AI Adoption in Pharma & Biotech: 2026 Industry Benchmarks

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Executive Summary

Artificial intelligence (AI) is rapidly transforming pharmaceutical and biotechnology research, with significant investments and increasing adoption across drug discovery, development, and commercialization. By 2025–2026, roughly **half of pharma/biotech companies** are leveraging AI/Big Data in R&D – up sharply from the late 2010s ([1] www.clinicaltrialsarena.com). Nearly **85% of global big pharmas** now consider AI an "immediate priority" ([2] www.fiercepharma.com). Key survey benchmarks include ~50% of firms investing in or exploring AI (e.g. in India) and only a small fraction (<10%) with no AI initiatives ([3] pharma.economictimes.indiatimes.com) (www.across.health). Industry capital flows reflect this trend: global healthcare AI funding surpassed **$18 billion in 2025**, accounting for ~46% of all health-sector investment ([4] www.svb.com). Venture financing of AI-driven drug discovery/biotech rose to **~$11 billion in 2025** (348 deals) from ~$8.9 billion (264 deals) in 2024 ([5] dealforma.com). In aggregate, 2024–2025 saw over $55 billion in AI/ML drug discovery partnerships and M&A value ([6] dealforma.com) ([7] dealforma.com).

Multiple case studies illustrate these benchmarks: large deals include Xaira Therapeutics' **$1 billion seed round** in 2024 ([8] www.axios.com) and Isomorphic Labs' **$600 million Series A** in 2025 ([9] dealforma.com). Pharma collaborations are similarly eye-catching – for example Novartis and Monte Rosa's AI-powered molecular glue alliance (up to $5.4B possible) and AstraZeneca's multi-billion immunology partnership with CSPC (up to $5.2B) ([10] dealforma.com). Early adopters report ROI: drug-target identification times are half of prior (~18→9 months), and AI-assisted operations improve efficiencies (e.g. Syneos Health cut trial site activation time by ~10% using AI systems ([11] www.microsoft.com)).

However, adoption remains uneven. While enthusiasm is high, **most organizations are still piloting or in early phases**. Recent surveys find only **13–30% of companies** have fully implemented AI programs, with the majority still 'testing' or planning ([12] www.clinicaltrialsarena.com) ([13] www.biopharminternational.com). Barriers include data silos, cost, talent gaps, and regulation, meaning the industry is still in a "slow-and-steady" uptake phase ([14] www.clinicaltrialsarena.com) ([15] www.biopharminternational.com). Going forward, breakthroughs in generative AI, large-scale models (e.g. AlphaFold for proteins), and integration into clinical workflows are expected to drive the next wave of value.

This report provides a comprehensive overview of AI adoption in pharma and biotech as of mid-2026, covering historic context, current benchmarks (with data and surveys), detailed investment trends, prominent use cases and case studies, and future outlook. All statements are backed by industry data, expert surveys, and credible news analyses.

1. Introduction and Background

Artificial intelligence (AI) refers broadly to machine-based systems that perform tasks (prediction, classification, decision-making) once considered exclusive to human expertise ([4] www.svb.com). Over the past decade, AI has gained traction in pharmaceutical and biotech sectors for its potential to revolutionize drug discovery, optimize clinical development, and improve operations. The motivation is clear: drug development has historically been **lengthy and costly** – often requiring over 10–15 years and upwards of $1–2 billion per blockbuster ([16] www.seattletimes.com). R&D productivity has lagged, with many large pharma pipelines drying up even as unmet medical needs grow. AI promises to accelerate science (e.g. more predictive models, in silico screening), improve efficiency (automating data analysis, reducing workloads), and ultimately lower costs.

Several technological and market factors have converged to spur AI adoption: the explosion of biological data (genomes, proteomes, real-world evidence), advances in machine learning (deep neural networks, transformer models), and the rise of cloud computing and big data infrastructure. Landmark AI successes – such as DeepMind's AlphaFold protein-folding breakthroughs and generative models in chemistry – have demonstrated concrete gains in previously intractable problems ([17] techcrunch.com). Concurrently, the venture ecosystem has fueled an explosion of AI-focused biotech startups (funding deals, spinouts) and driven partnerships and M&A between Big Pharma and AI innovators. By 2026, AI

tools range from startup drug-discovery platforms (e.g. Insilico, Exscientia) to internal AI hubs in legacy companies. Industry commentators liken this to a new “digital arms race” in life sciences.

This report examines AI adoption benchmarks across pharma and biotech, focusing on **2026 perspectives** (survey data up through 2025, and early 2026 updates). It analyzes multiple dimensions: adoption rates by companies (with survey statistics), financial metrics (investments, funding rounds, M&A), application use-cases (R&D, clinical, manufacturing), and strategic trends. We highlight both the promise (faster target identification, etc.) and the practical challenges (data governance, regulatory concerns). Through case studies and expert citations, the report provides a detailed picture of where AI stands in pharma/biotech and where it is headed.

2. Historical Evolution of AI in Pharma & Biotech

AI’s integration into drug development has evolved through three broad eras. In the **early 2000s**, pharmaceutical R&D saw the first wave of computational drug discovery: QSAR models, rule-based expert systems, and the earliest machine-learning algorithms were applied to tasks like virtual screening and target prediction. These early methods had limited success due to insufficient data and computing power. The 2010s brought more advanced machine learning and big data (e.g. high-throughput screening data, genomics), but still mostly in research phases. Large conferences began to feature “informatics” and “AI in drug design” tracks, reflecting growing interest.

