn the promise of cell and gene therapies into reality for millions of patients.

Future of pharma formulation, digital...

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eye. Imagine sensors that alert operators to temperature fluctuations or potential machinery failures before they wreak havoc. It's all about using connectivity to optimize operations and enhance safety, a win-win for manufacturers and patients alike!

Automation Technologies and Their Impact on Production Efficiency

Automation technologies have become the backbone of modern pharmaceutical manufacturing, significantly boosting production efficiency. From robotic systems that handle packaging to automated lab systems that streamline analysis, these technologies minimize manual labour and reduce human error. The result? Faster turnaround times, increased output, and improved consistency in drug quality. With automation stepping up to the plate, pharma production has never looked so efficient!

Future Perspectives: Challenges and Opportunities in Pharma Manufacturing

Identifying Key Challenges Facing the Industry

The future of pharma manufacturing isn't just rainbows and unicorns. As the industry heads toward digital horizons, challenges such as workforce adaptation, technology integration, and regulatory compliance loom large. The rapid pace of innovation can feel overwhelming, and keeping up may seem like a Herculean task. Recognizing these challenges is the first step to tackling them head-on—after all, what's a good adventure without a few obstacles, right?

Opportunities for Growth and Innovation

With challenges come opportunities, and the pharma manufacturing sector is bursting with them. Embracing digital transformation and advanced technologies can lead to unprecedented efficiency, quality, and speed to market. The potential for innovative drug formulations and personalized medicine is also on the rise. By exploring these avenues, companies can not only improve patient outcomes but also carve out new revenue streams, making the future look bright and promising.

Vision for the Future of Pharma Manufacturing

The vision for the future of pharma manufacturing is one of agility, precision, and collaboration. Picture smart plants equipped with IoT devices, capable of self-optimizing production flows, and data analytics driving every critical decision. With a focus on sustainability and patient-centric approaches, the industry is set to revolutionize itself. As we leap into this future, let's buckle up and enjoy the ride, it's bound to be a transformative journey that benefits everyone along the way!

Conclusion

In conclusion, the future of pharmaceutical formulation and manufacturing is poised for remarkable advancements that promise to enhance efficiency, quality, and patient outcomes. By embracing digital transformation, continuous processing, and smart plant technologies, the industry can overcome current challenges and seize new opportunities for innovation. As these trends continue to evolve, staying informed and adaptable will be crucial for pharmaceutical companies aiming to thrive in an increasingly competitive landscape. The journey ahead holds great potential for reshaping the way we develop and deliver medicines to improve health around the globe

(The author is a Clinical Research Professional with over 18 years of experience. He is passionate about innovation and aims to use it to promote good health for the human race through his work in the clinical research field)

Asset light frameworks and regulatory depth emerge as new levers for resilient global pharma supply chains: Hari Kiran Chereddi

IN a sector where success is often equated with sprawling factories and heavy infrastructure, **HARI KIRAN CHEREDDI** has chosen a different compass. As Managing Director and Chief Executive Officer of HRV Pharma, he has built a global, asset light framework that prioritises regulatory depth, intellectual property, and market access over brick and mortar expansion. His approach reflects a belief that the future of pharma will be defined less by physical assets and more by agility, compliance, and ecosystem coordination.

In talks with **LAXMI YADAV** of PharmaClick, Chereddi explained how India's underutilised manufacturing base and the industry's fixation on capacity creation prompted him to rethink the conventional model. Rather than adding more plants, HRV Pharma positioned itself as a complementary layer — helping manufacturers maximise existing assets while building stronger regulatory and commercial pathways around them.

From navigating diverse regulatory systems across the US, Europe, MENA and India to embedding sustainability and AI driven orchestration into decentralised supply chains, Chereddi's journey underscores a disciplined, policy aware vision. Bootstrapped rather than venture funded, his model demonstrates how lean structures, regulatory expertise, and technology enabled coordination can create resilience in a sector where scientific innovation often outruns long term corporate planning.

Q1. Many pharmaceutical executives measure success by the physical size of their factories and production lines. You chose to scale HRV Pharma globally through a virtual, asset-light framework. What was the turning point that convinced you that heavy brick-and-mortar infrastructure is actually a liability in modern healthcare?

Hari Kiran: The turning point was the realisation that the pharmaceutical industry already had significant manufacturing capability, but much of that capacity was not being fully utilised. India has more than 650+ USFDA and EU GMP-approved facilities, yet many plants operate below their potential capacity. The traditional mindset was to build more infrastructure and then look for markets, but we started questioning whether adding more plants was solving the industry's biggest problems. We realised that the real value was not only in owning physical assets but in controlling the elements that determine market access, regulatory filings, Drug Master Files, intellectual property, quality systems and customer relationships. Every rupee invested in steel and concrete is a rupee that cannot be deployed towards product development, regulatory expansion or market creation. Our approach was to become complementary to existing manufacturing infrastructure by helping manufacturers utilise their assets better while creating a stronger regulatory and commercial layer around them.

Q2. When global supply chains face sudden bottlenecks, standard industry logic says to build more factories. You argue that duplicate manufacturing plants don't solve the real bottlenecks. If building more physical infrastructure is a distraction, where should global pharma companies actually invest their capital to guarantee product availability?

Hari Kiran: The industry often looks at supply challenges from the perspective of capacity creation, but the bigger gaps are usually around visibility, regulatory readiness, product development and supply-chain coordination. Building another factory does not necessarily solve the problem if existing global capacity is not being effectively connected with demand. Capital should instead move towards areas that improve agility, regulatory capabilities, technology platforms, quality systems, intellectual property creation, market access and stronger supply-chain intelligence. A pharmaceutical company needs to know where the right capacity exists, whether the facility meets regulatory requirements, how quickly a product can be developed and how reliably it can reach the customer. The future of supply chains will not be defined only by who owns the largest number of plants, but

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Asset light frameworks and regulatory...

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by who can coordinate the ecosystem most effectively and create a reliable pathway from product development to global availability.

Q3. After navigating major corporate mergers earlier in your career, you chose to bootstrap your current ventures instead of relying on heavy institutional venture funding. What critical strategic trap do founders fall into when they take on massive outside capital too early in a healthcare company's life cycle?

Hari Kiran: The biggest risk of raising significant capital too early is that founders may start following conventional models instead of building the right model for the industry. In pharma, scale is often associated with physical infrastructure, which can lead to heavy investments before identifying where true value lies. Remaining bootstrapped helped us stay disciplined, focus on regulatory assets, product development and market expansion, and ensure that every investment created measurable value. We believe capital should accelerate a strong business model, not define it.

Q4. Managing operations across the US, Europe, MENA, and India means dealing with wildly different regulatory systems. Instead of looking at a country's strict filing requirements as a bureaucratic hurdle, you view it as a tool for fast market entry. How do you practically turn a complex regulatory barrier into an aggressive competitive advantage?

Hari Kiran: Regulatory requirements are often viewed as a challenge, but we see them as a differentiator. In regulated markets, compliance is not just a requirement; it is an entry barrier that separates serious players from transactional suppliers. By building strong internal regulatory capabilities, managing Drug Master Files, understanding market-specific requirements and maintaining quality oversight across partners, we convert regulatory complexity into a competitive advantage. A customer does not only need a product; they need confidence that the product can move through regulatory pathways successfully and consistently. Our role is to remove that complexity for customers by managing the regulatory, technical and quality aspects while allowing manufacturing partners to focus on what they do best. This creates a platform where regulatory expertise becomes a business enabler rather than an operational constraint.

Q5. HRV Pharma recently earned an EcoVadis Bronze Medal, placing the company in the top 35% globally for sustainability. For a traditional brick-and-mortar manufacturer, reducing carbon footprints is straightforward because they control their own factories. For a virtual, asset-light company, how do you practically enforce strict environmental and ethical standards across a decentralized supply chain that you do not physically own?

Hari Kiran: In an asset-light model, sustainability depends on strong systems and governance rather than direct ownership of facilities. We ensure this by selecting partners purely based on regulatory compliance, operational capabilities and sustainability practices. We also have a 'HRV Certified Manufacturer' standard that is being assigned to ensure an additional layer of quality certification. Similar to quality, sustainability cannot rely on trust alone; it requires structured processes, continuous monitoring and technology-enabled visibility. This approach helps us maintain transparency, accountability and consistent standards across the entire network.

Q6. AI-driven orchestration and federated learning are currently turning static, linear supply chains into adaptive, self-healing networks. In a pharmaceutical industry that is notoriously paranoid about proprietary data leakages, how do you convince global network partners to adopt shared AI models without compromising their sensitive IP?

Hari Kiran: Technology adoption in pharma has to be built on trust, security and clear value creation. The objective is not to take away proprietary information from partners but to create better intelligence across the ecosystem while protecting individual capabilities. At HRV Pharma, technology and AI are used to improve product identification, novel routes of synthesis, development pathways, regulatory planning, green chemistry, nitrosamine predictions. supply-chain visibility and operational efficiency. Each partner continues to retain ownership of its core manufacturing expertise, while the platform creates coordination across the network. The conversation changes when partners understand that technology is not replacing their capabilities but helping them access more opportunities, improve utilisation and make better decisions. The future will belong to platforms that can combine data-driven intelligence with strong governance frameworks, ensuring collaboration without compromising confidentiality.

Q7. Traditional five-year corporate planning in pharma frequently fails because scientific innovation outruns long-term strategy every few months. As we point the compass toward 2030, how do you structurally design a company to scale aggressively while keeping the operational roadmap modular enough to pivot on a short-term horizon?

