

From discovery to delivery

The technologies reshaping
global biopharma

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Table of content

Introduction	03
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What is driving the biopharma industry currently?	04
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Precision medicine – generating integrated therapeutic ecosystems	04
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Artificial intelligence becoming the competitive advantage in drug development	05
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Manufacturing becomes an intelligence layer with smart factories	06
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Regulatory evolution – Regulating with the digital biopharma	07
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Conclusion	08
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Introduction

The global biopharma industry is undergoing a profound transformation. Driven by the adoption of advanced AI based drug development solutions, and a growing emphasis on novel biologic therapies with a focus expanding beyond oncology (metabolic, cardiovascular therapies) there is a slow but steady shift towards precision health. On one hand where AI is moving from pilot phases to large scale deployment across the drug development value chain, there is a simultaneous investment in next gen therapies such as Radiopharmaceuticals, RNA based therapeutics, and Cell and Gene therapies altogether reconfiguring the biopharma industry dynamics like never before.

Despite rising cost containment pressures, impending patent expirations and subsequent generic and biosimilar competition, the industry is turning these challenges into opportunities through increased deal-making, licensing partnerships, and M&A activity. Beyond R&D, manufacturing is also going more digital with greater use of AI, analytics, and real-time monitoring to improve efficiency and compliance. Overall, innovation is no longer a phenomenon associated with developed markets. Countries across Asia Pacific, Latin America, and the

Middle East are investing aggressively in localization, genomics infrastructure, and digital capabilities to reduce import dependence and capture value in high-growth therapies.

The Middle East and Africa region, which is valued at \$58.66 Billion as per Frost & Sullivan's analysis in our recent report **on Growth Opportunities in the Global Pharmaceutical Industry, 2026¹**, capturing 3.6% of the global pharma market share in 2025, is particularly well positioned owing to the governments combining healthcare reform with national strategies for biotechnology, AI, digital infrastructure and local manufacturing. Saudi Arabia's National Biotechnology Strategy targets a global biotechnology hub by 2040, while the UAE's National Genome Strategy is building infrastructure for personalized medicine, and Abu Dhabi's HELM (Health, Endurance, Longevity, and Medicine) cluster, positions the region as a strategic hub for biopharma expansion.

What is driving the biopharma industry currently?

Precision medicine – generating integrated therapeutic ecosystems

Most therapies manufactured today continue to follow a one-size-fits-all approach, developed for large patient populations despite significant biological differences among individuals. Although targeted therapies have gained traction in certain therapeutic areas such as oncology and rare diseases, much of healthcare still relies on generalized treatment approaches. Nevertheless, with precision medicine slowly taking center stage, treatment patterns are transitioning from being treatment centric to 'Patient Centric' with the integration of genomic, transcriptomic, proteomic, clinical and real-world data.

According to Frost & Sullivan Analysis in our recent report, **Future of Biopharma Industry, 2040²**, a convergence of pharmacogenomics and theranostics is evident which not only allows identification of newer indications for existing treatments but also support real time patient monitoring by delivering a targeted therapy to the same molecular target. While companies such as Roche, Merck, BMS, etc., lead with oncology drugs targeting multiple receptors including HER2, EGFR, ALK, BRAF; companion diagnostics facilitate constant monitoring with timely treatment assessment. On the other hand, radioligand therapies are a great example of successful application of theranostics dominated

by companies like Novartis. As the industry moves into the next decade of innovation, by 2040, precision medicine will pave way for **integrated multi-modal ecosystems** where diagnostics, therapeutics, data and clinical decision-making work together.

As per Frost & Sullivan's analysis, precision medicine in the Middle East region replicates a similar growth pattern to that of the developed markets with an expected double-digit growth of over 10% in the next 5-7 years. Across the region, programs such as the Emirati Genome Program, Saudi Arabia's Human Genome Program (SGP), and many more are designed around securing a robust genomics infrastructure alongside strategic global partnerships to support precision medicine R&D. For instance, in 2025, Lifera announced partnerships with MSD, Pfizer, Sanofi and GSK for vaccine localization, alongside initiatives covering cell and gene therapy and genomic screening. In the long term, these initiatives will blend global modality innovation with Middle Eastern genomic depth, accelerating precision approaches tailored to local populations.

Artificial intelligence becoming the competitive advantage in drug development

AI is rapidly emerging as the industry's most powerful productivity lever. With the help of generative models for de novo design, protein structure prediction, clinical trial simulation and predictive analytics-based manufacturing AI is slowly embedding itself across the drug development value chain. With more than 40 AI discovered drugs having successfully entered clinical trials, the discussion has moved past from "whether AI is the future?" to "what is your company's AI readiness?"