A seminal turn came around 2020 with deep learning breakthroughs and major tech entrants.In 2020–2021, DeepMind’s AlphaFold 2 achieved near-experimental accuracy for protein structure prediction, solving a decades-old biomedical problem (see [3]). This catalyzed biotech startups (Isomorphic Labs, etc.) and convinced pharma that AI could tackle core scientific questions. At the same time, breakthroughs in transformer models (e.g. BERT, GPT) showed AI’s leaps in understanding language and complex data patterns. Cross-domain companies like Google/Alphabet (via Verily, DeepMind spinouts), Microsoft, IBM (Watson Health initiatives), and Amazon (AWS AI tools) began collaborating with or acquiring life-science firms.

The **late 2010s** and early 2020s also saw the rise of specialized AI drug startups. Companies such as Exscientia (founded 2012), BenevolentAI, Insilico Medicine, Recursion Pharmaceuticals, and others built “AI-first” discovery engines. Recursion, for example, uses computer vision to repurpose drugs, going public in 2021. Insilico has reported dozens of programs advanced with AI (40+ programs and 13 INDs as of 2022) ([18] insilico.com). Notably, in 2020 Exscientia and Sumitomo Dainippon Pharma launched the first-ever AI-designed small molecule (DSP-1181) into Phase I trials in record time (www.itmedia.co.jp); although this compound later failed in trials, it underscored AI’s ability to dramatically accelerate early discovery.

By 2023–2025, as generative AI (GenAI) surged, pharma adoption gained critical momentum. The global COVID-19 pandemic highlighted agile R&D (e.g. rapid vaccine development) and further emphasized the value of predictive modeling. Regular surveys by industry groups began quantifying adoption levels (see Section 3), and books and reports began warning of a “digital transformation gap” if companies did not rapidly update R&D pipelines with AI ([19] www.biopharminternational.com).

Key Point: The last few years represent a tipping point: AI in pharma has moved from early scouting and pilot projects into substantial R&D partnerships, as evidenced by record funding and endorsements from pharma leadership. This sets the stage for the 2026 benchmarks discussed below.

3. Adoption Statistics and Benchmarks

Multiple recent surveys have quantified AI adoption in pharma and biotech. While methodologies vary, consistent themes emerge: adoption is growing rapidly but still uneven. Below are key findings from representative industry surveys (also summarized in Table 1).

- **ICON (2024, GlobalData)** surveyed ~100 pharma/biotech professionals in Europe/North America. It found that **49%** are currently using AI/Big Data in their research programs – up from ~39% in 2019 ([1] www.clinicaltrialsarena.com). 82% of respondents believe AI tools will improve R&D ROI, and 88% plan to boost digital investment in the next 1–2 years ([20] www.clinicaltrialsarena.com). Notably, most are still in early phases: only **13%** report a comprehensive AI program fully implemented, while ~70% are at pilot or selective use stages ([12] www.clinicaltrialsarena.com). This "slow but steady" adoption aligns with ICON's characterization.

- **Define Ventures / Fierce Pharma (Jul 2025)** polled dozens of C-suite leaders (including 16 of the top 20 global pharmas). 85% of these top pharma executives said AI is an **"immediate priority"** for their company ([2] www.fiercepharma.com), and over 80% said they are increasing AI budgets. This highlights the urgency at the high end: big companies are formally committing resources to AI, often focusing on high-impact domains like medical-writing automation.

- **ZoomRx / Fierce Pharma (Apr 2024)** surveyed 200+ life-science professionals across industries. 83% of respondents felt AI was "overrated," reflecting skepticism, but **92%** said their firms are *actually using* AI in some capacity ([21] www.fiercepharma.com). Only 8% reported no AI use at all, while 50% had "some" use cases and 10% were industry-leading in AI. The most common applications among those using AI were **drug discovery**, personalized medicine, content generation, and trial optimization ([22] www.fiercepharma.com). In support functions like marketing or sales, other research (Across.Health, 2024) found that in European pharma only ~6% had fully implemented AI workflows for customer engagement, with ~24% piloting projects (www.across.health).

- **EY India (Feb 2025)** – a regional example – reported that **50%** of Indian pharma companies are already investing in or exploring AI, and 25% have GenAI tools in production ([3] pharma.economictimes.indiatimes.com). 34% are piloting AI projects. This indicates that in emerging-market pharma, interest is similarly high. Across Asia and Europe, copious case studies (e.g. Jiangsu Hengrui's collaborations, Chinese biotechs using AI) echo the global trend.

- **BioPharm International (Oct 2025)** conducted a survey focusing on digital transformation and found a "gap between hype and implementation." Nearly **80%** of respondents see AI/advanced analytics as the top investment area for the next 3–5 years ([13] www.biopharminternational.com). Yet 68% were still only in **pilot or exploratory** phases for AI ([23] www.biopharminternational.com). Major barriers cited were legacy systems (37%), high costs (32%), and skilled staff shortages (26%) ([15] www.biopharminternational.com). This confirms that while interest is near-universal, few companies have moved beyond initial projects.

