PitchBook

EMERGING TECH RESEARCH

Biopharma Report

VC trends and emerging opportunities

Q4
2023

Contents

Institutional Research Group

Analysis

Kazi Helal, Ph.D. Senior Analyst, Biotech
kazi.helal@pitchbook.com
pbinstitutionalresearch@pitchbook.com

Data

Colin Anderson Data Analyst

Publishing

Report designed by **Joey Schaffer** and **Drew Sanders**

Published on March 4, 2024

For the inaugural update as well as our complete biopharma research, please see the designated analyst workspace on the PitchBook Platform.

Vertical update

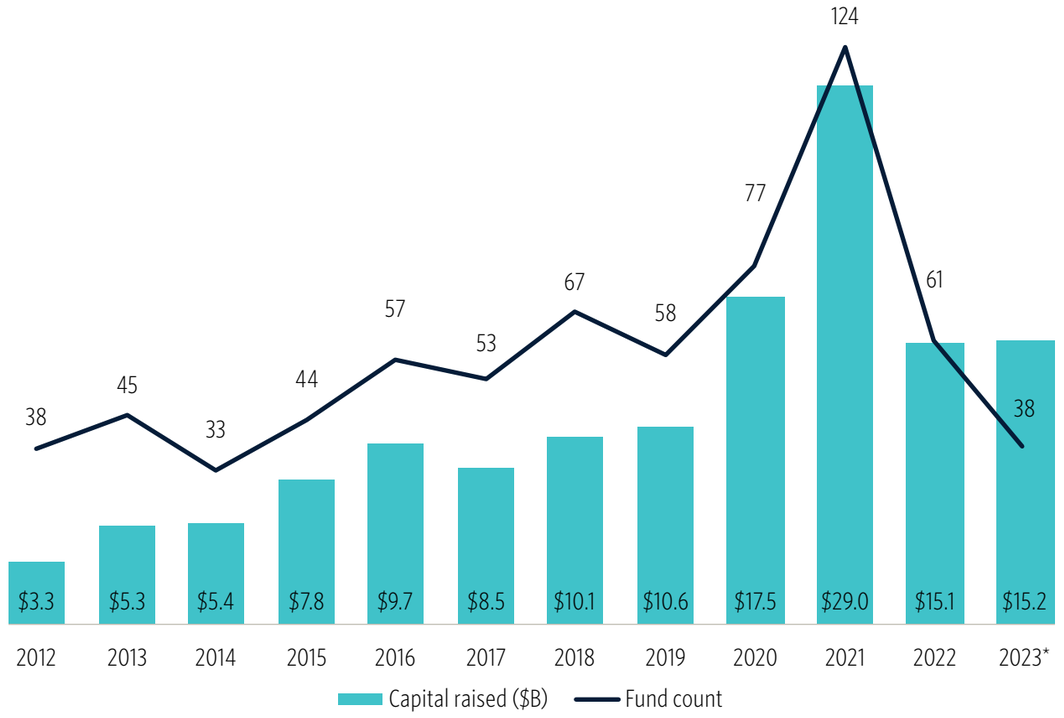
The biopharma sector is navigating a transformative phase marked by a circumspect investment approach, market correction, and significant interest in AI and obesity treatments. In Q4 2023, venture funding dipped to $6.3 billion, a decrease from $7.8 billion in Q3 and a drop from $36.7 billion in 2022 to $29.9 billion, indicating a cautious VC climate.

Despite market headwinds, including a sluggish public market and limited exit options, investor enthusiasm persisted in Q4, especially for early-stage firms integrating AI into drug discovery and development. This trend is exemplified by Isomorphic Labs, an Alphabet subsidiary, which has forged billion-dollar partnerships with Eli Lilly and Novartis, stirring discussions on Big Tech's emerging role in digital biology. Nonetheless, the slow adoption of AI in clinical development highlights the need for a long-term investment vision to harness AI's full potential in the sector.

The domain of weight loss therapeutics, led by giants such as Eli Lilly and Novo Nordisk, offers unique opportunities for private entities. These companies are innovating to carve a niche in the market by improving GLP-1 agonist biology and creating new treatment modalities for obesity. A testament to this potential is Carmot Therapeutics' $2.9 billion exit to Roche in December 2023, bolstering confidence in the sector's investment prospects.

Besides AI and obesity drugs, attention is also being drawn to novel modality technologies and platforms seeking broader adoption. This area has seen continuing investor interest due to its high exit potential. Notable areas include small molecule technology employing molecular glues, peptides utilizing macrocycles, and gene therapy with epigenetic editing. However, some funding recalibration is needed to focus platforms to selective high-value targets and maximize financial runways.

Life sciences VC fundraising activity



Source: PitchBook • Geography: North America and Europe
*As of December 31, 2023

Additional high-level trends indicate growing investor focus on quality, supporting fewer companies but with significant development progress. Our data shows a shift from the 2021 trend of early IPOs for firms with preliminary clinical data to a preference for mature clinical data before IPOs. This strategic patience emphasizes clinical validation and asset-centric investments, as evidenced by extended intervals between funding rounds—a sign of a market favoring proven advancement over mere potential.

This recalibrated investment philosophy was evident at the J.P. Morgan Healthcare Conference in January 2024, where multiple exits by late-stage biotech firms were announced, signaling a readiness to return capital to investors via strategic mergers, acquisitions, or public listings. This included the following IPOs: Metagenomi ($100.0 million), Dyne Therapeutics ($345.0 million), ArriVent Biopharma ($100.0 million), and Praxis Precision Medicines ($150.0 million), with more to follow in 2024, thus making it a potentially optimistic year for recovering confidence in biotech investing.

Q4 2023 timeline

November 8 — News

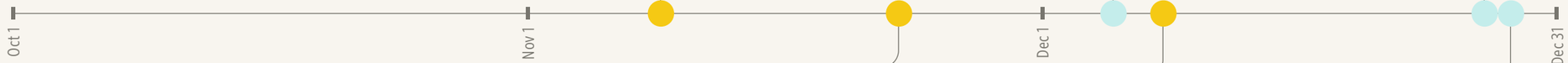
Eli Lilly's Zepbound receives Food and Drug Administration (FDA) approval. As the first to activate glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) receptors, Zepbound offers a novel treatment option for adults with obesity or weight-related conditions.

December 4 — M&A

Eli Lilly acquires Carmot Therapeutics for $2.9 billion, gaining access to its portfolio of metabolic disease therapeutics, including advanced clinical-stage GLP-1 analogues for obesity and Type 2 diabetes treatment.

December 26 — M&A

Bristol Myers Squibb announces the acquisition of RayzeBio for $4.1 billion. This acquisition enriches Bristol Myers' oncology portfolio with RayzeBio's radiopharmaceutical therapeutics, highlighting significant growth opportunities in radiopharma cancer treatment for investors.



November 21 — News

Genentech partners with NVIDIA in a strategic AI research collaboration to expedite drug discovery and development. Leveraging NVIDIA's AI supercomputing, this alliance aims to transform research & development (R&D) efficiency and innovation in healthcare.

December 9 — News

The FDA approves Casgevy, the first clustered regularly interspaced short palindromic repeats (CRISPR) gene-editing treatment for sickle cell disease, developed by Vertex Pharmaceuticals and CRISPR Therapeutics. This approval marks a significant advancement in genetic medicine for inherited diseases.

December 27 — M&A

AbbVie agrees to acquire ImmunoGen for $10.1 billion, focusing on its flagship cancer therapy ELAHERE for platinum-resistant ovarian cancer. This acquisition strengthens AbbVie's solid tumor and hematologic malignancies portfolio as well as its antibody-drug conjugate technologies, which is an area of extreme pharma modality technology interest that continues.