Hari Kiran: The key is to build a company around capabilities rather than fixed assets. Our model focuses on regulatory expertise, intellectual property, technology, partner networks and market access, allowing us to scale without repeatedly investing in infrastructure. This flexibility enables us to pursue new molecules, enter new markets and adapt quickly as opportunities evolve. As we look towards 2030, maintaining a lean structure while strengthening core capabilities will be critical to achieving sustainable growth.

Centre to mandate registration of pharma packaging firms, industry experts hail patient-safety push

LAXMI YADAV, MUMBAI

INDIA plans to tighten oversight of pharmaceutical packaging materials by requiring companies engaged in the production and supply of printed drug pack materials to obtain formal registration certificates, a move aimed at improving traceability and reducing counterfeit medicines in circulation.

Under the proposal, entities producing printed packaging materials for medicines will need a "packaging registration certificate" and a unique registration number generated through a government portal, reported a leading daily, citing people familiar with the matter.

The framework is designed to safeguard drug authenticity, particularly for sensitive categories such as weight-loss treatments and rabies vaccines, which have been prone to fake batches, the report added.

The registration will be granted subject to eligibility conditions and documentation, while certified firms will be required to maintain records of artworks and printing change parts to ensure safe custody.

Industry experts have welcomed the initiative. "We welcome this proposal of Central Govt and is in line with global practices. It will help in curbing the menace of spurious drugs. In fact we have been advocating this step from long time at all forums including National Human Rights Commission," said Harish Jain, national president of the Federation of Pharma Entrepreneurs (FOPE) and Director of Embiotic Laboratories.

AVPS Chakravarthi, Global Ambassador of the World Packaging Organisation and a long-time advocate of ethical pharma practices, echoed the sentiment, stressing that packaging "is no longer just about protecting a medicine—it is about protecting the patient."

He noted that the proposed registration framework, which would assign unique IDs to packaging entities and tighten control over artworks and printing components, could be one of the most significant regulatory developments for India's pharma sector in recent years. "Patient safety doesn't begin with the tablet. It begins with the pack," Chakravarthi remarked, underscoring packaging's role as the first visible assurance of quality and the last line of defence before medicines reach consumers.

While welcoming the initiative, Chakravarthi emphasized that registration should be seen as a starting point. The industry, he said, must continue to invest in secure artwork management, robust anti-counterfeiting technologies, digital authentication, and strong collaboration between regulators, pharma companies, and packaging partners to ensure supply chain integrity.

How emerging Indian pharmaceutical companies are expanding their presence across global markets

A look at 5 emerging Indian pharmaceutical companies strengthening their international footprint through exports, manufacturing expansion, and global market access.

OUR BUREAU, MUMBAI

A look at five Indian pharmaceutical companies strengthening their international footprint through exports, manufacturing expansion, regulatory approvals, and global market access.

India's pharmaceutical industry continues to play a critical role in global healthcare by supplying affordable, high-quality medicines to countries across developed and emerging markets. From generic formulations and active pharmaceutical ingredients (APIs) to specialty therapies and contract manufacturing services, Indian pharmaceutical companies have built a strong reputation for quality, scale, and regulatory compliance.

With pharmaceutical exports reaching US$30.47 billion in FY25, Indian companies are steadily expanding their international footprint through manufacturing investments, product innovation, regulatory approvals, and entry into new markets. The following companies illustrate how India's pharmaceutical sector continues to strengthen its presence across global markets.

Unichem Laboratories Limited

Unichem Laboratories has established a growing presence across international markets through its subsidiaries, partnerships, and regulatory-approved product portfolio. The company operates in key markets including the United States, Canada, Brazil, and other Latin American countries. Through its wholly owned subsidiaries and strategic alliances, Unichem markets generic pharmaceutical products while continuing to develop a pipeline of APIs and abbreviated new drug applications (ANDAs) for regulated markets. The company's manufacturing facilities have received approvals from international regulatory agencies including the US FDA, UK MHRA, ANVISA Brazil, PMDA Japan, and EU GMP authorities, supporting its global expansion strategy.

HAB Pharmaceuticals & Research Limited

HAB Pharmaceuticals and Research Limited is strengthening its export presence through continued investments in manufacturing capacity and international market development. Hab Pharma Selaqui supplies pharmaceutical products across multiple overseas markets like Afghanistan, Kenya, UAE, Japan, Nigeria, Turkey, Egypt, Tanzania, Iraq, Yemen, Mauritius, Somalia, Indonesia, etc. and continues to expand its production capabilities through investments in sterile and oral solid dosage manufacturing facilities. With a focus on quality manufacturing, product diversification, and export-led growth, HAB Pharma is steadily enhancing its role within India's pharmaceutical export ecosystem and supporting access to affordable medicines across international markets.

Viyash Scientific Limited (Formerly Sequent Scientific)

Viyash Scientific Limited has built a strong international footprint in the animal health sector and today operates across more than 100 countries through its veterinary formulations and API business. The company maintains manufacturing facilities in India, Spain, Brazil, and Turkey, with approvals from international regulatory bodies including the US FDA, EU GMP, WHO, and TGA. Through its focus on animal healthcare, global manufacturing network, and regulated-market capabilities, Sequent continues to strengthen its position as a global veterinary pharmaceutical company.

Medicamen Biotech Limited

Medicamen Biotech has accelerated its global expansion through a series of regulatory milestones and manufacturing upgrades. The company's Bhiwadi manufacturing facility recently secured European Union Good Manufacturing Practice (EU GMP) certification, while its parent company, Shivalik Rasayan, received US FDA approval for its API manufacturing facility. Medicamen has also announced US FDA approval for its sterile oncology manufacturing facility, strengthening its ability to serve regulated international markets. These approvals position the company to expand its presence across key global pharmaceutical markets while supporting future export growth.

Beta Drugs Ltd.

Beta Drugs has emerged as a specialized oncology pharmaceutical company focused on improving access to affordable cancer therapies. The company has developed a strong portfolio of oncology formulations and continues to invest in manufacturing capabilities that support domestic and international growth to Latin America, Asia & Southeast Asia, Middle East & Africa, etc. By focusing on quality standards, product innovation, and specialized oncology therapies, Beta Drugs is expanding its presence in global healthcare markets while contributing to broader access to cancer treatment solutions.

India's Expanding Global Pharmaceutical Footprint

India's pharmaceutical exporters continue to strengthen the country's position as a trusted global supplier of medicines. As demand for affordable healthcare solutions grows worldwide, Indian companies are expanding their reach through manufacturing excellence, innovation, regulatory compliance, and strategic investments in international markets.

From established manufacturers to fast-growing specialty pharmaceutical companies, these organizations are helping reinforce India's role as one of the world's most important pharmaceutical supply hubs while supporting healthcare access across the world. Their continued investments in quality, capacity expansion, and international market development are expected to further strengthen India's standing in the global pharmaceutical industry.

Shantha Biologics partners with Denmark's Novo Nordisk for cartridge fill-finish in diabetes and obesity care

OUR BUREAU, MUMBAI

PHARMA major Shantha Biologics has signed an agreement with Novo Nordisk, the Danish pharmaceutical company, to manufacture cartridges for injectable medicines at its Hyderabad plant.

It means Shantha Biologics will fill the cartridges and prepare them for use, a final and highly sensitive

step in producing drugs like insulin and other injectable therapies. The financial terms and production volumes remain undisclosed.

Cartridge fill-finish involves loading a drug into a slim, pre-filled cartridge that clicks into a pen injector, the format patients use to self-administer their own medication at home rather than in a hospital. The process demands sterile, contamination-free conditions and tight dosing accuracy, since the drug goes directly into the body. This manufacturing format is used across a range of chronic and long-term conditions,

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Track and trace: Building trust in pharma through global standards and AI

PALLAVI JAIN

PATIENTS and caregivers today expect faster access to information, personalized support, and complete transparency. They want to know instantly if a medicine is authentic, safe, and suitable for their needs. This shift in expectations is not just about convenience; it is about trust, safety, and engagement.

In this environment, track and trace has emerged as the foundation of transparency. It ensures that every product carries a verifiable digital identity, enabling stakeholders to follow its journey from manufacturer to patient. Artificial Intelligence (AI) is now accelerating this transformation, helping strengthen product data quality, traceability, and responsiveness across the pharmaceutical supply chain.

Why Traceability is essential in Pharma?

Consumers are more aware than ever. They check expiry dates, dosage instructions, allergen warnings, and even sustainability details. In pharma, the stakes are higher: a wrong dosage label or missing allergen information can create serious risks. Trusted data is therefore essential.

Track and trace systems provide:

a) ***Forward traceability***: Following a product from manufacturer to distributor, retailer, and finally the patient.
b) ***Backward traceability***: Tracing back from the consumer to the source, enabling quick recalls and investigations.

Serialization and Digital Identity

At the heart of track and trace lies serialization which simply means assigning a unique code to every pack. This code becomes the product's digital identity, carrying information such as batch number, expiry date, and manufacturing details.

Serialization enables:

I. ***Authentication***: One can verify if a medicine is genuine.
II. ***Recall readiness***: Companies can act swiftly if a batch is compromised.
III. ***Export readiness***: Meeting global regulatory requirements for pharma shipments.

With GS1 Digital Link-based 2D barcodes, this digital identity becomes accessible to everyone, from pharmacists to patients, through a simple scan.

Standards: The Common/Universal Language

Traceability is critical but it cannot succeed without interoperable standards. GS1 standards provide a common language that ensures data is consistent across manufacturers, distributors, regulators, and retailers. Standards enable…

- Unique product identification ensures every medicine is globally recognized.
- Standardized data repositories like GS1 India's DataKart make product information accessible and reliable.
- Barcode verification ensures scannability and reduces errors at point of sale.