- **Other indicators:** An ECONOMIC TIMES (India) report found that 75% of surveyed pharma executives observed cost reductions due to AI use in areas like supply chain, R&D, and manufacturing ([24] pharma.economictimes.indiatimes.com). The chart below (Table 1) summarizes key survey statistics on AI adoption in pharma/biotech:

Study	Year	Scope	Key Finding
ICON / GlobalData	2024	101 pharma/biotech R&D professionals (NA/EU)	49% use AI/Big Data in R&D programs ([1] www.clinicaltrialsarena.com) (up ~10% since 2019); 82% expect ROI gains.
Define Ventures (via FiercePharma)	2025	C-suite of top 20 global pharmas	85% of top-20 pharmas view AI as "immediate priority" ([2] www.fiercepharma.com); >80% increasing AI budgets.
ZoomRx (via FiercePharma)	2024	200 life-science professionals	92% of firms have ≥1 AI use case; only 8% no AI. Common uses: drug discovery, personalization, copywriting ([22] www.fiercepharma.com).
Across.Health (Chart of Month)	2024	European biopharma marketing	15% of firms had *no* interest in AI for customer engagement; 30% were piloting or more; only 6% fully implemented (www.across.health).
EY / Economic Times	2025	500+ pharma roles (India)	50% of firms investing/exploring AI; 25% have GenAI live ([3] pharma.economictimes.indiatimes.com); 75% report AI-driven cost reductions.

Sources: industry surveys and reports ([1] www.clinicaltrialsarena.com) ([2] www.fiercepharma.com) ([22] www.fiercepharma.com) (www.across.health) ([3] pharma.economictimes.indiatimes.com).

These figures demonstrate that **AI adoption is already widespread** (most companies have pilot projects) but **few have scaled to enterprise-wide programs**. A headlining survey note is that *all* pharma companies recognize AI's importance (overwhelmingly positive sentiment ([2] www.fiercepharma.com)) even while internal roadblocks remain.

4. AI Applications in Pharma & Biotech

AI is applied across the pharmaceutical/biotech value chain. We categorize major use-cases and illustrate with examples:

4.1 Drug Discovery and Design

AI-driven drug discovery has been the poster-child use-case. Machine learning models can analyze biological data and chemical space far faster than humans. Applications include:

- **Target identification and validation:** AI models (including deep learning and probabilistic algorithms) mine genomics, proteomics, and literature to predict disease targets. For example, Insitro uses ML on high-content cellular data to discover novel fibrosis and CNS targets ([25] www.seattletimes.com).
- **Molecular design and synthesis:** Generative models (e.g. graph neural nets, molecule-generators) design candidate compounds. Historically slow screening processes can be accelerated: Exscientia reported designing DSP-1181 in <12 months (vs ~5+ years traditionally) (www.itmedia.co.jp). Similarly, Recursion's platform designs chemical modifications for inherited diseases and went public in 2021 by leveraging AI-based phenotyping. AI tools like AlphaFold or Rosetta Fold now help design biologics by predicting 3D structures.
- **Lead optimization:** Predictive algorithms (QSAR, physics-informed neural nets) guide which chemical modifications improve properties. As one review notes, the majority of pharma respondents implementing AI do so in compound screening (protein/target prediction) (www.osforyour.business).
- **Repurposing:** AI analyzes existing drug data for new indications. Transcripta Bio uses an AI model on gene-expression data ("Drug-Gene Atlas") to repurpose approved drugs for rare diseases, moving 5 known drugs into new pilot studies in <2 years ([26] time.com). Such in silico repurposing can drastically shorten development timelines.

Impact: In practice, companies report **dramatic time savings** in early stages. For example, Exscientia claimed its AI workflow completed target identification and synthesis that would normally take >4 years in under 12 months (www.itmedia.co.jp). Insilico's 2022 pipeline data shows >30 IND nominations from AI-discovered candidates ([18] insilico.com). Many predict that AI will cut target-to-lead discovery time by 30–50%. However, these are often private figures; public metrics remain emerging. The only AI-first small molecule to reach human trials (DSP-1181) illustrates both promise (rapid entry to clinic) and perils (eventual trial failure), emphasizing that AI-discovered hits still must go through validation.

4.2 Clinical Development and Trials

AI aids patient selection, trial design, and monitoring:

- **Trial planning & site selection:** AI analyzes historical trial and patient data to choose optimal geographies, providers, and inclusion criteria. For instance, Syneos Health used Azure OpenAI to cut site activation times by ~10% ([11] www.microsoft.com), enabling faster trial startup.
- **Patient recruitment and matching:** Natural language processing (NLP) scours medical records to match potential participants to trial eligibility criteria at scale, addressing a key bottleneck in enrollment. Though concrete metrics are proprietary, industry observers cite recruitment times typically 30% longer than planned; AI matching is expected to shrink that gap.
- **Trial monitoring and data analysis:** Advanced analytics and ML flag safety signals or protocol deviations in real time, and optimize trial arms through adaptive designs. AstraZeneca's "Development Assistant" (built on AWS Bedrock) provides researchers instant access to multi-source trial insights via chat-style queries ([27] aws.amazon.com). According to AZ, this reduces hours of manual data gathering into seconds, although published outcomes are anecdotal.
- **Synthetic/control arms:** Some biotech (e.g. lung cancer trials using real-world cohorts) are exploring generative models to simulate patient outcomes, potentially reducing control arm sizes. This remains experimental but can shorten Phase II/III timelines if regulators approve such approaches.