Q4 VC deal count summary

204
total deals

-3.8%
QoQ growth

-24.2%
YoY growth

-20.1%
YTD growth

Q4 VC deal value summary

$6.3B
total deal value

-19.0%
QoQ growth

-21.0%
YoY growth

-18.4%
YTD growth

Biopharma landscape

1. Cell therapy
2. Chemistry
3. Gene therapy
4. Biologics
5. Emerging therapy
6. Oncology
7. Neurology
8. Cardiovascular & metabolic disease
9. Immunology & infectious disease
10. Digestive & renal systems disorder
11. Systemic & structural disorder
12. Specialty disease

Drug modality VC ecosystem market map

This market map is an overview of venture-backed or growth-stage companies that have received venture capital or other notable private investments. Click to view the full map on the PitchBook Platform.

1 Cell therapy

Immune cell

SONOMA BIOTHERAPEUTICS · ArsenalBio · REPERTOIRE IMMUNE MEDICINES · A2 · IASO BIO · Wugen · TESSA THERAPEUTICS · 上海细胞治疗集团 · PACT pharma · gentibio

Tissue/biomaterial

Fesarius Therapeutics · VERIGRAFT · bioaesthetics · Videregen · Endorum · precisebio · Aspect · LIFESPROUT · CELLPHIRE THERAPEUTICS · INNERVACE

Stem cell

ALTOS · orcabio · AURION BIOTECH · Aspen Neuroscience · Heartseed · NEURONA THERAPEUTICS · GARUDA THERAPEUTICS · OSSIUM HEALTH · Cambrian · SHORELINE

2 Chemistry

Small molecule

nimbus THERAPEUTICS · Valo · KALLYOPE · TREELINE BIOSCIENCES · Insilico Medicine · EMALEX biosciences · Liminal BioSciences · CARMOT THERAPEUTICS · Genesis Therapeutics

Degrader

AMPHISTA THERAPEUTICS · VICINITAS THERAPEUTICS · Photys · Avilar THERAPEUTICS · stablix · Plexium · GLUBIO · cullgen · LYCIA THERAPEUTICS · biotheryx

Radiopharma

RadioMedix · ARICEUM · 药明博锐 BoomRay · RadioMedix · Nucleus RadioPharma · tae LIFE SCIENCES · EpicentRx · Ablaze · alpha-9 ONCOLOGY · KORTUC

3 Gene therapy

mRNA

ReCode THERAPEUTICS · NUTCRACKER · capstan therapeutics · METiS 剂泰医药 · RVAC MEDICINES · etherna · REDONA THERAPEUTICS · COMBINED THERAPEUTICS · REJUVENATION TECHNOLOGIES · 赛岚医药 CrownLab

Oligos/RNA

TRAND THERAPEUTICS · 触望制药 Argo Biopharma · MINA Therapeutics · inceptive · alltrna · AtaLanta THERAPEUTICS · ISARNA THERAPEUTICS · LUCANAbio · CAMP4 · GurAlis

Gene editor

EXCISION · 克睿基因 · 3 BIOMEDICINE · Tome BIOSCIENCES · nvelop therapeutics · LOCUS BIOSCIENCES · scribe THERAPEUTICS · TUNE THERAPEUTICS · EDIGENE 博雅辑因 · CHROMA MEDICINE

Gene delivery

affinia THERAPEUTICS · JAGUAR GENE THERAPY · FRONTERA THERAPEUTICS · ensoma · Ring THERAPEUTICS · NEOGENE · Encoded THERAPEUTICS · CAPSIDA BIOTHERAPEUTICS · FORGE BIOLOGICS

4 Biologics

Antibody

ITB-MED · Origincell 原能细胞 · EpimAb Biotherapeutics · ARCH ONCOLOGY · TrueBinding · LIGHTCHAIN BIOTHERAPEUTICS · AGOMAB THERAPEUTICS · Umoja BIOTHERAPEUTICS · UpstreamBio · HEMOB

ADC/conjugates

ADC THERAPEUTICS · RemeGen · Nuvation Bio · Rakuten Medical · aura · AVIDITY BIOSCIENCES · PYXIS ONCOLOGY · KELUN-BIOTECH 科伦博泰 · SOLVE THERAPEUTICS

Protein/peptide

WORG 百明信康 · ERA THERAPEUTICS · Enterome · Synthekine · MBX Biosciences · NEURELIS · Cerapedics · FOG · AMPHARMA · ODYSSEY THERAPEUTICS

Vaccine

新合生物 NeoCura · MAXVAX 迈科康生物 · INNOVENA 深信生物 · nouscom · Tecon Pharmaceutical · Imvax · Advaccine · Leyden Labs · Juntuo Biomedical

5 Emerging therapy

Bacteriotherapy

microbiotica · DermBiont · OxThera · adaptive phage THERAPEUTICS · prokarium · FEDERATION BIO · Siolta Therapeutics · Artizan BIOSCIENCES · BiomeBank · exeliom biosciences

Oncolytic virus

accession therapeutics · ImmVira · FluGen · tilt BIOMEDICINE · GENEMEDICINE · ABALOS THERAPEUTICS · THERAVECTYS · ICONOVIR BIO · ImmVira · VYRIAD

Exosome

evox · Diasome · anjarium · Vesigen · ExoCoBio · MANTRA BIO · Carmine THERAPEUTICS · ARUNABIO · STRM·BIO · EVOQUE THERAPEUTICS

Nanotech

Intrance MEDICAL SYSTEMS · SN BioScience · virometix VACCINES · haima therapeutics · Cellics Therapeutics · COUR · AMORPHICAL · AVICEDA THERAPEUTICS · MonTa Biosciences · HOPEWELL Therapeutics

Therapeutic area VC ecosystem market map

This market map is an overview of venture-backed or growth-stage companies that have received venture capital or other notable private investments. Click to view the full map on the PitchBook Platform.

6 Oncology

7 Neurology

8 Cardiovascular & metabolic disease

9 Immunology & infectious disease

10 Digestive & renal system disorder

11 Systemic & structural disorder

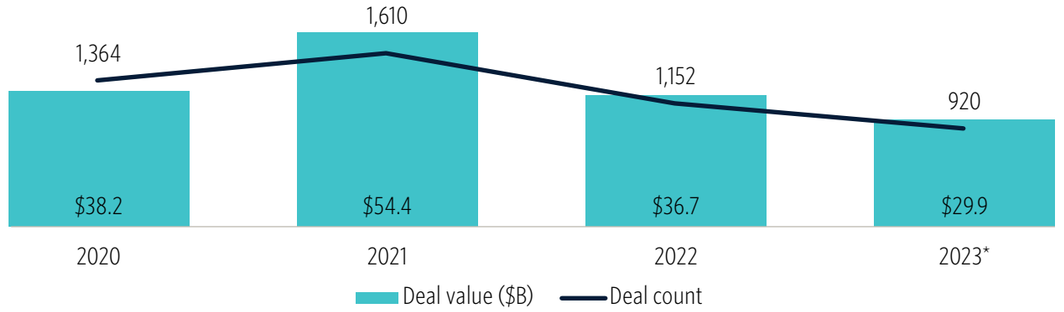
12 Specialty disease

VC activity

The venture capital landscape within the biopharma sector in 2023 saw a pivotal recalibration, with $29.9 billion allocated across approximately 920 transactions. Deal activity declined modestly in the latter part of the year, transitioning from $7.8 billion across 212 deals in the preceding quarter to $6.3 billion over 204 deals. Despite this, the exit activity—encompassing IPOs and M&As—totaled $18.3 billion across 94 exits, illustrating a strategic patience and selective investment ethos that pervaded the year. Q4 saw a dip to $1.8 billion from 24 deals, largely attributable to companies postponing their announcements to coincide with the J.P. Morgan Healthcare Conference in January. The year's end marked a significant correction from the explosive growth experienced amid the height of the COVID-19 pandemic, with the exit distribution echoing a semblance of stability compared with 2022, featuring 55 IPOs and 39 acquisitions. Venture capital funding trends indicated a cautious yet discerning investment approach, with an increased median interval between funding rounds, underscoring a preference for companies showcasing mature clinical data.