Standards bridge the gap between diverse stakeholders, enabling seamless collaboration across the pharma ecosystem.

AI Enablement: From Data to Insight

AI takes traceability to the next level. By analyzing data across the supply chain, AI can predict risks in cold chain management and flag anomalies in dosage or packaging. It can also personalize patient engagement by linking product data with usage instructions and support regulators with real time visibility into product movement.

For example, AI enabled sensors can monitor whether vaccines are stored within the required temperature range. If a deviation occurs, alerts are triggered instantly, preventing compromised products from reaching patients.

CASE EXAMPLES

- ***Forward Traceability***: A patient scans a QR code on a pain relief medicine and sees its origin, batch details, and expiry date.
- ***Backward Traceability***: A regulator identifies a faulty batch of cough syrup and traces it back to the manufacturing line, ensuring corrective action.
- ***Serialization in Exports***: Indian pharma companies meet EU and US requirements by embedding unique identifiers in every pack, ensuring compliance and market access.

Collaboration across the ecosystem

Track and trace is not the responsibility of one stakeholder alone. It requires collaboration across:

- ***Manufacturers***: Ensuring accurate serialization and data capture.
- ***Distributors***: Maintaining visibility across logistics.
- ***Retailers and Pharmacies***: Providing consumers with reliable product information.
- ***Regulators***: Enforcing compliance and enabling recalls.
- ***Technology Providers***: Embedding AI, IoT, and blockchain for smarter traceability.

Together, these players create a safer, smarter ecosystem where trusted data flows seamlessly.

The Road Ahead

India's pharma industry is at a turning point. With rising global demand, stricter regulations, and evolving consumer expectations, track and trace powered by AI and standards will define the future.

Patients will gain confidence through instant verification, businesses will benefit from efficiency, compliance, and credibility. It also helps regulators in having real time visibility to protect public health.

The finish line does not exist because continuous learning, adaptation, and collaboration are inevitable. The journey of track and trace is ongoing, and its success depends on how well the ecosystem embraces standards, AI, and transparency.

Conclusion

Trusted data is not just numbers on a screen. It is the foundation of trust between people, products, and businesses. In pharma, where lives are at stake, track and trace ensures that every medicine carries proof of authenticity, safety, and compliance.

As AI reshapes expectations and standards provide the common language, the call is clear: collaborate, innovate, and build a future where every product tells its story with confidence.

(The author is a strategy and industry engagement lead)

Shantha Biologics partners with Denmark's...

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including diabetes, obesity, growth hormone deficiencies and certain autoimmune and oncology treatments delivered through biologic therapies.

For Shantha Biologics, the deal is validation as much as it is business. The company's fill-finish lines are automated and approved by the US FDA, one of the toughest regulators in the world. Winning this CDMO (contract development and manufacturing organisation) mandate from Novo Nordisk, one of the largest insulin and diabetes care companies globally, signals that a plant in India can meet that bar.

The timing works in Shantha Biologics' favour. CDMO partnerships for biologic drugs, medicines made from living cells rather than chemicals, are powering a fast-growing global market. It was valued at $25.32 billion in 2025 and is expected to grow to $38.29 billion by 2031, according to industry estimates. Shantha Biologics said it plans to expand further in vaccines, biologics and injectable manufacturing as that demand grows.

The company expects its Hyderabad workforce to grow to around 500 employees in the near future.

Intelligent coatings are shaping the future of pharma packaging

SATWANT KAUR MANKU

For decades, pharmaceutical packaging served a foundational but fundamentally passive role: containment and protection. Today, a paradigm shift is underway. Driven by advancements in materials science and an urgent industry need for heightened security, efficacy, and patient compliance, packaging is transitioning from a static barrier into an active, intelligent participant in the therapeutic ecosystem. At the forefront of this revolution are intelligent coatings.

"We are moving rapidly toward a future where the package does not just hold the medicine; it monitors it, protects it from sophisticated global counterfeit networks, and actively communicates with the patient."

The packaging has evolved from a protective afterthought to a central component of product quality, patient safety and brand differentiation. Today, intelligent coatings are accelerating that shift. These functional surface treatments—ranging from moisture and oxygen scavenging layers to smart, responsive films and tamper evident sensors—are transforming how we think about containment, stability, compliance and supply chain visibility.

For pharmaceutical manufacturers and their packaging partners, intelligent coatings are not a fad; they are a strategic capability that can reduce cost, mitigate risk and unlock new patient centric services.

Why coatings matter now

The sudden acceleration of interest in functional surface treatments is not accidental. It is the result of three powerful macro trends converging on the pharmaceutical landscape simultaneously

Three converging trends are driving interest in intelligent coatings.

DRIVING FORCE TRIAD		
1	2	3
Regulatory scrutiny, enhanced serialization and global product integrity demands.	Shifting Modalities, Rise of complex biologics, cell/gene therapies, and sensitive peptides.	Eco & Patient demand for adherence and mono-materials

Coatings provide an efficient path to add functionality without redesigning the entire package—often fitting into existing manufacturing lines and regulatory dossiers more smoothly than new substrate changes.

The Molecular Shield: Enhancing Efficacy and Shelf-Life

The primary directive of any pharmaceutical package is to maintain the critical stability of its contents. As the industry pivots toward complex biologics, cell and gene therapies, and highly sensitive small molecules, traditional passive barriers are reaching their physical limits. Moisture, oxygen ingress, and ultraviolet light remain the perpetual enemies of molecular stability.

Intelligent barrier coatings leverage nanotechnology to create tortuous paths for gas molecules, drastically reducing permeability without increasing the weight or thickness of the material.

Securing the Chain: Advanced Anti-Counterfeiting

The World Health Organization estimates that counterfeit medicines account for tens of billions of dollars in illicit trade annually, posing an unconscionable risk to global public health. As counterfeiters grow more sophisticated, mimicking holographic labels and serial codes with alarming accuracy, the packaging industry must stay several steps ahead.

This is where intelligent surface coatings provide an unbreachable, forensic-level line of defense. By embedding covert markers directly into the primary or secondary coating

layers, manufacturers give every batch a unique, immutable identity. These technologies include:

- ***Optochemical Markers***: Molecular signatures that react only under highly specific chemical testing conditions.
- ***Luminescent Rare-Earth Phosphors***: Compounds that absorb invisible light frequencies and "upconvert" them into distinct, predictable wavelengths.
- ***Microscopic Chemical Fingerprints***: Nanoscale structural additives unique to specific manufacturing plants or batches.

Because these security elements are baked directly into the structural coating of the package itself, they are invisible to the naked eye and completely impossible to replicate, transfer, or peel off. Field agents, customs officials, and distributors can instantaneously verify authenticity using specialized handheld scanners or smartphones equipped with custom optical filters. This effectively eliminates the vulnerabilities associated with traditional stick-on tamper labels.

Sensing and Communicating: Patient Compliance and Logistics

Traditional digital data loggers are highly effective at monitoring temperature across an entire shipping pallet, but they suffer from a blind spot: they fail to track the individual patient or clinician experience at the unit-dose level. If a single vial sits on a hot loading dock or a blister pack is left in a hot car, centralized logistics data won't capture it.

Intelligent coatings bridge this visibility gap through engineered molecular rearrangement. Thermo- and photochromic smart inks change color permanently if a package breaches its validated temperature threshold or suffers excessive UV exposure. A clinician or patient can look directly at a vial label or blister pack and instantly know, via an intuitive visual cue, whether the product remains safe to use.

Furthermore, we are witnessing the convergence of intelligent coatings with printed electronics. Conductive carbon-based ink coatings can now be printed directly onto blister packs to create a seamless electronic circuit. When a patient pushes a pill through the foil, the circuit breaks, logging the exact time and date of dosage. This data can be transmitted via Near Field Communication (NFC) to a patient's smartphone, alerting care teams to non-compliance or automatically sending reminders.

This interaction bridges the gap between physical medicine and digital therapeutics, empowering care teams to intervene in real time when patients struggle with non-compliance.

Business benefits and ROI

Intelligent coatings deliver value across the product lifecycle:

Stability and cost reductions: Improved barrier properties can extend shelf life and reduce cold chain dependence or the quantity of secondary packaging.

Patient safety and adherence: Visual indicators for temperature excursions or tampering protect patients and clinicians. Coatings that reduce surface friction or improve device handling can increase adherence and reduce dosing errors.

Brand protection and supply chain traceability: Authentication coatings complement serialization and blockchain initiatives, making counterfeiting harder and recall segmentation more precise.

Sustainability: Thin, functional coatings can replace thicker multi layer laminates that are difficult to recycle, enabling a move toward mono material constructions while preserving barrier performance.

Implementation challenges and mitigation

Adoption is not without challenges. Coating chemistries must meet stringent safety standards; supply chains for specialty coating materials can be constrained; and analytical methods require investment. To mitigate these risks:

- Start with pilot studies on low risk SKUs or device components to generate data and internal expertise.
- Partner with reputable coating suppliers who have pharma experience and can support regulatory submissions.
- Use modular designs where the coating is applied to a replaceable element to limit product contact scope initially.
- Build cross functional teams—R&D, regulatory, QA, manufacturing and procurement—to ensure decisions balance technical, commercial and compliance perspectives.

The Horizon: Future directions

Looking forward, the role of coatings in pharma packaging will expand even further. We will soon see bioactive coat-

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Water-as-process set to redefine pharma manufacturing: Bhavik Bhatti

PHARMACEUTICAL water, once treated as a mere utility, is now emerging as a process-critical discipline shaping the future of drug manufacturing. At the heart of this transformation is CN Water, a company that has steadily evolved from equipment supply to integrated, process-centric solutions that embed quality and sustainability into operations from the very beginning.