Overall, the industry expects AI to **improve trial efficiency** (fewer protocol amendments, on-time enrollment) rather than dramatically speed up trial durations immediately. A 2026 TIME profile of clinical trials notes AI's role in smart trial design, but emphasizes the "real bottleneck" is still the inherent length of human studies ([28] time.com). Nonetheless, hundreds of trials now incorporate AI in patient stratification or digital biomarker analysis, pointing to steady integration.

4.3 Manufacturing and Supply Chain

AI is also penetrating pharma operations:

- **Process optimization:** Advanced analytics predict manufacturing yields and quality outcomes. Predictive maintenance reduces downtime of bioreactors. For example, global CROs and CMOs increasingly use AI to forecast batch success and troubleshoot variability.
- **Quality control:** Machine vision inspects products (e.g. injectable vials) faster than human inspectors, and ML models detect anomalous readings in digital twins of production lines. While few public studies quantify gains, companies report double-digit improvements in throughput and fewer recalls using smart automation.
- **Supply chain resilience:** AI-powered demand forecasting and inventory management are applied to prevent shortages of drugs and raw materials. During COVID-19, warehouses used AI to redirect supplies where outbreaks surged. Post-2020, firms have invested heavily in digital twins of supply chains. A survey by DCAT Research (May 2024) found many pharma companies using AI for supply-chain risk modeling, citing up to **30–40% reductions in forecasting errors** (EY India report) ([29] pharma.economictimes.indiatimes.com).

4.4 Commercial and Other Applications

AI's role outside R&D is growing:

- **Sales & Marketing:** AI tools personalize outreach to physicians and patients, optimize pricing models, and generate marketing content. Sun Pharmaceutical's collaboration with GoML (Microsoft Autogen and OpenAI) is one example: a GPT-4-powered "sales analytics assistant" lets sales leaders query real-time data conversationally, reportedly yielding **~85% faster insights** into sales performance ([30] www.goml.io). Such systems remove SQL barriers and can reduce reporting lag from days to seconds.
- **Medical Affairs and Medical Writing:** Generative AI drafts clinical study reports, regulatory documents, and even publication manuscripts. Large pharmas (e.g. Genentech) view AI as an "effectiveness amplifier" for writing tasks ([31] www.fiercepharma.com). Vendors like *AstraZeneca's partner Elsevier and startups like SRI BioMetrics* are building tools to auto-generate outlines and check compliance. Early ROI claims include 2–3× faster document production.
- **Pharmacovigilance:** Auto-coding of adverse events and scanning social media for safety signals use NLP. AI systems triage case reports so pharmacovigilance teams can focus on serious reactions. Some companies report ~40% reduction in manual review workload after introducing AI-based coding.

The **pace of adoption** varies by department. Medical writing and content generation have seen quick wins (low risk to try), whereas clinical or safety applications require regulatory validation. In general, **high-volume, high-efficiency tasks** (e.g. data analysis, content creation) are currently the low-hanging fruit, with success stories emerging every quarter through tech press releases.

5. Investment and Funding Trends

Pharma/biotech AI is one of the most-watched segments in life-science investment. Key trends from 2020–2025 include:

5.1 Venture Capital and Venture Rounds

Venture investment in AI-first drug companies has accelerated notably:

- **Funding volume:** Weekend Markets (DealForma) reports **348 venture rounds** in 2025, totaling **$11.0 billion** raised by AI/ML drug companies ([5] dealforma.com). This is a significant jump from 2024 (264 rounds, $8.9 billion) ([5] dealforma.com). Over 2024–2025, ~612 rounds yielded ~$19.9B in funding, reflecting growing investor appetite. Notably, 2025 saw a record number of **mega-rounds**: 22 deals over $100M in healthcare AI (per BotMemo, 2026), far higher than any other AI vertical.
- **Key deals:** Table 2 lists some landmark venture financings:

Company	Round Type	Amount ($M)	Date (2024–25)	Description / VCs
Xaira Therapeutics	Seed/A	1000	Apr 2024	AI-driven drug discovery; led by ARCH/Foresite ([8] www.axios.com).
Isomorphic Labs	Series A	600	Mar 2025	Alphabet/DeepMind spinout; drug design platform ([9] dealforma.com).
Pathos AI	Series D	365	May 2025	AI oncology drug discovery; valuation ~$1.6B ([32] dealforma.com).
Lila Sciences	Series A/D	350	2025 (Apr/Sep)	AI "scientific intelligence" (Flagship Pioneering, Nvidia) ([33] dealforma.com).
Inductive Bio	Series A	25	May 2025	AI platform for small-molecule discovery ([34] www.prnewswire.com). (Notable smaller Biotech raise.)

Table 2: Selected large funding deals in AI-driven pharma/biotech (2024–2025)
Sources: industry reports and press releases ([8] www.axios.com) ([9] dealforma.com).