In line with this transformation, big tech vendors and specialized AI firms are becoming co-orchestrators in R&D, supplying computational and foundation models, data platforms that biopharma companies integrate into R&D workflows. **Middle East** is also not far behind. Large number of stakeholders, across various industries, indicate AI adoption within their business value chains. In terms of the pharma

industry in the region, Big IT giants such as Microsoft have committed a \$15 billion investment in UAE AI infrastructure from 2023 up to 2029. Insilico Medicine's Abu Dhabi center successfully nominated the UAE's first fully AI-discovered preclinical candidates in 2025, including oncology and non-opioid pain assets, completing discovery workflows in under 12 months using local compute and talent. As the Middle East region continues to witness a surge in localized patient databases, in the next 10-15 years, it can bridge the gap between researchers and biopharma companies to build truly regional disease models and drug discovery networks.



Manufacturing becomes an intelligence layer with smart factories

As precision medicine expands technologies including AI, digital twins, IoT sensors, and continuous or modular processing are becoming essential providing the much-needed agile manufacturing models. Tools such as digital twins and advanced analytics are creating real-time visibility across assets and processes by simulating production changes, while predictive analytics identify deviations, equipment failures and supply risks. Companies such as Sanofi harnessed Dassault Systemes' digital twin technology to step up its vaccine manufacturing game.

Smart manufacturing, however, cannot operate in silos from supply chains. Especially precision therapies require specialized packaging materials, cold-chain capabilities and, in some cases, patient-specific logistics making it an integral part of the manufacturing infrastructure. More specifically in the Middle East, where manufacturing is a strategic priority, companies such as Mubadala launched Mubadala Bio in 2025 to strengthen local manufacturing and

pharmaceutical logistics. Lifera also signed a MoU with Novo Nordisk with the aim of localizing manufacturing of advanced GLP-1 treatments for diabetes and obesity thus stabilizing the supply chains. Moving forward, the biopharma factory of 2040 will be connected from raw-material procurement through production and distribution with the help of federated supply ecosystems. These ecosystems will essentially pave way for **hyper personalized manufacturing** at scale allowing single patient GMP normalization. On the other hand, companies will also provide ESG differentiated Manufacturing solutions with a specific focus on green bioprocessing combining the much talked about digital revolution with energy optimization and process efficiency.

Regulatory evolution - Regulating with the digital biopharma

Traditionally, regulatory processes involved complex and manual paper-based workflows, sequential reviews and relatively static datasets that were captured in silos. As modern healthcare increasingly relies on data capture via connected systems, wearables, genomics platforms and real-world data sources, it is imperative for global regulatory agencies to adapt to this reality by embracing digital submissions, real-world evidence, AI validation frameworks, decentralized clinical trials, and advanced analytics. As a result, the regulatory scenario is evolving towards risk based adaptive framework that accommodates AI/ML, advanced manufacturing techniques, and RWE with agencies such as FDA and EMA issuing guidance on algorithm transparency, lifecycle management of learning systems, and cybersecurity.

Middle East is no different, with regional governments such as Saudi Arabia's SFDA also publishing dedicated guidance on AI/ML-enabled medical devices (MDS-G010)

covering validation, data quality, and human oversight amongst other areas. Similarly, UAE's Department of Health has created agile pathways supporting novel therapies and clinical research growth. These regional approaches complement international harmonization efforts and position the Middle East as a testing ground for digital-ready regulation that balances innovation speed with patient safety. In the coming decade, leveraging opportunities around building inter-operable and risk based regulatory frameworks with the real-time application of autonomous cloud systems, AI/ ML algorithms and controlled data environments will become increasingly important as technology companies become embedded in healthcare and life-sciences ecosystems.



Conclusion

As next generation therapies such as CGTs, RNA therapeutics and radiopharmaceuticals expand the boundaries of precision health, AI is emerging as a foundational capability for discovery, development, manufacturing, and commercialization. Developing infrastructure for smart factories, resilient supply networks, and adaptive regulatory frameworks is no longer an opportunity to explore but a strategic imperative to build an interconnected ecosystem.

For the Middle East, this transformation means becoming an active contributor to biopharma industry through sustained investments in genomics, AI infrastructure, advanced manufacturing systems and associated regulatory upgrades. By 2040, middle eastern countries including KSA, UAE are set to emerge as regional hubs not only for biopharma innovation spanning the entire value chain but also as critical partners in shaping the future of personalized, data-driven, and digitally connected healthcare.

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