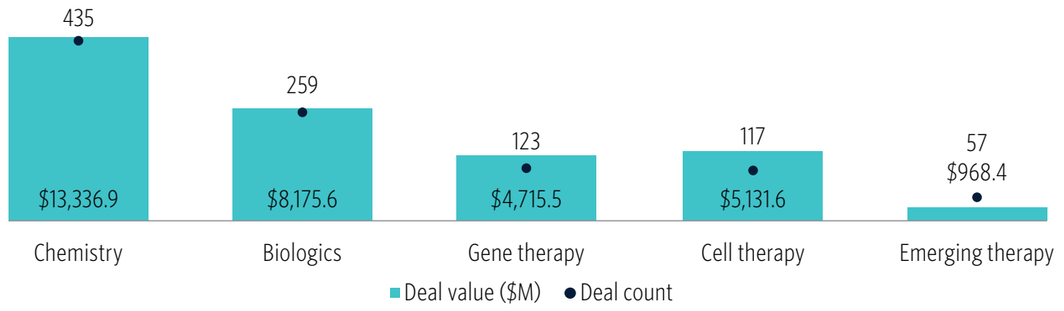
The exit landscape revealed a discerning market, with M&A exits and a heightened IPO bar reflecting a strategic pivot toward quality and clinical validation. Key exits include the noteworthy Carmot's $2.9 billion acquisition by Roche, catalyzing optimism for future investments—particularly within the obesity therapeutic area—and RayzeBio's $4.1 billion acquisition by Bristol Myers Squibb. This trend, coupled with strategic collaborations, such as Isomorphic Labs with Novartis and Eli Lilly, highlighted the renewed interest in the next generation of computational drug discovery while early efforts are still progressing through the clinic. Isomorphic Labs may serve as the bellwether for future AI biotech startup funding despite being a corporate spin out from Alphabet. Potential startups include EvolutionaryScale (raised $40.0 million) and Inceptive Bio (raised $120.0 million), which may obtain similar early success as Isomorphic in finding high-valued partnerships. However, investors need to be wary if the space becomes similar to OpenAI's dominance, meaning there will be few concentrated AI biotech bets due to the scarce talent so that small check seed-stage bets will not prosper.

Biopharma VC deal activity



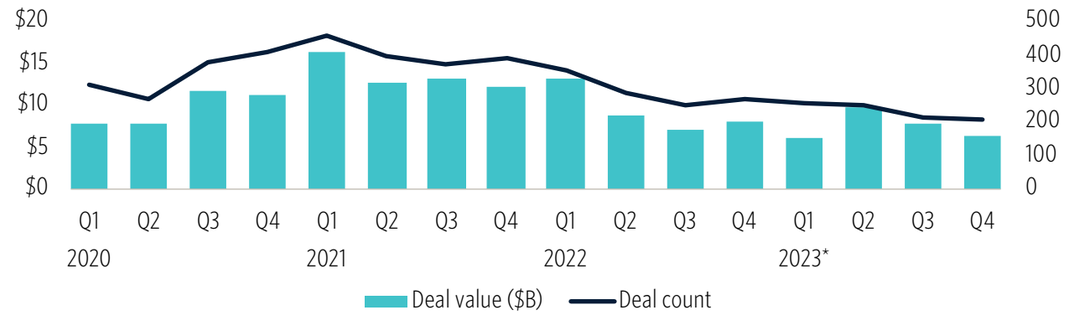
Source: PitchBook • Geography: Global • *As of December 31, 2023

Trailing 12-month biopharma VC deal activity by segment*



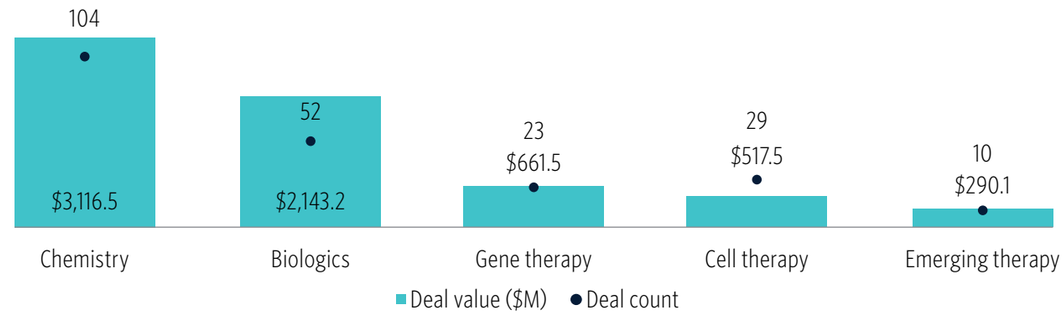
Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC deal activity by quarter



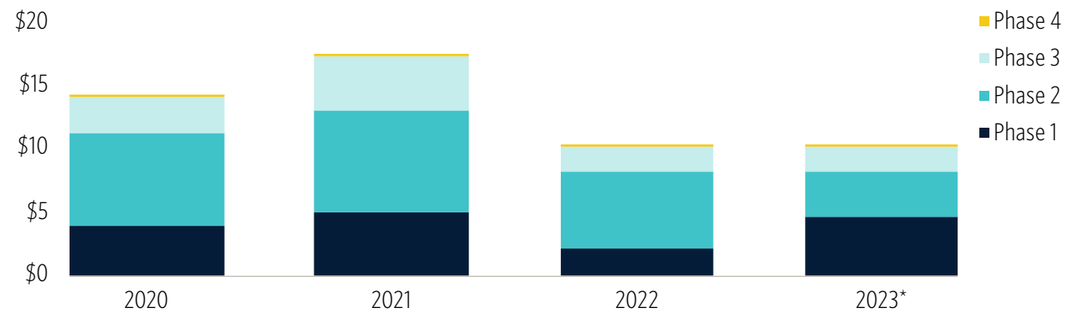
Source: PitchBook • Geography: Global • *As of December 31, 2023

Q4 2023 biopharma VC deal activity by segment*



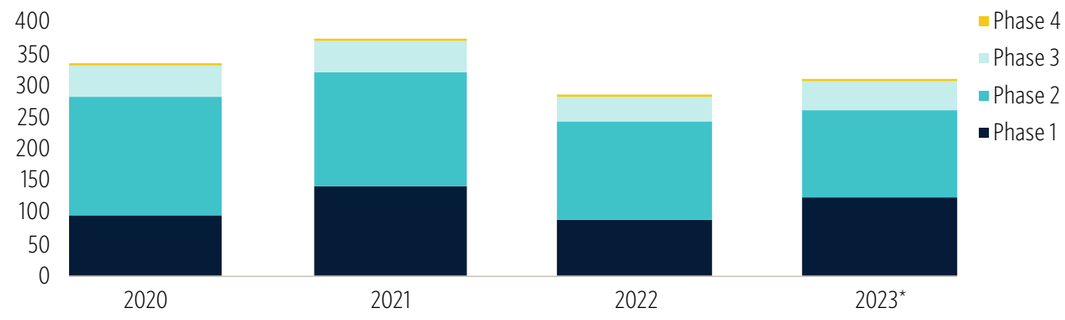
Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC deal value ($B) by highest phase