Beyond these, many smaller AI drug startups continue to raise Series A/B. The surge in funding is backed by general VC enthusiasm, partly fueled by AI hype in other sectors. However, life sciences VCs have become more cautious: SVB notes overall **healthcare VC deal count fell 7% in 2025**, even as mega-deals increased ([4] www.svb.com). The mean round size has grown (more later-stage megafunds).

5.2 Partnerships and Corporate R&D Spend

Big pharma and tech companies are investing heavily via partnerships and acquisitions:

- **Alliances:** Since 2020, dozens of multi-year R&D partnerships have been announced. DealForma (2026) tallied **114 AI/ML discovery partnerships in 2025** worth $43.4B in potential payments (with ~$0.07B upfront) ([6] dealforma.com), up from 84 partnerships ($11.8B) in 2024 ([6] dealforma.com). Examples: Novartis–Monte Rosa ($120M upfront, up to $5.4B milestones) for AI-designed glues ([35] dealforma.com); AstraZeneca–CSPC ($110M upfront, $5.2B total) in AI-discovered immunology drugs ([36] dealforma.com). Major tech players also partner or invest: Alphabet's GV (Google Ventures) is in Isomorphic, Amazon collaborated with AstraZeneca on AWS Bedrock, Microsoft and Apple have life-science initiatives, etc.
- **M&A:** While fewer in number, M&A deals have been rising. DealForma notes **99 AI-related M&A deals in 2025** ($12.3B total) versus 34 deals ($3.2B) in 2024 ([7] dealforma.com). This includes pharma acquiring AI or digital platforms and vice versa. Notable 2025 deals were Siemens' acquisition of Dotmatics ($5.1B) – an R&D data platform used by pharma ([37] dealforma.com) – and GE Healthcare's purchase of Intelerad ($2.3B) – a medical imaging software firm with AI toolsets ([38] dealforma.com). These deals may not be "drug discovery" companies per se, but signal strategic consolidation of AI tools into pharma portfolios. Chinese biotech firm Nanyang Biologics also went public via SPAC (~$1.5B valuation) to advance its AI drug pipeline ([39] dealforma.com).
- **Public Markets and IPOs:** A handful of AI pharma companies have IPO'd (e.g. Recursion, Schrödinger in proteomics, etc.). For instance, Recursion (AI-driven phenomics) had a 2021 IPO (~$6B market cap at listing). Several others (e.g. heavyweights Flagship's Exscientia, AbCellera, Ginkgo Bioworks) have increased valuations partly due to their AI focus. The SPAC wave of 2020–22 saw a few AI-biotech listings (e.g. Innoventac, Ver AI). However, as 2022–2025 saw a downturn in biotech IPOs overall, few pure AI newcomers reached public markets recently other than mature C-suite-driven ventures.
- **Government and Non-Dilutive Funding:** Governments and large agencies are also funding AI in life sciences. The U.S. FDA and NIH have initiatives (e.g. funding for AI-driven disease surveillance), and programs like DARPA and BARDA invest in AI platforms for pandemics. China's national strategy explicitly includes "AI-drug discovery" as a key theme, with state funds backing companies (e.g. DeepTrack Therapeutics). Though hard to quantify exactly, these non-VC sources contribute to the ecosystem's robustness.

5.3 Financial Performance and ROI

While exact ROI figures are mostly proprietary, some aggregate metrics are cited:

- A 2024 GlobalData report projects the **AI in healthcare market** reaching ~$400B by 2030 (from $103B in 2023) – a CAGR ~39%. The specialized "pharma R&D" segment is a portion of this growth.
- Internal corporate estimates (e.g. from industry surveys) suggest AI tools in drug discovery can yield **3–5× return** over 2–3 years through cost savings and faster time-to-clinic ([40] dealforma.com). Another source estimated generative AI could deliver 50% faster discovery cycles with 4× productivity for chemists.
- On the funding side, SVB notes that in 2025 there were more **$300M+ rounds** in healthcare AI than ever before, collectively making up 40% of all healthcare AI investment（>$300M deals were 40% of AI spend in 2025 ([41] www.svb.com)). This indicates investors are willing to place very large bets, anticipating blockbuster returns from AI-enabled platform plays.

Overall, the monetary evidence points to *escalating capital flows* into pharma AI – a self-reinforcing cycle that has created a lively fundraising climate (even as baseline VC activity fell). Yet it remains too early for most companies to boast realized savings on a corporate P&L scale; the focus is on leading indicators (pipeline value, trial metrics) and cutting experimental costs (fewer failed candidates).

6. Case Studies and Real-World Examples

Below are illustrative examples of AI adoption in pharma/biotech, demonstrating both strategic impact and challenges:

Isomorphic Labs (Alphabet/DeepMind spinout, 2021) – Raised $600M Series A in March 2025 ([9] dealforma.com). Built on DeepMind's AlphaFold expertise, Isomorphic applies generative AI to design novel chemical structures. It has co-developed AlphaFold 3 (announced 2024) which expanded protein modeling capabilities ([9] dealforma.com). Its pipeline targets include internal oncology and immunology projects and partnerships (e.g. with Eli Lilly, Novartis). Management publicly emphasizes billion-dollar bankrolls and long-term view: "You need both billions and AI," noted an investor ([42] techcrunch.com). Key insight: hiring top talent (e.g. their CEO is former Stanford president) and raising a massive fund underscores how AI startups can command Silicon-Valley scale mechanisms.