In talks with **LAXMI YADAV** of PharmaClick, **BHAVIK BHATTI**, CEO of CN Water, outlines how the industry's shift toward a "water-as-process" philosophy is redefining contamination control, lifecycle management, and digital assurance. He explains why predictive analytics, Cold WFI technologies, and upstream Zero Liquid Discharge strategies are no longer incremental upgrades but structural necessities for Indian pharma under global regulatory and ESG scrutiny.

Bhatti also highlights CN Water's new Navi Mumbai engineering and training centre as a hub for innovation, digital integration, and R&D, designed to support manufacturers in embedding sustainability and reliability into their water operations. With India's pharma sector under pressure to meet international compliance benchmarks—and new opportunities opening in semiconductor-grade ultrapure water—he believes CN Water is uniquely positioned to drive the next phase of industry transformation.

Q1. For decades, pharma viewed water as a basic utility like electricity or HVAC. What was the exact regulatory or technological tipping point that forced a shift toward a 'process' mindset, and how does this new architecture technologically stop contamination before it even starts?

Bhavik Bhatti: I don't think it was a single tipping point. It has been an evolution over the last two decades. As pharmaceutical manufacturing became more complex, every critical process came under greater regulatory scrutiny. Water is naturally at the centre of this evolution because it is one of the most critical raw materials for all injectable & biotech plants. In oral solutions and large-volume parenterals (injections, infusions), over 90% of the final product is actually water. When your primary raw material has such a direct impact on product quality and patient safety, it can no longer be managed as a simple utility.

A process mindset shifts the focus from individual water systems to the performance of the manufacturing process itself. This would lead to fewer quality deviations, greater operational reliability and more predictability.

Our own journey at CN Water has evolved alongside this industry transformation. Over the years, we have moved beyond supplying water generation equipment to engineering integrated, process-centric water solutions that help pharmaceutical manufacturers embed quality into their operations from the very beginning. We believe this "water-as-process" philosophy represents the future of pharmaceutical water systems, and we are uniquely positioned to help the industry drive this transition.

Q2. When a pharmaceutical plant transitions to a process-driven water strategy, what actually changes for the operators on the factory floor? How does this shift alter day-to-day quality control and safeguard batch consistency?

Bhavik Bhatti: The biggest change is that operators move from reactive 'system maintenance' to proactive 'process performance'. Conventionally, operators worked with water system level information such as TOC, conductivity, flow rate, pressure or tank level. A process-driven approach will connect these parameters across the entire water lifecycle and create a much richer set of system and process-level information.

Operators will now need to interpret process trends, understand relationships between various parameters and use digital tools, analytics and AI to make more informed decisions. The real value lies in predictability. Small changes in system behaviour can be identified and corrected long before they develop into quality deviations, microbial risks, or equipment failures. This predictive approach reduces unplanned downtime, minimises interventions, and ensures the water system remains in a continuous state of control.

Ultimately, that translates into more consistent water quality, fewer manufacturing disruptions, stronger regulatory compliance, and, most importantly, greater batch-to-batch consistency. In today's pharmaceutical environment, where product quality and patient safety depend on process reliability, that shift is transformational rather than incremental.

Q3. With the new Navi Mumbai engineering and training centre, what specific capabilities are you building to support this transition?

Bhavik Bhatti: Our vision is to create a centre where engineering, digital technologies and operational excellence come together. It will enable customers, consultants and our own engineers to understand and optimize the complete pharmaceutical water process.

We are strengthening our engineering and process design capabilities to develop solutions specifically for the needs of Indian pharmaceutical manufacturers. Secondly, we are significantly expanding our process integration capabilities – to drive better collaboration between engineering, production and quality teams. We are also investing heavily in our Digital Assurance philosophy (through the CN-tinel platform). This includes IoT-enabled monitoring, data analytics and AI to provide continuous visibility and more predictability across the water process.

Another important pillar of the centre is product innovation and R&D. We are investing in the development of next-generation pharmaceutical water technologies that deliver higher efficiency, greater sustainability, and enhanced process reliability. Our R&D efforts will focus on advancing membrane-based water generation, intelligent process automation, energy optimisation and modular system architectures that simplify validation. We are developing solutions that not only address today's regulatory and operational requirements but also anticipate future industry needs.

Q4. Pharmaceutical water systems are notoriously resource-heavy, requiring massive amounts of energy for thermal sanitization and continuous circulation. How is modern engineering breaking this cycle to make water loops truly sustainable?

Bhavik Bhatti: New approaches are looking at the issue not just in terms of energy efficiency, but also water recovery and carbon footprint. Cold WFI is a very good example of how water engineering is evolving. WFI systems are one of the highest consumers of steam and energy because of thermal

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Water-as-process set to redefine...

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sanitization and continuous circulation needs.

But Cold WFI technology is membrane based, does not require steam-intensive distillation. This automatically translates into lower energy consumption, a smaller carbon footprint and lower operating costs. And Cold WFI technology meets all EuPh guidelines for WFI generation. Modern membrane systems are usually very resource efficient, with high levels of water recovery and lower environmental impact.

Cold WFI technology has been available in Europe for quite a while, but adoption has picked up in India in the last few years. We are now seeing a real movement towards systems that are more compliant but also more sustainable.

Q5. With Indian pharma under intense scrutiny to meet global ESG (Environmental, Social, and Governance) standards, how much of a difference can optimizing water operations make to a company's overall carbon footprint?

Bhavik Bhatti: I think ESG is becoming increasingly important for pharmaceutical manufacturers, especially for export-oriented companies. Water plays a much bigger role than people realize. It is one of the few utilities that touches almost every stage – including formulation, cleaning, sterilization and equipment preparation. All water that is used needs to go through treatment, storage and distribution, which adds to energy consumption. Every tonne of steam that can be reduced lowers energy consumption and carbon footprint.

Pharmaceutical water process needs to be looked at more seriously as a sustainability driver. Improvements in water technology and stronger lifecycle management approaches definitely reduce water consumption, steam demand, electricity consumption, chemical usage and the amount of wastewater that is produced.

Q6. Achieving ZLD is a massive challenge for chemical and pharma units. What structural changes are required in water processing to make zero-waste manufacturing a reality rather than a corporate buzzword?

Bhavik Bhatti: People generally see ZLD as an end-of-pipe problem. It begins at the wastewater treatment plant. Wastewater treatment itself consumes a lot of energy. The question we need to ask is – why are we generating so much wastewater in the first place?

Structurally, ZLD benefits by taking an approach that is more upstream. Let's talk about how we can reduce reject streams, improve RO recovery, minimizing flushing, reduce sanitization and manage water more efficiently across the entire manufacturing process. For example, can we reduce steam consumption through optimized sanitization frequency and better loop architecture?

I believe ZLD needs to include better technology and good engineering practices along with end-of-pipe solutions. At many of our customer facilities, we have achieved 0% continuous water reject and saved over 1000 kilolitres of RO water annually – per site – through better engineering and superior EDI technology.

Q7. AI and Industry 4.0 are widely discussed in drug discovery, but how is smart automation changing water operations? How close are we to fully autonomous water plants that self-heal or flag maintenance issues before a breakdown occurs?

Bhavik Bhatti: Pharmaceutical water has actually been highly automated for many years – with SCADA and PLC systems. Those do not really go away, but we are now seeing the addition of another layer – data and intelligence. Very customized digital platforms – we have a platform called CNtinel - can analyse thousands of parameters in real-time, flag issues as they arise, predict anomalies, they can spot equipment degradation well before end-of-life. They can enable access to integrated plant or process level information and sometimes even recommend corrective actions.

Pharmaceutical water is a GMP-critical process where the judgement of experienced engineering and quality teams will be essential. Fully autonomous systems are not really feasible in the near-term. Data and AI will create enormous value in helping these teams make faster and more effective decisions on the ground. This is also part of our Digital Assurance philosophy. We are using data analytics, remote monitoring and AI as an intelligence and process automation layer sitting on top of existing sensors and SCADA systems. This approach enables operators and maintenance teams to understand what changed, what can be predicted and how it may impact process performance.

Q8. Global regulatory scrutiny from the USFDA and stringent updates like EU GMP Annex 1 put a heavy focus on continuous Contamination Control Strategies (CCS). How does moving to a digitally-mapped, process-driven water system safeguard an exporter against data integrity red flags and Form 483 observations?

Bhavik Bhatti: The key trend here is the industry's move towards CCS in a serious way. You need to show that every critical process is continuously tracked and under control. This is a much tougher challenge without continuous access to real-time, integrated information. Microbial management, for example, which still uses cultures, and takes several days to get results. Digital technologies plus RMM approaches actually can give you almost instant access to microbial information.

This enables operators to catch process drift early instead of relying on alarms, equipment failures or large quality deviations. They can intervene before process drift becomes a quality or compliance issue. This is also a much stronger foundation for data integrity, because you can capture every data point, manage audit trails, perform trend analysis and build more predictability across the process.

Q9. India is currently making a major geopolitical push into domestic semiconductor fabrication, a sector that relies entirely on Ultrapure Water (UPW). How does your 30+ year legacy in pharmaceutical water position CN Water to bridge India's massive UPW deficit for microchip manufacturing?

Bhavik Bhatti: Water is a critical manufacturing process in both pharmaceuticals and semiconductors. The engineering discipline is very similar, with extremely tight process control. Some of the India specific challenges in pharmaceutical water – like source water conditions – will be even more severe when it comes to UPW generation.

India has a massive UPW opportunity because huge incentives are being given to accelerate investment in fabs. We can adopt global UPW best practices right from the design stage – that's the easy part. The real challenge will be designing systems and processes that deliver the same quality of water consistently, year after year. I think companies like CN Water, which have spent decades in critical utilities, can make a meaningful contribution here.