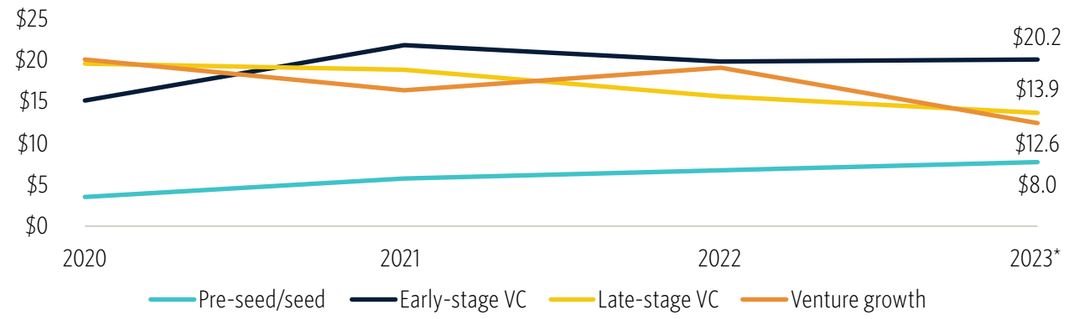
Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC deal count by highest phase



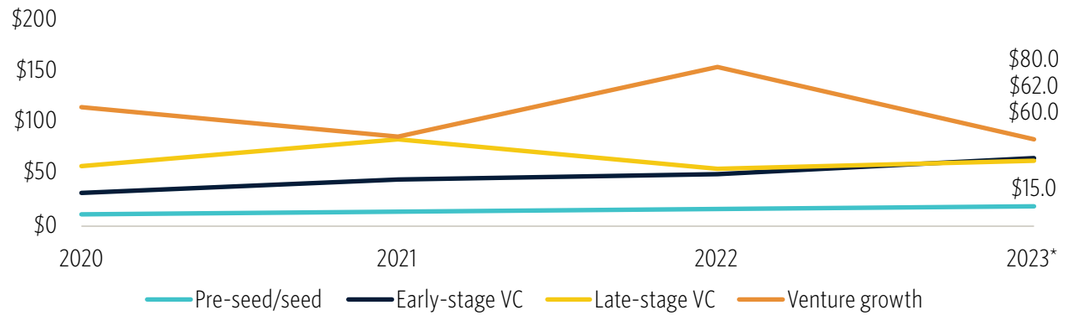
Source: PitchBook • Geography: Global • *As of December 31, 2023

Median biopharma VC deal value ($M) by stage



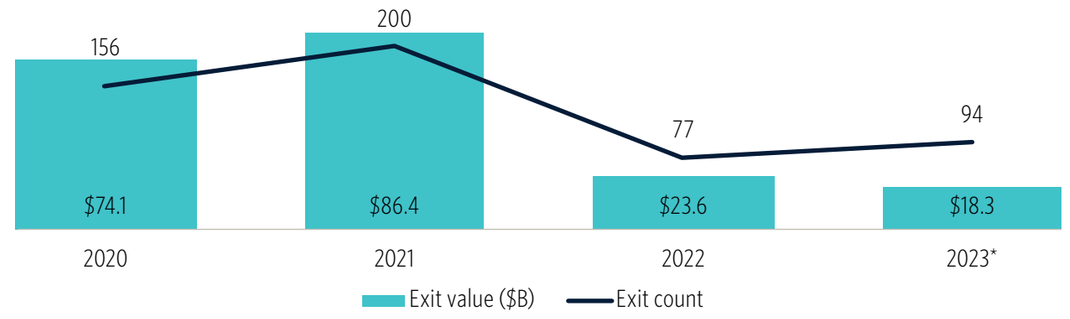
Source: PitchBook • Geography: Global • *As of December 31, 2023

Median biopharma VC pre-money valuation ($M) by stage



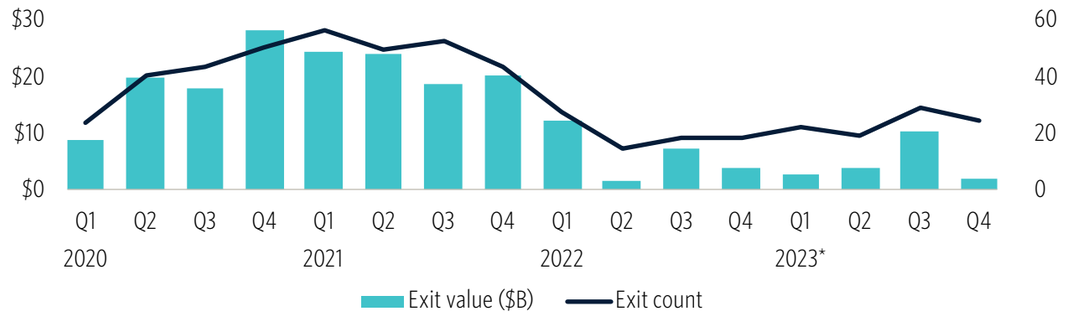
Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC exit activity



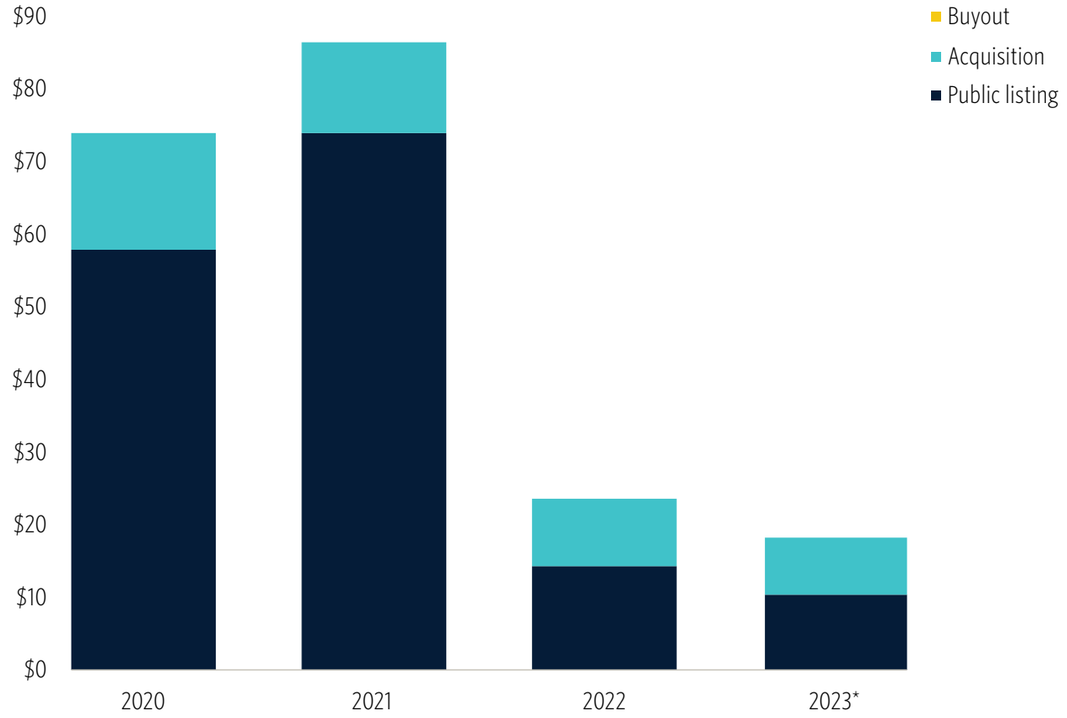
Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC exit activity by quarter