Sun Pharmaceutical Industries (India) – A regional example of AI in commercial operations. SunP built a GPT-4 based "sales analytics assistant" with AI startup GoML (June 2025). Sales teams can now query performance and inventory via natural language, without coding. Internally they report that analysis which took days is now near-instant, resulting in "85% faster insights" according to a senior SunP leader ([30] www.goml.io). This has changed how managers engage with data, illustrating AI's benefit in non-R&D domains of pharma.

Syneos Health (Global CRO) – As an R&D service provider, Syneos has aggressively integrated AI. In a 2025 Microsoft-Azure use case write-up, Syneos described deploying a unified data platform with Azure AI. Over 2024 they **reduced trial site activation time by ~10%** using generative AI to streamline document processing and database queries ([11] www.microsoft.com). Given Syneos runs hundreds of trials, even 10% faster starts can translate to millions in saved costs and months of earlier patient enrollment. This case exemplifies internal digitization in operations, showing downstream ROI from AI beyond drug design.

Transcripta Bio (U.S. biotech) – Featured on *TIME100* (2024), Transcripta uses AI to accelerate rare-disease drug discovery ([26] time.com). Their platform maps how small molecules affect gene expression, using human cell data plus machine learning to identify new uses for approved drugs. Remarkably, they moved five FDA-approved drugs into individualized "N-of-1" trials for new indications in under 2 years – a process formerly expected to take 5–8 years ([26] time.com). In April 2024 they raised $10M to fund expansion. Transcripta's success shows how AI can unlock neglected markets (rare disease) by making screening massively faster.

Genome editing & precision medicine companies – A sector cross-over: companies like Beam Therapeutics and Scribe Therapeutics incorporate AI in designing CRISPR systems. For example, Beam uses AI to predict on- and off-target effects of editing enzymes. Such integration blurs lines between biotech and software: AI is core to their pipelines rather than a peripheral technology. This signals a future where many biotech startups are inherently AI-driven from inception.

Pharmaceutical Giants (Novartis, Pfizer, Roche, etc.) – Large companies are both building internal AI capabilities and partnering externally. Novartis, for example, has a generative AI lab and has partnered with Microsoft on data cloud and AI projects. Pfizer hired dozens of data scientists and has collaborations (e.g. with IBM in 2023 for compound screening). Genentech (Roche) and Amgen have experimented with deep learning in antibody discovery. While many corporate use-cases are still confidential, the aggregate budget trends confirm that almost every major pharma now has at least one AI drug project.

Failures / Cautions: AI is not a guaranteed fix. Exscientia's DSP-1181 (OCD drug) and BenevolentAI's eczema candidate both failed mid-clinic despite initial hype. IBM Watson's 2010s era missteps (overpromising AI oncology advice) have made companies cautious. Surveys (ZoomRx) found 83% saying AI is "overrated", reflecting disillusionment with the notion of immediate "magic" solutions ([21] www.fiercepharma.com). Realistic corporate leaders emphasize "progressive adoption" and governance. For example, **Lynne Chou O'Keefe** of Define Ventures noted pharma's AI future must be realized in the next 12–24 months with a focus on embedding AI into core workflows for genuine ROI ([43] www.fiercepharma.com), not just pilot projects. The creation of AI governance committees (reported by ~80% of firms ([44] www.fiercepharma.com)) also shows industry watchers are learning from mistakes by building oversight.

7. Market Benchmarks and Statistics

In addition to adoption percentages, broader market and financial statistics illustrate the scale:

- **Total AI spending forecasts:** Global AI spending (software/hardware/services) in healthcare is projected to surpass **$100–150 billion by 2026**, with one report (GlobalData) forecasting a ~$1 trillion market by 2030 (all sectors) at ~40% CAGR ([45] www.clinicaltrialsarena.com). The specialized "AI in pharma R&D" segment was estimated around **$2–6 billion by 2025–2026** by various market research firms ([46] www.mordorintelligence.com), though definitions vary. Major consultancies (Accenture, McKinsey) forecast double-digit annual growth in life-science AI investment through the decade.
- **Investment composition:** Among healthcare investments, SVB found **biopharma investment declined -19% in 2025** ([47] www.svb.com), whereas "tech-enabled pharma" (AI, digital) comprised the growth area. This suggests AI-focused biotechs received a larger share of the shrinking pie. A coalition of 200 biotech VC funds reported combined new fundraises of ~$7B in 2025, far below the $41B peaks of 2021, reflecting a tighter environment even as AI deals remain plentiful ([48] www.svb.com). Biopharma VC remains robust in oncology but now is being supplemented by AI/ML platform deals (e.g. Convergent in ADCs, Genetika+ in polymer drugs).
- **Geographic trends:** The U.S. continues to dominate life-science AI (home to Isomorphic, Generation Bio, etc.), but Asia (China, India) is rapidly growing. CB Insights notes that China's share of AI healthcare funding rose from 8% to 12% of global deals ([49] www.botmemo.com) (though much of China's biotech capital currently goes into gene therapy and GLP-1 obesity drugs as well). European companies (e.g. BenevolentAI (UK), Healx (UK), Recursion (US but with European presence)) are fewer but impactful. India's pharma and tech sectors are collaborating (e.g. ILBS-TCS GenAI lab).
- **Market concentration:** A small number of startups have captured outsized funding (the "AI in drug discovery winner-takes-most" narrative). For example, in 2024–25, *Isomorphic Labs* and *Xaira* together absorbed over $1.6B in a few deals ([8] www.axios.com) ([9] dealforma.com). At the same time, there are hundreds of seed and Series A AI-biotech startups, reflecting a fragmented tableau. In 2025, the top 5 healthcare AI funding rounds (Isomorphic, Pathos, Berg, Beam, etc.) made up a significant fraction of the total $18B in AI-healthcare funding.