Q10. As CN Water evolves into a "Water Process" company, what milestones do you foresee in the next five years?

Bhavik Bhatti: Over the next five years, I think we will become much more of a lifecycle and digital assurance company. Leaders will want confidence that their water process will perform consistently – from source to product.

As the industry evolves, the conversation will move beyond traditional system metrics such as conductivity, TOC, or flow rates. The focus will shift towards lifecycle performance, contamination prevention, sustainability, operational resilience, and continuous regulatory compliance. Our role is to help build these capabilities across the industry while accelerating the adoption of the Water-as-Process philosophy.

Technology will be a key enabler of this transformation. We will continue to invest in digital platforms, data analytics, IoT connectivity, and AI-driven intelligence to make water processes more predictive, autonomous, and efficient. At the same time, we will strengthen our capabilities in product innovation and R&D, advancing next-generation water technologies that improve process reliability, reduce environmental impact, optimise energy consumption and simplify lifecycle management.

Over time, we will bring water systems much closer to process systems – as a more seamless integrated manufacturing process. We will make further investments in data and AI – to help customers improve reliability, sustainability, compliance and efficiency of their water processes. We will see new benchmarks and best practices around lifecycle performance, contamination control and Digital Assurance.

I believe that 'Water-as-Process' will become the accepted way of designing, operating and optimizing pharmaceutical water operations, and CN Water will play a meaningful role in this industry transformation.

Counterfeiting: A growing threat to brands, consumers and business growth

ROHITT D MISTRY

COUNTERFEITING has emerged as one of the most significant threats facing brand owners in India. Across industries such as Pharmaceuticals, Liquor, Apparel, Automotive Components, FMCG, Packaged Foods, Agrochemicals, Mobile Accessories and Consumer Products, counterfeit goods are infiltrating legitimate supply chains, damaging brand reputation, eroding consumer trust and causing substantial revenue losses.

The impact extends far beyond lost sales. Counterfeit products jeopardise consumer safety, reduce government revenues, weaken distribution networks and undermine years of investment in building trusted brands.

Most importantly, consumers have a right to receive the genuine product they paid for. A patient should receive genuine medicine. A farmer should receive genuine crop protection products. A motorist should receive genuine brake components. Consumers cannot be expected to become a brand's policeman by determining whether products are genuine or fake. The responsibility lies with the brand owner to ensure authenticity and product integrity.

The Scale of the Problem

Recent industry studies by FICCI, CRISIL and ASPA indicate alarming levels of counterfeiting across key sectors:

Counterfeit medicines can lead to treatment failure and patient harm. Counterfeit liquor can result in serious health consequences. Fake automotive parts can compromise vehicle safety. Counterfeit agrochemicals can damage crops and farmer livelihoods. The consequences affect not only brands but society as a whole.

Why Traditional Protection Is No Longer Enough

Today's counterfeiters are highly organised, technologically capable and quick to adapt. Traditional packaging alone is no longer sufficient.

Industry Sector	Market Size (₹ Crore)	Estimated Counterfeiting
Pharmaceuticals	5,10,000	20%
Liquor	4,67,500	38%
Automotive Components	8,50,000	25%
Apparel	8,92,500	31%
FMCG	18,70,000	28%
Packaged Foods	5,95,000	30%
Healthcare	31,45,000	20%
Computer Peripherals	1,10,500	40%
Mobile Accessories	7,05,500	30%
Consumer Durables	1,19,000	17%

Estimated Economic Impact Across Key Sectors: Over ₹1,05,000 Crore Annually.
"Every Consumer Deserves the Genuine Product. Counterfeiters Don't Care. We Do."

Effective brand protection requires a layered strategy combining:

- Security holograms and optically variable devices
- Tamper-evident labels and seals
- Security printing technologies
- Product serialization and track-and-trace
- Digital authentication systems
- Consumer engagement and market intelligence

The objective is not merely to detect counterfeits, but to prevent them from entering the marketplace in the first place.

How Holotechs Helps Brands Combat Counterfeiting

For over 30 years, Holotechs has helped leading brands protect their products, revenues and reputations through innovative authentication and anti-counterfeit technologies. Our expertise spans pharmaceuticals, FMCG, liquor, agrochemicals, apparel, automotive and consumer products.

Our BrandRakshak portfolio combines physical and digital security solutions, including:

- Security holograms and optically variable devices
- Tamper-evident labels and closures
- Security blister foils and packaging materials
- Holographic shrink sleeves and capsules
- Covert and overt authentication features
- QRCipher™ encrypted authentication and traceability platform

QRCipher™ extends protection beyond the pack by providing product authentication, traceability, consumer engagement and market intelligence through a single secure digital identity throughout the product lifecycle.

Over three decades, Holotechs has continuously innovated to stay ahead of counterfeiters and is proud to maintain a remarkable record of zero successful duplication of our security solutions.

Protecting Brands. Protecting Consumers. Driving Growth.

Counterfeiting is no longer merely a security issue. It is a business issue, a consumer safety issue and a brand trust issue.

The brands that will thrive in the future are those that proactively protect their products, their consumers and their reputation.

At Holotechs, we help brands stay ahead of counterfeiters through proven authentication technologies, industry expertise and a commitment to protecting what businesses have worked hard to build.

"Every Consumer Deserves the Genuine Product. Counterfeiters Don't Care. We Do."

(The author is a Director at Holographic Security Marking Systems Pvt Ltd)

Intelligent coatings are shaping...

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ings engineered to actively stabilize delicate proteins or neutralize surface pathogens on contact. Simultaneously, circularity-focused coatings will emerge, designed to completely dissolve during recycling washes to allow pristine substrate recovery. Driven by AI-guided formulation, machine learning models will soon predict the exact E&L profiles and barrier performance of new coating chemistries before they are even mixed in a lab, slashing time-to-market.

Conclusion

Intelligent coatings represent a pragmatic, high-leverage technology platform. They allow pharmaceutical companies to protect their products, secure their supply chains, engage their patients, and achieve sustainability targets—all while preserving their existing packaging machinery.

As a consultant who has seen packaging move from cardboard boxes to this frontier, my counsel is simple:

Packaging can no longer be evaluated merely as a box or a bottle; it must be treated as a strategic component of the therapy itself. By applying the same scientific rigor to surface coatings that is traditionally reserved for drug substances, forward-thinking manufacturers will successfully mitigate risk, optimize costs, and deliver significantly better patient outcomes.

(The author is a Global Consultant Healthcare – Nutra and Pharma, Founder Director - Vivid Management Services, Indian Drug Manufacturers' Association - IDMA – Nutraceutical, Committee Member)

QR coding and Track & trace: Building safer and smarter supply chains

NITIN SAWHNEY

THE increasing complexity of global supply chains has made product authenticity, traceability and consumer trust more important than ever. Industries such as pharmaceuticals, food, cosmetics, medical devices and consumer goods face growing challenges from counterfeiting, product diversion and limited visibility across distribution networks. QR coding combined with Track & Trace technology is emerging as one of the most effective solutions to address these challenges.

While QR codes are often viewed simply as a way to provide product information, their true potential lies in enabling end-to-end visibility throughout the product lifecycle. By giving every product a digital identity, organisations can strengthen supply chain security, improve operational efficiency and build greater confidence among consumers.

Beyond Compliance

Governments around the world are increasingly promoting digital traceability, with many initiatives leveraging globally recognized GS1 standards to improve product integrity and protect consumers. In India, for example, QR code requirements introduced for specified pharmaceutical products have accelerated the adoption of serialization and digital traceability technologies, reflecting a broader global shift toward more transparent, secure and resilient supply chains.

However, implementing QR codes solely to satisfy regulatory requirements often means missing the broader strategic opportunities they offer. When designed correctly, QR coding becomes the foundation for product authentication, supply chain intelligence, customer engagement and advanced analytics.

Static vs. Dynamic QR Codes

Not all QR codes offer the same level of protection.

A static QR code contains identical information across every unit within a production batch. While suitable for sharing product information, static codes provide limited protection against duplication.

Dynamic QR codes, on the other hand, assign a unique identity to every individual product. Each package carries its own digital fingerprint, making mass replication significantly more difficult and enabling every item to be individually authenticated.

Unique serialization also creates opportunities for manufacturers to monitor products throughout their journey from factory to consumer.

Secure Serialization Matters

Serialization is much more than assigning sequential numbers to products.

Simple numbering systems can become predictable over time, making them vulnerable to reverse engineering. Modern serialization platforms instead rely on highly randomized, cryptographically secure code generation methods that produce globally unique identifiers while maintaining high scalability for billions of products.

Equally important is protecting the underlying systems responsible for generating and validating these identities. Strong cybersecurity, secure databases, and resilient system architecture are essential to maintaining trust in any authentication programme.

Turning Every Scan into Intelligence

Every product scan generates valuable information.

Location, timestamp, scan history, device information, and verification results together create a powerful source of supply chain intelligence. When analysed effectively, this data can reveal unusual distribution patterns, detect counterfeit hotspots, identify grey market activity, and support rapid investigations.

Rather than reacting after counterfeit products reach consumers, organizations can use real-time analytics to identify emerging risks and respond proactively.

Track & Trace: Complete Supply Chain Visibility

Serialization becomes even more powerful when combined with Track & Trace systems.

Instead of identifying only individual products, Track & Trace establishes digital relationships between primary packs, secondary packaging, shipping cartons, and pallets through aggregation. By scanning the highest packaging level, organizations can automatically identify every product contained within it.

This capability enables continuous visibility as products move from manufacturing facilities through distributors, wholesalers, retailers, healthcare providers, and ultimately to end users.