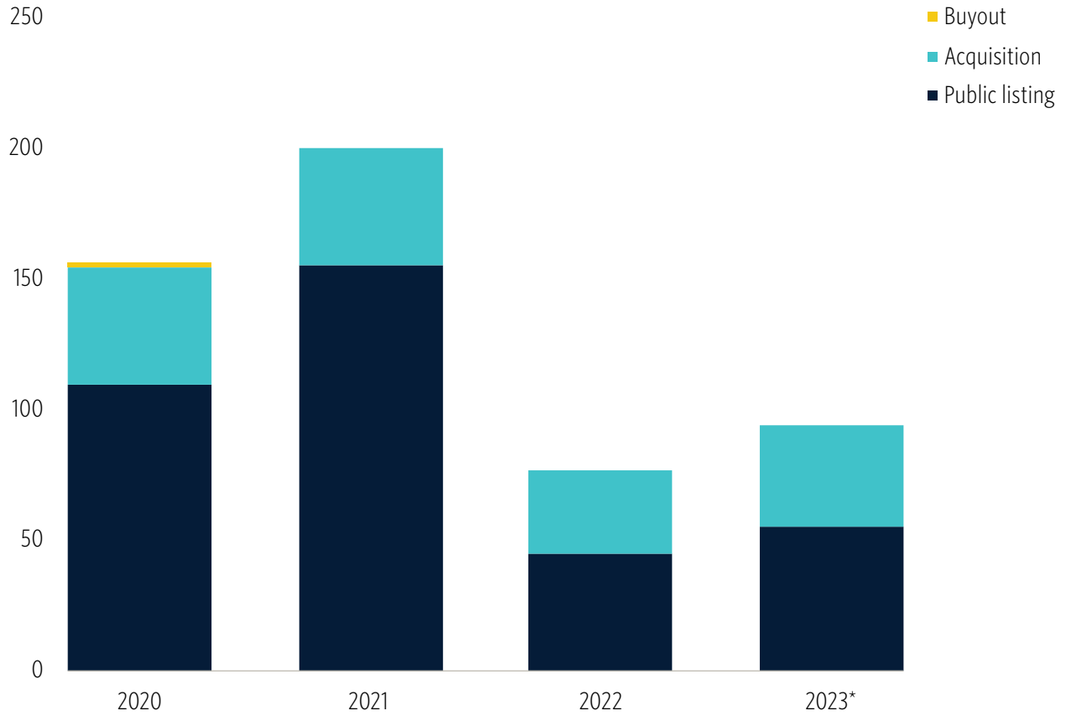
Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC exit value ($B) by type



Source: PitchBook • Geography: Global • *As of December 31, 2023

Biopharma VC exit count by type



Source: PitchBook • Geography: Global • *As of December 31, 2023

Key biopharma early-stage VC deals in Q4 2023*

Company	Close date	Subsegment	Stage	Deal value ($M)	Lead investor(s)	Valuation step-up
Aiolos Bio	October 24	Small molecule	Series A	$245.0	Atlas Venture, Bain Capital Life Sciences, Forbion, Sofinnova Investments	N/A
Terremoto Biosciences	November 2	Small molecule	Series B	$175.0	N/A	N/A
VectorY Therapeutics	November 13	Antibody, gene delivery	Series A	$137.0	EQT Life Sciences, Forbion	N/A
EyeBio	November 14	Protein/peptide	Series A	$130.0	N/A	N/A
Seismic Therapeutic	November 17	Protein/peptide	Series B	$121.0	Bessemer Venture Partners	1.2x
ManaT Bio	October 10	Antibody	Series A1	$120.0	Catalio Capital Management	2.1x
Tome Biosciences	December 12	Gene editor	Series B	$117.5	N/A	1.5x
Sudo Biosciences	December 20	Small molecule	Series B	$116.0	Enavate Sciences, TPG	N/A
Iambic	October 12	Small molecule	Series B	$103.2	Abingworth, Ascenta Capital, Nvidia	1.3x
Triveni Bio	October 26	Antibody	Series A	$91.6	Atlas Venture, Cormorant Asset Management	0.4x

Source: PitchBook • Geography: Global • *As of December 31, 2023

Key biopharma late-stage VC deals in Q4 2023*

Company	Close date	Subsegment	Stage	Deal value ($M)	Lead investor(s)	Valuation step-up
MapLight	October 30	Small molecule	Series C	$225.0	Novo Holdings	1.1x
Bicara Therapeutics	December 6	Antibody	Series C	$165.0	Braidwell, TPG	1.5x
Kyverna	November 6	Immune cell	Series B	$152.0	Leaps by Bayer, Moderna France	3.0x
Avistone Pharmaceuticals Biotechnology	October 24	Small molecule	Series B	$137.5	CMG SDIC Fund, IDG Capital	N/A
Cognito Therapeutics	November 15	Nanotech	Series B	$129.1	FoundersX Ventures	N/A
Odyssey Therapeutics	October 25	Small molecule, protein/ peptide	Series C	$101.0	Ascenta Capital	0.9x
AgomAb Therapeutics	October 11	Antibody	Series C	$100.0	Fidelity Management & Research	N/A
Lassen Therapeutics	December 19	Antibody	Series B	$85.0	Eventide Asset Management, Perceptive Advisors, SR One Capital Management	N/A
Atom Bioscience	October 16	Small molecule	Series D	$83.0	Kaitai Capital	N/A
Nouscom	November 14	Vaccine	Series C	$71.8	Andera Partners, Bpifrance, M Ventures	N/A

Source: PitchBook • Geography: Global • *As of December 31, 2023

Key biopharma VC exits in Q4 2023*

Company	Close date	Subsegment	Exit value ($M)	Exit type	Acquirer(s)/index	Post-money valuation ($M)
Forge Biologics	December 21	Gene delivery	$620.0	Acquisition	Ajinomoto	$620.0
T3 Pharmaceuticals	November 22	Protein/peptide, bacteriotherapy	$501.7	Acquisition	Boehringer Ingelheim	$501.7
Cargo Therapeutics	November 9	Immune cell	$298.8	Public listing	Hong Kong Exchange	$580.1
Lexeo Therapeutics	November 3	Gene delivery	$176.9	Public listing	Nasdaq	$288.4
Mitokinin	October 4	Small molecule	$110.0	Acquisition	AbbVie	$110.0
K Pharma	October 17	Small molecule	$63.0	Public listing	Tokyo Stock Exchange	$73.7
Tourmaline Bio	October 19	Antibody	N/A	Public listing	Nasdaq	N/A
Cartesian Therapeutics	November 13	Immune cell	N/A	Public listing	Nasdaq	N/A
Notable Labs	October 16	Small molecule	N/A	Public listing	Nasdaq	N/A
HighTide Therapeutics	December 22	Small molecule	N/A	Public listing	Hong Kong Exchange	$758.4

Source: PitchBook • Geography: Global • *As of December 31, 2023

Top strategic acquirers of biopharma companies since 2023*

Investor	Deal count	Investor type
Eli Lilly	6	Corporation
AstraZeneca	3	Corporation
Bristol-Myers Squibb	2	Corporation
Sail Biomedicines	2	VC-backed company
AbbVie	2	Corporation
United Therapeutics	2	Corporation

Source: PitchBook • Geography: Global • *As of December 31, 2023

Top VC investors in biopharma companies since 2023*

Investor	Deal count	Pre-seed/ seed	Early-stage VC	Late-stage VC	Venture growth
RA Capital Management	28	4	8	13	3
Alexandria Venture Investments	25	4	14	7	0
ARCH Venture Partners	22	1	17	3	1
Catalio Capital Management	17	0	9	8	0
Polaris Partners	16	0	9	5	2
Sofinnova Partners	14	2	7	4	1
F-Prime Capital	13	1	9	3	0
GV	12	0	9	1	2
Sanofi Ventures	12	1	4	6	1
EQT Life Sciences	12	0	6	5	1

Source: PitchBook • Geography: Global • *As of December 31, 2023

Top VC-backed biopharma companies by total VC raised to date*

Company	VC ($M) raised to date	Segment	Category	IPO probability	M&A probability	No exit probability
Aspect Biosystems	$2,720.8	Cell therapy	Tissue/biomaterial	91%	7%	2%
Dongyangguang	$1,235.6	Chemistry, biologics	Small molecule, antibody	N/A	N/A	N/A
AbogenBio	$835.5	Biologics, gene therapy	Vaccine, mRNA	N/A	N/A	N/A
Ailomics Therapeutics	$858.5	Chemistry	Small molecule	N/A	N/A	N/A
Rakuten Medical	$836.8	Biologics	ADC/conjugates	76%	21%	3%
Eikon Therapeutics	$806.6	Chemistry	Small molecule	77%	19%	4%
Magpie Pharmaceuticals	$768.9	Chemistry	Small molecule	N/A	N/A	N/A
Generate:Biomedicines	$693.0	Biologics	Protein/peptide	93%	5%	2%
insitro	$643.2	Chemistry	Small molecule	90%	8%	2%
Nimbus Therapeutics	$637.0	Chemistry	Small molecule	94%	4%	2%

Source: PitchBook • Geography: Global • *As of December 31, 2023
Note: Probability data is based on PitchBook VC Exit Predictor methodology.