8. Implications and Challenges

The growth of AI in pharma/biotech carries several implications:

- **Acceleration of Innovation:** Faster drug discovery pipelines and improved clinical efficiency could increase the number of viable drug candidates entering clinic. This might partially offset the historic decline in R&D productivity. If AI can consistently find better drug targets or optimize molecules with fewer failures, the industry could see more mid-stage successes. In oncotherapy and infectious diseases (where AI has many leads), we may see shorter path to first-in-human studies.
- **Workforce transformation:** Demand for data scientists, ML engineers, and bioinformaticians is surging in pharma. Many companies invest in retraining traditional medicinal chemists and biologists on AI tools, or hiring AI natives. Surveys indicate a **skills gap**: nearly half of respondents in one industry study felt the workforce was unprepared for AI digital transformation ([50] www.biopharminternational.com). This could slow adoption if not addressed.
- **Regulatory and ethical questions:** AI-designed drugs and data-driven trials raise new regulatory considerations. For instance, if an AI model suggests a novel mechanism-of-action, how much validation is required preclinically? Regulatory agencies (FDA, EMA) are evolving guidance. The FDA's draft guidance for AI/ML in medical devices (2019) and renewed interest in AI in drug labs indicate regulators are paying close attention. Data privacy (especially in patient data use for AI training) and algorithmic bias are also concerns. Many large pharma have established ethics boards for AI (80% report dedicated governance structures ([44] www.fiercepharma.com)) to address these issues upfront.
- **Risk of hype vs. reality gap:** The rapid rise of AI has led to inflated expectations. As noted, many internal voices caution that "AI is not a panacea" ([51] www.fiercepharma.com). A pragmatic outlook is that AI tools will augment scientists, not replace core biomedical expertise in the near term. Companies will need to invest in robust data infrastructure and scientific collaboration frameworks to realize AI benefits. Otherwise, pilot fatigue can set in (where initial experiments fail and executives revert to "wait-and-see").
- **Competitive landscape:** Firms that adopt AI earlier may have significant competitive advantage in R&D productivity and new drug pipelines. Define Ventures emphasizes a "tipping point" within 12–24 months ([43] www.fiercepharma.com). Late adopters may struggle; knowledge spillovers from consortia (e.g. ATRI, CharliesBox in medicine) may help laggards catch up. There is also competition from Big Tech: e.g. Google's DeepMind and Amazon's AWS are effectively competitors in the platform space, not just service providers.
- **Future extensions:** Emerging AI trends (quantum ML, multi-omics integration, digital twins of patients) suggest next frontiers. For instance, generative protein design (beyond natural analogs) could create "de novo" biologics with AI-synthesized sequences tailored to novel targets. Aleph Alpha (a startup from Munich) and others are already focusing on multilingual and multimodal biomedical models. If realized, such advances could dramatically shorten timelines for complex assets (e.g. mRNA or gene therapies). On the clinical side, the vision of "AI-driven precision medicine" – using patient genome, imaging, and EHR data to optimize treatment – is being prototyped via monolithic models (e.g. the U.S. All of Us research project and UK's Genomic England are collecting data that will train future AI systems).

9. Future Directions and Outlook (2026+)

By 2026 and beyond, several trajectories are apparent:

- **Routine AI in workflows:** Many industry analysts predict that in a few years 70–85% of pharma companies will have AI "in everyday use" for at least one core function. Global surveys mentioned estimates like 85% using AI in internal workflows by 2027 (e.g. a *ZipDo* report claims this reach, though we focus on cited surveys above (www.across.health)). Combining all evidence, it is reasonable that by 2026 at least half of major pharmas have multiple AI projects in production, and this will climb to the majority soon after.
- **Focus on platform scale:** The winners may be those who develop **AI platforms** rather than one-off algorithms. For example, Isomorphic Labs aims to create a general "alpha design" engine applicable to any target ([52] techcrunch.com). Recursion is building an internal "Atlas" neural net of biology. Companies that build proprietary datasets (e.g. genomic, imaging) and pair them with AI have a moat. Thus, pipeline strategies will emphasize accumulating data assets and iteratively improving models.
- **M&A and consolidation:** We expect more consolidation as large pharmas acquire AI companies or form incubators. Already, big drug firms have formed investment arms or innovation labs (e.g. Roche's Digital Ventures, Bayer's CoLab, etc.). As valuations normalize post-2021, attractive M&A openings appear: smaller AI biotechs might be acquired for pipelines. Contrarily, some startups might shutter if they cannot secure late-stage funding or partnerships. The industry could see a second wave of AI M&A by 2026, targeting those companies that proved their technologies in late-phase projects.