The benefits extend beyond security. Manufacturers gain improved inventory visibility, better recall management, enhanced demand forecasting, reduced product diversion, and more efficient logistics operations.

Connecting with Consumers

QR codes also create a direct digital connection between manufacturers and consumers.

After verifying authenticity, users can access product instructions, educational content, usage guidance, safety information, recall notices, and customer support. In healthcare, QR-enabled engagement can also facilitate medication adherence, pharmacovigilance reporting, and patient education.

This direct communication channel strengthens trust while delivering greater value throughout the customer experience.

A Layered Approach to Security

No single anti-counterfeiting technology can eliminate risk entirely.

Because QR codes are intentionally readable by smartphones, they can still be copied individually. However, copying isolated codes is vastly different from successfully replicating an entire serialized ecosystem monitored through continuous verification.

For maximum protection, organizations increasingly combine QR coding with complementary security measures such as tamper-evident packaging, holograms, covert markers, forensic taggants, secure printing technologies, blockchain-enabled record keeping, non-cloneable features, and advanced analytics.

Multiple layers of security significantly increase the complexity and cost of counterfeiting while improving detection capabilities.

Looking Ahead

QR coding and Track & Trace are rapidly evolving from compliance initiatives into strategic business capabilities. As digital technologies continue to reshape global supply chains, organizations that embrace comprehensive serialization programmes will be better positioned to protect their brands, improve operational resilience and strengthen consumer trust.

In an increasingly connected world, every product can become a trusted source of information. QR coding, when combined with intelligent Track & Trace systems, transforms ordinary packaging into a gateway for visibility, security and engagement, helping businesses safeguard products while delivering greater confidence across the entire supply chain.

(The author is a SVP & COO at PharmaSecure)

Phygital authentication set to anchor pharma supply chains by 2030: Ankit Gupta

COUNTERFEIT medicines are no longer a distant problem; they are a pressing global threat undermining patient safety and eroding trust in healthcare systems. As the pharmaceutical industry grapples with increasingly sophisticated fakes, authentication and traceability have moved from compliance checkboxes to strategic imperatives.

At the centre of this shift is **ANKIT GUPTA**, President of the Authentication Solution Providers' Association (ASPA) and Joint Managing Director of Holostik Group. An academician at heart and a serial entrepreneur by profession, Gupta blends global exposure from Harvard Business School, IIM Ahmedabad, and UCLA with a legacy rooted in India's anti counterfeiting movement. Over his 15 year journey, he has steered Holostik India Limited to serve more than 10,000 brands across 90 countries, while founding ventures in biodegradable packaging and digital solutions.

Carrying forward the vision of his father, Late UK Gupta — a founding member of HoMAI (now ASPA) — Gupta has become one of the most prominent voices advocating for resilient supply chains. In talks with **LAXMI YADAV** from PharmaClick, he outlines how ASPA is driving awareness, policy advocacy, and industry collaboration to strengthen global supply chains. His mission is clear: to build a trusted pharmaceutical marketplace where patient safety, product authenticity, and supply chain integrity are universally protected.

Q1. Pharmaceutical counterfeiting continues to threaten patient safety and erode trust globally. As President of ASPA and a leading voice in the authentication industry, what do you see as the most urgent priorities today in strengthening pharma supply chains against fakes?

Ankit Gupta: Counterfeit medicines are not merely a commercial concern, they are a direct threat to patient safety and public health. The most urgent priority today is establishing end-to-end traceability across the pharmaceutical supply chain. ASPA's industry engagements consistently indicate that counterfeiters are becoming more sophisticated, exploiting gaps in distribution networks and digital marketplaces. Therefore, authentication can no longer be viewed as a standalone packaging feature; it must be integrated into a broader ecosystem involving serialization, track-and-trace technologies, digital verification, and real-time monitoring.

A strong example of industry action is ASPA member collaborations with leading pharmaceutical companies such as Mankind Pharma, which has actively adopted authentication and traceability solutions to strengthen product security and consumer trust. Such initiatives demonstrate how pharmaceutical manufacturers are increasingly moving beyond compliance and embracing authentication as a strategic tool for patient safety and brand protection.

What we often say at ASPA is Ek Aur Ek Gyarah. When manufacturers, regulators, technology providers, distributors, and consumers collaborate, the collective impact becomes far greater than individual efforts. Stronger awareness, harmonized regulations, and widespread adoption of authentication and traceability technologies will be critical to building resilient pharmaceutical supply chains and restoring consumer confidence.

Q2. Packaging is increasingly viewed as the frontline defence against counterfeit medicines. From tamper-evident seals to serialization and smart labels, which innovations are proving most effective in real-world pharma supply chains, and how receptive are manufacturers to adopting them at scale?

Ankit Gupta: Packaging has evolved from being a protective layer to becoming one of the most important trust and authentication tools in the pharmaceutical industry. Recent consumer studies consistently demonstrate that consumers actively rely on packaging cues to assess product authenticity. While these findings are often discussed across FMCG categories, the implications are even more critical for pharmaceuticals, where counterfeit products can directly impact patient health and safety.

The CRISIL-ASPA State of Counterfeiting in India 2025 Report highlights the growing importance of packaging-based authentication. The study found that 61% of consumers rely on packaging quality and printing clarity to identify genuine products, while 42% check holograms and 37% verify QR codes before making a purchase. These findings underline the increasing role of packaging as the first line of defence against counterfeiting.

As a result, technologies such as serialization, secure QR codes, tamper-evident features, holograms, RFID-enabled labels, digital tax stamps, and mobile-based verification systems are proving highly effective in real-world supply chains. These solutions enable instant authentication by manufacturers, distributors, pharmacists, healthcare professionals, and consumers.

Manufacturers are increasingly receptive to these technologies because they recognize that authentication is no longer merely a compliance requirement; it is a business and patient-safety imperative. The need of the hour is to move beyond standalone security features and adopt integrated authentication and traceability ecosystems that combine physical, digital, and phygital technologies. Such an approach not only strengthens supply chain visibility but also empowers consumers to verify authenticity with confidence while protecting brand reputation and public health.

Q3. Counterfeit medicines remain a pressing challenge across emerging markets. From ASPA's vantage point, what new trends in counterfeiting are you observing, and how are they impacting patient safety and brand trust?

Ankit Gupta: One of the most concerning trends we are observing is the increasing sophistication of counterfeit healthcare and pharmaceutical products. Counterfeiters today are no longer producing obvious imitations, they are replicating packaging, labelling, and even certain security features with remarkable accuracy, making it increasingly difficult for consumers and supply chain stakeholders to distinguish genuine products from fake ones.

Recent consumer research highlights the scale of this challenge. The CRISIL-ASPA State of Counterfeiting in India 2025 Report found that 28% of consumers reported encountering a counterfeit healthcare product at least once in the last 12 months. This is particularly alarming given the direct impact counterfeit medicines and healthcare products can have on patient safety and treatment outcomes.

The rapid growth of e-commerce platforms, online pharmacies, and fragmented distribution networks has further expanded the channels through which counterfeit products can reach consumers. In many cases, fake medicines may contain incorrect ingredients, substandard formulations, harmful substances, or no active pharmaceutical ingredient at all, posing serious health risks.

Beyond the public health implications, counterfeiting significantly damages brand trust. Pharmaceutical companies invest heavily in quality, safety, and compliance, yet a single counterfeit incident can undermine years of consumer confidence. This is

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Phygital authentication set to anchor...

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why ASPA continues to advocate for stronger adoption of authentication and traceability technologies, greater consumer awareness, and closer collaboration between industry, regulators, and technology providers. Protecting patients requires a proactive approach that combines robust physical security features, digital verification systems, and end-to-end supply chain visibility.

Q4. Do you see regulators in MENA and Asia moving toward stricter mandates on serialization, QR codes, and authentication labels? How might harmonisation of such frameworks benefit cross-border pharma trade?

Ankit Gupta: Yes, we are witnessing a clear shift toward stronger regulatory frameworks across MENA and Asian markets. Governments and regulators increasingly recognize that serialization, QR-based verification, authentication labels, and traceability systems are essential tools for safeguarding public health and preventing counterfeit medicines from entering legitimate supply chains.

This growing focus on authentication and traceability was one of the key drivers behind ASPA's expansion into the Middle East and Africa through the launch of its Middle East & Africa (MEA) Chapter. The initiative was introduced to strengthen collaboration among manufacturers, brand owners, technology providers, regulators, and enforcement agencies across regions that play an important role in global pharmaceutical and healthcare supply chains.

At ASPA, we believe that counterfeiting is a transnational challenge that requires coordinated cross-border action. While many countries are making progress, regulatory fragmentation remains a challenge, with varying compliance requirements creating complexity for manufacturers operating across multiple markets. Greater harmonization of authentication, serialization, and traceability frameworks would improve supply chain visibility, reduce compliance burdens, facilitate smoother cross-border trade, and enhance patient safety.

Through initiatives such as the ASPA MEA Chapter and ongoing engagement with global stakeholders, ASPA continues to advocate for collaborative, globally aligned authentication frameworks that support both public health objectives and international pharmaceutical trade.

5. Beyond physical packaging, how is digital authentication — blockchain, AI-enabled verification, mobile apps — redefining the fight against counterfeiting in pharma supply chains?

Ankit Gupta: Digital authentication is undoubtedly transforming anti-counterfeiting efforts by adding intelligence, transparency, and real-time verification capabilities to traditional security measures. Technologies such as blockchain, AI-powered analytics, digital twins, and mobile verification platforms are helping stakeholders monitor product movement and identify anomalies more effectively.