Emerging opportunities

Molecular glue degraders

A small molecule drug modality that acts by “gluing” a target protein to a ubiquitin ligase, marking the target for degradation by the proteasome, which can result in a therapeutic effect for diseases caused by the overabundance or activity of certain proteins.

Epigenetic editing

A type of gene therapy that modifies the epigenome without changing the DNA sequence itself, such as DNA methylation or histone modification, which regulate gene activity.

Macrocyclic peptides

A drug modality that leverages ring-shaped molecules with at least 12 atoms, offering a blend of small molecules’ synthetic accessibility and biologics’ low immunogenicity, alongside high binding affinity and the capacity to modulate challenging protein surfaces.

Molecular glue degraders

Overview

Molecular glue degrader technology offers an innovative approach to targeting disease-associated proteins that defy conventional small molecule treatment strategies. These small molecules induce the degradation of specific proteins, broadening the range of druggable targets by bypassing the need for traditional binding pockets. The roots of this technology can be traced back to the advent of Thalidomide by Swiss-based company Ciba AG in the 1950s for treating morning sickness with the severe side effect of causing phocomelia birth defects. The drug's mechanism was initially enigmatic and held great interest for cancer applications but uncovered after 2010 when the initial protein degraders were designed by Craig Crew's Lab at Yale.[1] These protein degraders were introduced as proteolysis targeting chimeras (PROTACs), which use bifunctional molecules to bridge target proteins with E3 ligases, marking them for degradation.

Molecular glues represent a refinement over PROTACs—they are typically smaller, facilitating direct interactions between E3 ligases and proteins without requiring a dedicated ligand for each. This versatility enables the targeting of a broader spectrum of diseases, including various cancers and inflammatory disorders. The initial success with Thalidomide, despite its misunderstood mechanism, paved the way for this drug development strategy. The field is burgeoning thanks to pivotal contributions from companies such as Arvinas (raised $989.0 million), Nurix Therapeutics (raised $571.9 million), Kymera Therapeutics (raised $991.1 million), and Foghorn Therapeutics (raised $388.7 million) and academic researchers like Craig Crew from Yale University, who laid the groundwork with original technology and patents. Advances in AI & machine learning (ML) have significantly aided molecular design, propelling a growing pipeline of molecular glue candidates through clinical trials, and piquing the interest of venture capitalists and pharmaceutical giants.

Market direction

The market trajectory for molecular glue technology is buoyant, with a near-term focus on advancing clinical trials, particularly within oncology and rare diseases aided by AI & ML for molecular design. Front-runners like Degron Therapeutics (raised $23.5 million), Triana Biomedicines (raised $126.0 million), and Monte Rosa Therapeutics (raised $450.8 million) have already made substantial inroads, signaling a wider embrace of this technology. This opportunity for molecular glue degrader therapies benefits from the established traditional small molecule clinical development and approval frameworks that the PROTAC degrader technology also followed. Despite technological strides and novel discovery methods, creating glues remains arduous, as they cannot yet be systematically designed like PROTACs. Overcoming this obstacle to produce glues tailored for any disease target is an ambitious endeavor, with well-funded companies' pipelines stuck in R&D preclinical phases and lacking early-stage clinical trials, underscoring the magnitude of this challenge. Intellectual property remains a critical focus for startups, as they devise innovative molecules to circumvent current limitations around certain structural features.

1: "Molecular Glues: The Adhesive Connecting Targeted Protein Degradation to the Clinic," National Library of Medicine, Janet M. Sasso, et al., July 20, 2022.

Epigenetic editing

Overview

Epigenetic editing technology is emerging as a key growth area within CRISPR 2.0 developments, offering a refined approach to gene regulation that does not involve altering the DNA sequence. This method employs CRISPR-associated mechanisms for the precise modulation of gene expression, allowing gene editing to address a broader spectrum of diseases. Characterized by its potential for reversible and nuanced gene expression adjustments, epigenetic editing is on the brink of significant expansion. This is maintained by considerable investments and the pioneering efforts of startups such as Chroma Medicine (raised $262.0 million), Tune Therapeutics (raised $160.0 million), and Epic Bio (raised $55.0 million). The technology's development is motivated by the limitations of existing gene-editing strategies and the intricate nature of diseases like cancer, neurological disorders, and chronic pain. By enabling the fine-tuning of gene expression, epigenetic editing presents a potentially safer and more versatile treatment pathway, distinguishing itself from traditional gene editing that directly modifies the DNA sequence. The early but promising market for epigenetic editing, with its ability to address diseases with complex genetic backgrounds, heralds a new era of therapeutic interventions.

Market direction

The future trajectory of epigenetic editing is marked by an optimistic short-term outlook, focusing initially on diseases with well-understood epigenetic mechanisms like certain cancers and monogenic diseases. As the technology matures, its application is expected to broaden, potentially revolutionizing the treatment of complex diseases influenced by multiple genes. This could open new therapeutic avenues for conditions like diabetes, autoimmune disorders, and even aspects of aging, showcasing epigenetic editing's versatility beyond the capabilities of traditional gene editing. In terms of fundraising, most recently, Moonwalk Biosciences launched with a $57.0 million Series A, demonstrating continued interest in the space.

The regulatory frameworks surrounding this innovative approach are anticipated to evolve, addressing the unique challenges presented by epigenetic editing, including ensuring safety, efficacy, and monitoring long-term effects. With the approval of the first CRISPR therapy, CRISPR Therapeutics' (raised $531.0 million) and Vertex Pharma's Casegvy, there is more confidence for FDA pathways. However, financing, adoption, and cost to patients remain a major hurdle due to the million-dollar price points of gene therapy at large. The strategic implications for startups, investors, and incumbent pharmaceutical firms emphasize the need for a focused approach on diseases where traditional gene editing falls short, investment in companies with solid platforms and clear therapeutic targets, and the integration of epigenetic editing into existing R&D portfolios to widen the therapeutic landscape.

Macrocyclic peptides

Overview

Macrocyclic peptide technology offers a novel solution for targeting complex diseases that have eluded traditional therapeutic approaches. Early efforts fell under the macrocycles category. These were small molecules mined from nature that showed therapeutic potential but were difficult to design from scratch. Characterized by their large, ring-shaped molecular structures, macrocyclic peptides hold the promise of drugs with unparalleled specificity and potency. This potential is underscored by Merck's progress with MK-0616, a phase III oral macrocyclic peptide inhibitor of PCSK9 aimed at cardiovascular disease treatment. However, initial efforts on the venture side, such as by Ensemble Therapeutics launching with $38.2 million, flopped due to R&D costs. Renewed efforts are recent with Circle Pharma (raised $127.0 million total) and Unnatural Products (raised $38.5 million total). Most recently, the $220 million collaboration between Merck and Unnatural Products to develop macrocyclic candidates for challenging oncology targets further highlights the sector's growing momentum. With their unique ability to modulate protein-protein interactions and target intracellular proteins, macrocyclic peptides could significantly impact areas with unmet medical needs, particularly in cardiovascular diseases and cancer. However, this technology faces challenges such as optimizing pharmacokinetic properties, ensuring cell permeability, and achieving oral bioavailability, necessitating advanced chemical and technological solutions. Despite this, Merck is the leading Big Pharma company advocating for the future potential.