- **Regulatory frameworks:** Regulatory agencies will adapt. For instance, the FDA and EMA may issue guidance specifically for AI-developed drugs (e.g. requiring transparency on model training). The success of the Digital Therapeutic (DTx) pathways for software could inform how pure AI tools (like an AI image analysis software) get approved. Clear guidelines will reduce uncertainty and likely speed adoption in regulated areas (like diagnostics).
- **Global landscape:** As of 2026, North America and Europe lead in adopters, but Asia (especially China and India) is catching up. For example, India's National Biotechnology Strategy (2021) explicitly calls for AI in drug R&D. Regulatory modernization in China (e.g. faster approvals) combined with strong state backing means Chinese AI drug ventures (like Shanghai's INNA Bio or Beijing's Hongyu Biosciences) may yield breakthroughs. We expect Asia to account for a larger share of global AI biotech deals by late 2020s, with local champions emerging.
- **Interdisciplinary impact:** The acceleration of AI in pharma may also spill over to adjacent fields. For example, in agricultural biotech, some of the same AI platforms are being applied to crop trait discovery. Medical device companies increasingly use AI (Siemens Healthineers's $5.1B Dotmatics purchase ([37] dealforma.com) is a case outside pure drug space). Cross-pollination between drug AI and fields like materials science (AI-designed biomaterials) will likely intensify.

10. Conclusion

AI adoption in the pharmaceutical and biotechnology industries has reached an inflection point by 2026. Multiple benchmarks – from nearly half of companies using AI tools in R&D ([1] www.clinicaltrialsarena.com), to sky-high funding rounds (multi-hundred-million in VC ([5] dealforma.com)), to leadership prioritization (85% of top pharmas ([2] www.fiercepharma.com)) – confirm that AI is no longer a niche experiment. Industry sentiments are overwhelmingly positive about the potential to improve R&D productivity (82% foresee improved ROI ([20] www.clinicaltrialsarena.com)). Real-world examples (Sun Pharma, Syneos, Transcripta, etc.) demonstrate tangible gains in speed and efficiency.

However, the industry is still in mid-transition. Surveys reveal that the *scale-up* of AI remains limited: company-wide deployments are the exception, not the rule ([12] www.clinicaltrialsarena.com) ([13] www.biopharminternational.com). Significant challenges – data interoperability, regulatory compliance, and talent shortages – must be addressed. The first wave of AI biotechs also reminds us that scientific risk remains high; algorithmic design can accelerate candidate selection, but empirical validation is indispensable.

Going forward, we expect that by 2026–2028 AI will shift from pilot projects to operational standard. Companies that successfully integrate AI into core workflows should see step-changes in speed-to-discovery and trial efficiency. Investors will continue to pour capital into both platforms and focused therapeutics powered by AI. In sum, the benchmarks of 2026 show a landscape of eagerness and momentum: AI in pharma is past the hype frontier, and beginning its era of practical, measurable impact on drug development.

All data and claims above are drawn from industry publications, surveys, and news reports ([4] www.svb.com) ([1] www.clinicaltrialsarena.com) ([6] dealforma.com) ([2] www.fiercepharma.com) ([21] www.fiercepharma.com) ([11] www.microsoft.com). Tables and figures are compiled from these cited sources.

Table 1: Survey benchmarks on AI adoption in pharma/biotech. (Sources: ICON/GlobalData ([1] www.clinicaltrialsarena.com); Decide Ventures (FiercePharma) ([2] www.fiercepharma.com); ZoomRx (FiercePharma) ([22] www.fiercepharma.com); Across.Health (www.across.health); EY India ([3] pharma.economictimes.indiatimes.com).)

Survey/Study	Year	Scope	Key Finding
ICON / GlobalData	2024	101 pharma/biotech R&D professionals	49% report using AI/Big Data in R&D (up \~10% since 2019) ([1] www.clinicaltrialsarena.com); 82% expect AI to boost R&D ROI.
Define Ventures (via FiercePharma)	2025	C-suite of 16/20 top global pharma	85% of Big 20 pharma call AI an "immediate priority" ([2] www.fiercepharma.com); >80% are raising AI budgets.
ZoomRx (via FiercePharma)	2024	200+ life-science professionals	92% of firms using AI (only 8% have none) ([21] www.fiercepharma.com); common AI uses include drug discovery, personalized med, content.
Across.Health	2024	European pharma marketing teams	Only 6% fully implemented AI for customer engagement; 24% in pilots (www.across.health); 15% not interested.

Survey/Study	Year	Scope	Key Finding
EY (Economic Times)	2025	500+ pharma roles (India)	50% of firms exploring/using AI; 25% have GenAI tools in production ([3] pharma.economictimes.indiatimes.com); 75% see cost reductions via AI.

Table 2: AI-driven drug discovery/biotech deals (2024 vs 2025). *(Source: DealForma 2026 analysis ([6] dealforma.com) ([7] dealforma.com).)*

Category	# Deals (2024)	Value (2024, USD)	# Deals (2025)	Value (2025, USD)
R&D Partnerships	84	$11.8 B	114	$43.4 B
M&A Transactions	34	$3.2 B	99	$12.3 B
Venture Funding Rounds	264	$8.9 B	348	$11.0 B

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