However, ASPA strongly believes that digital technology alone is not sufficient to combat counterfeiting. Counterfeiters continue to evolve rapidly, and relying solely on digital solutions can create vulnerabilities. The most effective strategy combines robust physical security features with digital authentication and traceability systems.

Many ASPA member companies have successfully deployed layered solutions that integrate holograms, tamper-evident technologies, secure labels, covert features, QR-based verification, and cloud-based authentication platforms. This multi-layered approach significantly increases the complexity and cost of counterfeiting while providing greater confidence to regulators, manufacturers, distributors, and consumers.

The future lies in creating integrated phygital ecosystems where physical and digital security measures work together to deliver end-to-end product authentication and traceability.

6. ASPA has long advocated industry collaboration. What partnerships or initiatives are currently underway with pharma associations, and how do they aim to strengthen global anti-counterfeiting ecosystems?

Ankit Gupta: Collaboration remains at the heart of ASPA's mission. Counterfeiting is a complex challenge that cannot be addressed by any single stakeholder, making collective action essential.

One of ASPA's flagship initiatives is TAF Connect, which brings together industry leaders, policymakers, technology providers, regulators, and brand owners to discuss emerging threats and solutions in authentication and traceability. The pharmaceutical sector remains one of the key focus areas of TAF Connect due to the direct implications of counterfeit medicines on patient safety. Industry leaders such as Mankind Pharma Limited have actively supported and participated in these conversations, highlighting the growing commitment of pharmaceutical companies toward secure supply chains.

ASPA also works closely with leading industry associations and chambers including the Confederation of Indian Industry (CII), the Federation of Indian Chambers of Commerce and Industry (FICCI), and the PHD Chamber of Commerce and Industry (PHDCCI), ASSOCHAM. The association actively engages with policymakers and has submitted recommendations to the National Human Rights Commission (NHRC) and the Department for Promotion of Industry and Internal Trade (DPIIT) on strengthening anti-counterfeiting measures and protecting consumer rights.

Through awareness programmes, policy advocacy, industry forums, technical workshops, and stakeholder consultations, ASPA continues to promote the adoption of authentication and traceability technologies while fostering stronger collaboration across the anti-counterfeiting ecosystem.

Q7. Looking ahead to 2030, what is your vision for the authentication industry's role in pharma, and how will ASPA continue to influence policy, innovation, and awareness in this space?

Ankit Gupta: By 2030, authentication will become a foundational component of pharmaceutical supply chains rather than an optional security enhancement. Every legitimate pharmaceutical product should ideally possess a secure identity that enables authentication, traceability, and transparency throughout its lifecycle.

However, the future will not be driven by digital technologies alone. ASPA envisions a balanced ecosystem built on physical, digital, and phygital authentication solutions. Physical technologies such as holograms, tamper-evident features, and secure labels will continue to play a vital role. Digital solutions including AI, blockchain, IoT, cloud-based verification, and data analytics will strengthen visibility and intelligence. The greatest impact, however, will come from phygital solutions that seamlessly integrate physical security with digital verification and traceability.

ASPA will continue to drive awareness, research, promote industry standards, support innovation, and advocate for effective policy measures that encourage widespread adoption of these technologies. Our objective remains clear: to create a trusted pharmaceutical marketplace where patient safety, product authenticity, and supply chain integrity are universally protected.

Q8. As geopolitical tensions in West Asia continue to influence global energy markets and investor sentiment, businesses across sectors are confronting higher costs and economic uncertainty. What has been the impact on your industry, and how is industry adapting to mitigate these risks?

Ankit Gupta: Geopolitical tensions inevitably affect global supply chains through higher logistics costs, raw material volatility, transportation disruptions, and increased operational uncertainty. The authentication and traceability industry is not immune to these pressures, particularly as many security materials, packaging components, and technology inputs are sourced through interconnected global supply networks.

However, these challenges have also reinforced the importance of supply chain resilience. Organizations are investing in diversified sourcing strategies, digital visibility tools, predictive analytics, and stronger traceability systems to reduce risk exposure. From ASPA's perspective, periods of uncertainty often accelerate innovation and collaboration. Businesses increasingly recognize that transparency and authentication are essential not only for combating counterfeiting but also for managing broader supply chain risks. Strengthening trust, visibility, and collaboration across stakeholders will remain central to navigating future disruptions effectively.

The cross-border blueprint: How enterprise leaders are maximizing transnational market share

SANJEEV KUMAR

THERE comes a moment in every business leader's journey when the question changes from "How do we grow?" to "How far can we grow?" Having spent over two decades in the healthcare and pharmaceutical industry, I have witnessed this shift firsthand. Indian companies have evolved from local manufacturers to respected global partners. Exporting, once considered an ambitious dream, has become an achievable business strategy. One lesson has remained constant: crossing borders is not about shipping products, it is about exporting trust.

Listening Before Selling

In today's interconnected world, geography is less of a barrier than ever before. Digital technology, efficient logistics, and international demand have created unprecedented opportunities. Companies no longer need to be global giants to think globally. What they need is clarity of purpose, adaptability, and the willingness to learn. Every market tells a different story—regulations vary, healthcare systems differ, and patients come from diverse cultural backgrounds. Success begins not with selling, but with listening.

Trust as the Passport

The most successful leaders never enter new markets believing they have all the answers. They spend time understanding local needs, respecting cultural differences, and building relationships. Trust cannot be manufactured overnight; it is earned through consistent quality, ethical conduct, and dependable service. Customers buy confidence before they buy products. Across industries, reputation becomes the passport to international success.

Technology as an Enabler

Technology has transformed international business. A company in India can now collaborate with Europe, the Middle East, and Africa in a single day. Artificial intelligence, cloud platforms, and advanced analytics make global expansion more accessible. Yet technology is only an enabler. Relationships continue to drive sustainable growth. People prefer doing business with people they trust, which is why expansion begins with relationships rather than transactions.

Respecting Regulations

Healthcare is one of the world's most regulated industries. Approval pathways, documentation standards, and compliance expectations differ across countries. While challenging, these regulations protect patients and strengthen confidence. Businesses that embrace compliance as part of their culture often discover it becomes a competitive strength rather than a barrier.

India's Unique Position

India today occupies a unique place in the global business landscape. Its pharmaceutical industry is recognized for manufacturing excellence, medical technology is expanding, and scientific talent is respected worldwide. Digital capabilities are growing rapidly. "Made in India" is increasingly synonymous with reliability, innovation, and quality.

Leadership Traits That Matter

Products alone do not build international success—leadership does. Successful leaders remain curious, invest in people, build partnerships, and appreciate cultural diversity. Above all, they never stop learning. Innovation deserves greater attention. It is not only about revolutionary technology but also about improving customer experience, simplifying supply chains, and enhancing product quality. Organizations that innovate consistently compete on value, not price.

Sustainability as a Business Expectation

Long-term success depends on responsible choices. Environmental responsibility, ethical sourcing, employee well-being, and community engagement are now business expectations. Global customers increasingly choose organizations that create value not only for shareholders but also for society.

Integrity and Human Values

The future belongs to organizations that combine commercial excellence with human values. Markets may change, technology will evolve, and competition will intensify. But integrity, trust, empathy, and meaningful relationships will always remain relevant.

A Continuous Journey

International expansion is not a destination marked on a map. It is a continuous journey of learning, adapting, and growing. Every country teaches a new lesson. Every customer offers a new perspective. Every partnership creates fresh opportunities. The blueprint is simple: think beyond borders but remain grounded in local realities. Build trust before pursuing market share. Invest in people as much as technology. Respect regulations. Encourage innovation. Lead with integrity.

Trust Crosses Borders First

The greatest opportunities of the coming decade will belong to leaders who understand one simple truth: businesses may cross borders, but trust crosses them first. When trust is earned, market share is no longer the ultimate achievement—it becomes the natural outcome of creating lasting value for people across the world.

(The author is a RSM – APAC at Biotech Healthcare)

Shilpa Biologicals launches PartnerPower, proprietary platform for real-time visibility on process development

OUR BUREAU, MUMBAI

SHILPA Biologicals Pvt. Ltd. has announced the launch of Partner Power, a purpose-built digital transparency platform that empowers global sponsors with uninterrupted, real-time insights into every stage of their biologics development and manufacturing programs.

Engineered as a unified digital 'data fabric,' PartnerPower replaces traditional periodic reporting with a continuously live, collaborative environment — enabling biopharmaceutical innovators worldwide to monitor the true 'state of affairs' of their projects at any moment, from anywhere in the world. It delivers real-time visibility into process development laboratories and GMP manufacturing environments, providing sponsors with direct access to operational data as it is generated.

By linking information across R&D, analytical development, and manufacturing operations, the platform is designed to support closer coordination, faster decision-making, and more efficient technology transfer.

The launch is another component of Shilpa Biologicals' wider strategy to elevate the global CDMO experience from transactional outsourcing to a fully integrated, partnership-driven model.

The platform has also been designed with data integrity and sponsor confidentiality as core principles, and aligned with the expectations of global regulatory authorities - including the US FDA, EMA, and PMDA - it enables a continuous state of audit readiness.

Madhav Bhutada, Director, Shilpa Biologicals, commented, "With PartnerPowerTM, we are setting a new global benchmark for what transparency in a CDMO partnership should look like. It allows our sponsors to innovate with complete confidence, knowing that every data point, every decision, and milestone is visible to them in real time."

Central govt amends drug price rules, packaging factors to count in ceiling rates

LAXMI YADAV, MUMBAI

THE central government has amended the Drugs (Prices Control) Order, 2013 (DPCO) to allow separate ceiling or retail prices for the same medicine, factoring in packaging type, pack size, dosage compliance, and therapeutic rationale.