Market direction

The macrocyclic peptide sector is prioritizing the advancement of clinical trial candidates, with a critical focus on demonstrating oral bioavailability and efficacy. The scope of technology application is poised to expand, encompassing diseases involving intricate intracellular targets and protein-protein interactions. Leading venture-backed companies in the next-gen technology are still pre-clinical. The clinical success of drugs like MK-0616 from Merck could catalyze the adoption of macrocyclic peptide technology, leading to a broader spectrum of therapeutic innovations. This technology investment growth is possible despite potential challenges in the cardiovascular and metabolic market from alternative approaches including GLP-1 antagonist drugs. Hence, the technology's market trajectory is favorably influenced by significant biomanufacturing investments in peptides and peptide engineering that is propelled by the commercial success of peptide-based obesity treatments from Eli Lilly and Novo Nordisk. Consequently, investors are increasingly attracted to peptides as a lucrative modality for investment, supported by developing infrastructure.

Select company highlights

nimbus THERAPEUTICS

Overview

Nimbus Therapeutics has carved out a niche in the biopharma industry through its computational drug discovery engine, targeting complex diseases with novel small molecule medicines. Established in 2009 by Atlas Venture and the in-silico drug developer Schrödinger, Nimbus has leveraged a cutting-edge silico drug screening and design platform to target diseases in immunology, oncology, and metabolism. The company's strategic collaborations, particularly its $4 billion deal with Takeda for a TYK2 inhibitor, underscore its market impact and highlight the effectiveness of its computational approach in addressing previously undruggable targets.

Nimbus has raised significant venture capital, including a notable $210.0 million in 2024, reflecting investor confidence in its innovative approach and promising pipeline. The company has achieved critical regulatory milestones, such as the Fast Track designation from the FDA for its acetyl-CoA carboxylase (ACC) allosteric inhibitor for nonalcoholic steatohepatitis (NASH), and has entered high-profile collaborations with Takeda, Eli Lilly, and Gilead, which enhance its pipeline and market reach. The asset-centric, LLC-based corporate structure has allowed Nimbus to build and sell assets desired by Big Pharma while returning the profits back for future R&D without worry about going public.

Key company information

Founded
2009

Employees
102

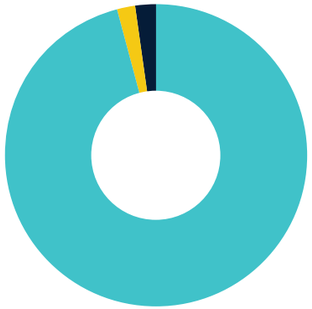
Total raised
$637.0M

First institutional round
$24.0M in Series A funding

Last financing
$210.0M in Series E funding

Lead investor(s)
GV, Atlas Venture, SR One Capital Management, BVF Partners, Pfizer Venture Investments, Lightstone Ventures

Exit Predictor



IPO: 96% probability **M&A:** 2% probability **No exit:** 2% probability

Success: 98% probability

Note: Probability data is based on PitchBook VC Exit Predictor methodology.

Outlook

Moving forward, Nimbus Therapeutics is poised for growth in the private market. The company's strategic direction includes advancing its pipeline, particularly in immune-oncology, and exploring new therapeutic areas. With a leadership team led by industry veterans, including CEO Jeb Keiper, Nimbus is well positioned to continue its trajectory of developing breakthrough medicines. The company's potential for future acquisitions or other exit strategies remains high, given its strategic partnerships and progress in drug development. Nimbus' success in computational drug discovery sets a precedent in the biopharma sector, demonstrating the hub and spoke model's viability for accelerating novel therapeutic development. This approach represents a compelling investment opportunity, highlighting significant returns potential in emerging biopharma technologies. Similar success was met with Biohaven (raised $520.5 million) and Roivant Sciences (raised $5.2 billion) both selling assets worth over billions. However, initially this model was not welcomed by platform-focused venture capitalists that saw greater value in validating a new technology with clinical trials—usually rare diseases for accelerated FDA timelines—and exiting the entire company to Big Pharma via M&A. Additionally, there is a hurdle in large funding needs to run multiple clinical efforts in hopes of a winner to cover the entire R&D costs, which may result in less profits overall.

The ability to stay private while generating large returns for its investors through strategic asset sales and partnerships, coupled with its commitment to advancing a diverse pipeline of novel small molecule candidates, puts Nimbus in a unique position. We view an IPO exit as unlikely, because the company has a clear pathway to profitability and does not need additional funding. If the company stays private, it will evolve into a venture builder for new bets with a management in place sourcing for new assets. This enables greater control as a drug discovery engine focused on selling its parts to pharma. The caveat is, in the future pipeline, if no acquisition occurs—meaning it cannot sell the drug assets to Big Pharma—then the company needs to build commercialization infrastructure internally. This may require substantial investments and dilution of ownership, resulting in a board of directors with a different vision that may seek a quick path to total exit instead of a long-term drug- and revenue-generating business. Additionally, as parts are sold, the remaining team and company assets may signal as being of lesser clinical quality, hence ending the virtuous cycle as the high-quality parts are long gone, thus making future raises difficult.

Financing history

Early-stage VC	Series A	Series B	Series C	Late-stage VC	Late-stage VC
March 11, 2011	**June 28, 2011**	**March 18, 2015**	**June 5, 2018**	**October 14, 2020**	**July 1, 2021**
Total raised $5.0M	**Total raised** $24.0M	**Total raised** $43.0M	**Total raised** $65.0M	**Total raised** $60.0M	**Total raised** $105.0M
Pre-money valuation N/A	**Pre-money valuation** N/A	**Pre-money valuation** N/A	**Pre-money valuation** N/A	**Pre-money valuation** N/A	**Pre-money valuation** N/A
Investor(s) Atlas Venture, William Gates, Richard Friesner	**Investor(s)** SR One, Lilly Ventures, Atlas Venture	**Investor(s)** Pfizer Venture Investments, Lightstone Ventures	**Investor(s)** Lilly Ventures, Pfizer Ventures, Schrödinger	**Investor(s)** RA Capital Management, BVF Partners	**Investor(s)** BVF Partners

Late-stage VC	Late-stage VC
September 2, 2022	**August 7, 2023**
Total raised $125.0M	**Total raised** $210.0M
Pre-money valuation N/A	**Pre-money valuation** N/A
Investor(s) SR One Capital Management, RA Capital Management	**Investor(s)** GV, Atlas Venture, SR One Capital Management

Generate:Biomedicines

Overview

Generate:Biomedicines, founded by Flagship Pioneering and with over $673 million total raised, is developing a generative biology platform that uses ML to enable the on-demand creation of novel drugs across various biologic modalities. With its Generate Platform, the company iterates through generation, building, measuring, and learning to rapidly identify and validate therapeutic targets and candidates. The platform claims to suggest novel protein sequences without prior knowledge and its suite for enhancing native proteins' therapeutic viability serves as its market differentiation.[2] The company currently has a pipeline of over 18 programs, with two entering the clinic covering immunology, infectious diseases, oncology, and other therapeutic areas. Generate:Biomedicines' pipeline includes GB-0895 for asthma and GB-0669 for COVID-19, with aims of an additional four to five assets added to the clinic within the next 24 months. Moreover, the expansion of its collaboration with Amgen involves a sixth program with a commitment of up to $370 million in future milestones. The ongoing Amgen partnership and its investment into the last round alongside NVentures signals confidence in the clinical potential and AI tech.