The Drugs (Prices Control) Amendment Order, 2026, notified by the DoP on June 30, empowers the government to fix differentiated prices for formulations that conform to Indian Pharmacopeia or other standards under the Drugs and Cosmetics Act.

In a significant change, Paragraph 11(3) has been revised. The earlier reference to injections and inhalations has been omitted, and the provision now allows the government to fix separate prices for any drug, either on application by the manufacturer or otherwise, provided there is a specified therapeutic rationale. Pricing decisions may now consider packaging type, pack size, dosage compliance, or the content in the pack — whether liquid, gaseous, or any other form — as long as the formulation meets statutory standards.

Chakravarthi AVPS, Global Ambassador of the World Packaging Organization and Chairman of Federation of Pharma Entrepreneurs (Telangana & Andhra Pradesh), hailed the move as a turning point. "This amendment marks a shift from viewing packaging as a mere commercial detail to recognising it as a determinant in pricing decisions. It is an important evolution in India's pharmaceutical pricing framework," he said.

The amendment also modifies Paragraph 14(2), which deals with liability for overcharging. Manufacturers selling a scheduled formulation above the ceiling price and local taxes remain liable to deposit the overcharged amount with interest. However, liability is now restricted to the quantity of stock actually traded through distributors or retailers found to have effected such overcharging, provided the manufacturer has complied with past price revisions.

Paragraph 15(2) has been updated to ease compliance for manufacturers. While existing manufacturers of drugs listed in the National List of Essential Medicines (NLEM) must still apply for prior price approval when launching a new drug, other manufacturers introducing the same drug within twelve months of its retail price fixation will not need to apply afresh. Instead, they must submit details in the newly introduced Form IA within one month of launch. The form requires disclosure of formulation name, manufacturer and marketing company details, composition as approved by regulators, date of commencement, pack size, therapeutic category, launch price, and the latest government-notified price. Failure to comply will attract liability for overcharging, along with interest and penalties.

Complementing this, Paragraph 15(6) has been replaced to stipulate that no manufacturer may launch a scheduled formulation at a price higher than the latest retail price (plus local taxes) fixed by the government during the preceding twelve months. Violations will result in repayment of the overcharged amount with interest and penalties, ensuring uniformity in pricing for new launches.

On price revision norms, Paragraph 24(1) clarifies that overcharged amounts will be calculated solely on the stock handled by each retailer, distributor, or stockist found selling above the ceiling price plus local taxes, pertaining to that batch. Manufacturers must demonstrate compliance by circulating revised price lists to dealers and retailers, publishing advertisements in at least two national newspapers within two weeks of notification, issuing supplementary price lists in Forms V or VI, and creating a dedicated DPCO section on their company homepage. They must also submit batch-wise production and stock details at the time of price revision.

These changes tighten compliance provisions and extend record-keeping obligations to seven financial years, giving regulators greater oversight of sales and stock positions. Liability for overcharging is now more targeted, focusing on actual stock sold above the ceiling price rather than blanket penalties.

Chakravarthi noted that the amendment goes beyond procedural reform. "A well-designed package does much more than protect a product. It can improve patient compliance, reduce medication errors, enable accurate dosing, enhance safety for children and the elderly, and support better treatment outcomes. Packaging is the Second Physician," said the packaging veteran.

He added that while the amendment does not explicitly state that packaging improves therapeutic outcomes, it acknowledges that packaging-related factors and dosage compliance may justify differentiated pricing when backed by therapeutic rationale. "The revised provisions also make implementation more practical, bringing clarity to price revisions, simplifying requirements for follow-on launches, and establishing a balanced compliance framework for manufacturers who communicate changes promptly across the supply chain," he observed.

Looking ahead, Chakravarthi stressed that the real test lies in how the National Pharmaceutical Pricing Authority (NPPA) operationalises these provisions. "Clear guidance on what constitutes an acceptable therapeutic rationale, along with a transparent and consistent evaluation process, will be essential to encourage meaningful innovation while safeguarding affordability," he said.

Having spent over four decades in pharmaceutical packaging, he concluded, "This amendment is a progressive step towards aligning patient-centric design, regulatory science, and healthcare outcomes. It is not the final destination — but it is certainly a step in the right direction. When packaging improves adherence, reduces errors, and helps patients take medicines correctly, it ceases to be a cost. It becomes part of the therapy."

HighRes and Waters collaborate to advance drug discovery through robotic automation

OUR BUREAU, MUMBAI

HIGHRES has announced a strategic collaboration to enable robotic capabilities on Waters Biosciences, formerly BD Biosciences, flow cytometers to automate key experimental steps and streamline research workflows, from basic research to drug discovery.

The companies are integrating the BD FACSLyric Flow Cytometer with the HighRes Nucleus Automation and Cellario Software Platforms, enabling scientists to utilise robotic arm capabilities to run reliable, complex, multi-step experiments unattended with continuous operation of up to three times more experimental runs per day. The integration enables higher-throughput studies, improves reproducibility, and allows for greater operational efficiency.

"The BD FACSLyric Flow Cytometer, when paired with HighRes automation, is an ideal solution for laboratories running complex flow cytometry studies that demand scale and precision, including for higher volumes of experiments. This collaboration exemplifies our long-term commitment to advancing robotic automation across our complete portfolio of flow cytometers, unlocking a new dimension of automation for research and biopharma partners aiming to bring their potentially life-changing therapies to market even faster," said Eric Diebold, Vice President and General Manager, Instruments & informatics, Waters Biosciences, Waters Corporation.

"With this collaboration, scientists can run more experiments per day with consistent quality, reduce hands-on time from hours to minutes, and design assays that were previously too complex or time-sensitive to automate – with every step tracked for complete data integrity and reproducibility. By combining BD's expertise in flow cytometry and HighRes' leadership in lab automation, we are enabling more labs around the world to operate with true end-to-end confidence," said Ira Hoffman, CEO, HighRes.

Pluss Advanced Technologies launches reusable temperature-controlled packaging solution for healthcare

OUR BUREAU, MUMBAI

GURUGRAM-based Pluss Advanced Technologies, a leading material science company and pioneer in Phase Change Material (PCM) technology, has announced the launch of Celsure Endura, a new range of reusable temperature-controlled shipping solutions designed to ensure reliable transportation of temperature-sensitive products across diverse climatic conditions.

As pharmaceutical, biotechnology, diagnostics and healthcare supply chains become increasingly dependent on precise temperature control, organisations are seeking solutions that can deliver product integrity while improving operational efficiency and sustainability. Celsure Endura has been developed to address these evolving requirements through advanced PCM technology, offering precise temperature maintenance, extended thermal protection and reduced logistics costs.

Engineered for demanding transportation environments, the Celsure Endura range is available across multiple temperature profiles, including 2–8°C, 15–25°C and -15°C to -25°C, making it suitable for a broad spectrum of pharmaceutical, biotech, clinical trial and healthcare applications.

The reusable shippers provide more than 120 hours of temperature protection, have been validated for 45°C summer exposure as well as extreme winter conditions, and enable a single operating protocol throughout the year. Its lightweight, reusable design enables cost-efficient transportation while enhancing product safety and sustainability.

The launch reinforces PLUSS' focus on developing science-led innovations that address real-world industry challenges. By combining advanced materials research with practical logistics applications, the company continues to support businesses in enhancing supply chain reliability while reducing their environmental footprint.

Strengthening pharma supply chain security requires a multi-layered approach: ASPA

OUR BUREAU, MUMBAI

THE Authentication Solution Providers' Association (ASPA) welcomes the Government of India's initiative to strengthen oversight and traceability within the pharmaceutical packaging ecosystem. Enhancing accountability and transparency in pharmaceutical packaging is an important step toward safeguarding patient safety and combating counterfeit medicines.

While the proposed registration framework for packaging suppliers is a positive move, registration alone may not fully address counterfeiting risks. ASPA recommends adopting Authentication and Traceability Solutions (ATS) alongside registration to create a more secure and reliable supply chain.

ASPA believes any regulatory framework should balance stronger oversight with ease of compliance, particularly for small and medium-sized enterprises, while encouraging standardized security practices across the pharmaceutical packaging ecosystem.

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Diverse technologies, common goal.

CDSCO weighs curbs on pharma brand extensions

OUR BUREAU, MUMBAI

THE Central Drugs Standard Control Organization (CDSCO) has invited public comments on whether pharmaceutical companies should be allowed to market multiple drug formulations under the same brand name with different extensions.

The move follows deliberations at the 67th Drugs Consultative Committee (DCC) meeting held on November 17, 2025, where members discussed concerns that brand name extensions could mislead consumers. A representation before the committee alleged that a company was selling drugs with different active ingredients under one established brand name, potentially creating confusion about therapeutic use.

In its notice dated July 6, 2026, the CDSCO said, "Concerns have been raised that the use of the same brand name for drugs with different active ingredients may mislead consumers and create confusion regarding their therapeutic use." The regulator has now uploaded the DCC's recommendations on its website and asked stakeholders to submit comments by July 17, 2026, via email.

Industry experts note that brand name extensions are a common marketing practice in India's Rs 2-lakh-crore pharmaceutical market, often used to leverage consumer familiarity. However, critics argue that such extensions blur distinctions between formulations, raising risks of inappropriate use. Globally, regulators including the US FDA and EMA have issued guidance discouraging brand names that could cause medication errors.

The CDSCO's consultation is expected to draw strong responses from both industry and healthcare professionals. While companies may defend extensions as brand equity tools, patient safety advocates are likely to push for stricter rules to prevent confusion.

The final decision could reshape marketing strategies in India's pharma sector, where brand loyalty often drives prescription choices.