Key company information

Founded
2018

First institutional round
$50.0M in Series A funding

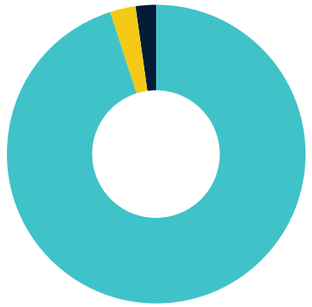
Lead investor(s)
Flagship Pioneering, Amgen, NVentures, Maps Capital, Altitude Life Science Ventures, ARCH Venture Partners, Fidelity Management & Research

Employees
300

Last financing
$273.0M in Series C funding

Total raised
$693.0M

Exit Predictor



IPO: 95% probability **M&A:** 3% probability **No exit:** 2% probability

Success: 98% probability

Note: Probability data is based on PitchBook VC Exit Predictor methodology.

2: "Generate:Biomedicines Raises Largest Biotech Series C of 2023," Genetic Engineering & Biotechnology News, Jonathan D. Grinstein, September 14, 2023.

Outlook

The company's funding achievements, including its last Series C venture funding that raised $273.0 million with a post-money valuation of $2.0 billion, reflect strong investor confidence in its technology and vision despite the economic downturn. However, caution remains for IPO potential until there are further developments on the clinical end despite massive valuations—some of which being driven by the search for COVID-19 treatments in the previous years. The caveat is the potential risk appetite for generative AI (GenAI) for investors to push for pre-clinical IPOs solely based on technology potential due to the long clinical timelines. While the company is at early clinical stage, other AI biotechs at pre-clinical phases went public based on technology potential in the previous years due to the opportunistic IPO window and investor optimism in AI & ML technology. The valuations in those cases of startups with no revenue generation were bloated, making it a large risk for investors looking at IPO paths since market capitalization will need a valuation cut to match corrected expectations. Regardless, GenAI renewed the interest in the computational drug design space and may benefit with the view as next-gen technology to push the company into an early IPO. This exit would be treated as another funding round and be ideal if private funding is not available. This would signal the company to cut down the pipeline and drop programs to focus on assets with larger market potential or quicker technology validation paths. In the long term, the exit value of AI biotechs have yet to be realized in terms of M&A, so Generate:Biomedicines may need to set the terms as clinical trials advance.

Financing history

Series A	Series B	Series C
September 10, 2020	**November 18, 2021**	**September 6, 2023**
Total raised $50.0M	**Total raised** $370.0M	**Total raised** $273.0M
Pre-money valuation $40.0M	**Pre-money valuation** $1.1B	**Pre-money valuation** $1.7B
Investor(s) Flagship Pioneering	**Investor(s)** Altitude Life Science Ventures, ARCH Venture Partners, Fidelity Management & Research	**Investor(s)** Amgen, NVentures, Maps Capital

BIOAGE

Overview

BioAge Labs was founded in Richmond, California, by CEO Kristen Fortney, Ph.D., and COO Eric Morgen, MD. BioAge focuses on developing therapies aimed at treating age-related diseases and extending the human health span. BioAge's approach combines proprietary omics data with ML techniques. It was previously focused on identifying key molecular pathways that influence longevity but has since pivoted toward addressing obesity. This enabled the team to capitalize on the emerging obesity drug boom interests of the biotech industry and successfully raise $194.3 million for its Series D round led by Sofinnova Investments. This significant capital infusion is earmarked for advancing its novel drug candidate, azelaprag, into Phase II trials. Designed to mimic exercise-induced biological molecules, the drug represents a groundbreaking approach to preserve muscle mass while promoting weight loss, showcasing BioAge's commitment to tackling both aging and obesity head-on. The company's innovative drug development process and strategic collaborations—notably with Eli Lilly for a Phase II trial combining azelaprag with Zepbound—position BioAge uniquely within the biopharma sector, offering substantial market potential in the realms of aging and obesity.

Key company information

Founded
2015

Employees
80

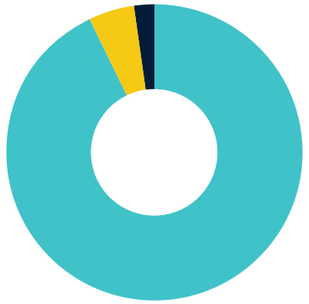
Total raised
$318.2M

First institutional round
$10.9M in Series A funding

Last financing
$194.3M in Series D funding

Lead investor(s)
Pear VC, Andreessen Horowitz, Sofinnova Investments, Felicis Ventures, Elad Gil

Exit Predictor



IPO: 93% probability **M&A:** 5% probability **No exit:** 2% probability

Success: 98% probability

Note: Probability data is based on PitchBook VC Exit Predictor methodology.

Outlook

The company's preparation for a Phase II trial of azelaprag in mid-2024, with an eye toward assessing market conditions for a potential IPO, reflects a strategic emphasis on obesity and metabolic diseases. This focus is complemented by the ambition to leverage BioAge's computational platform and vast longitudinal omics data, aiming to identify drug targets that can profoundly impact the aging process and related diseases. However, we believe the company's best way forward lies in delivering significant advancements in the treatment of obesity. An Eli Lilly acquisition is the most likely path given similar cases and partnerships, such as Eli Lilly's $1.9 billion acquisition of Versanis Bio. However, the path may not be clear if the Big Pharma obesity drug partnership fails since the remaining longevity assets are not valued as highly by investors. Longevity, despite megafunded billion-dollar bets such as Altos Labs (raised $3.3 billion), Calico Labs (Alphabet subsidiary), Unity Bio (raised $355.3 million), and others are still an area of unproven value due to long timelines, lackluster clinical data, and no pharma M&A.

Financing history

Series A	Series B	Series C	Series D
July 28, 2017	**January 24, 2019**	**December 3, 2020**	**February 1, 2024**
Total raised $10.9M	**Total raised** $23.0M	**Total raised** $90.0M	**Total raised** $194.3M
Pre-money valuation $33.0M	**Pre-money valuation** $62.0M	**Pre-money valuation** $175.0M	**Pre-money valuation** $200.0M
Investor(s) Andreessen Horowitz	**Investor(s)** Felicis	**Investor(s)** Andreessen Horowitz, Elad Gil	**Investor(s)** Sofinnova Investments

About PitchBook Industry and Technology Research

Independent, objective, and timely market intel

As the private markets continue to grow in complexity and competition, it's essential for investors to understand the industries, sectors, and companies driving the asset class.

Our Industry and Technology Research provides detailed analysis of nascent tech sectors so you can better navigate the changing markets you operate in—and pursue new opportunities with confidence.

PitchBook Data, Inc.

John Gabbert Founder, CEO

Nizar Tarhuni Vice President, Institutional Research and Editorial

Paul Condra Head of Emerging Technology Research

Additional research

Eric Bellomo
eric.bellomo@pitchbook.com
Gaming
E-Commerce

Brendan Burke
brendan.burke@pitchbook.com
Internet of Things
Information Security
Artificial Intelligence & Machine Learning

Aaron DeGagne
aaron.degagne@pitchbook.com
Medtech
Digital Health

Alex Frederick
alex.frederick@pitchbook.com
Agtech
Foodtech

Jonathan Geurkink
jonathan.geurkink@pitchbook.com
Supply Chain Tech
Mobility Tech

Kazi Helal
kazi.helal@pitchbook.com
Biopharma
Pharmatech

Derek Hernandez
derek.hernandez@pitchbook.com
Enterprise SaaS
Infrastructure SaaS

Ali Javaheri
ali.javaheri@pitchbook.com
Emerging Spaces

Robert Le
robert.le@pitchbook.com
Insurtech
Crypto

John MacDonagh
john.macdonagh@pitchbook.com
Carbon & Emissions Tech
Clean Energy Tech

Rebecca Springer
rebecca.springer@pitchbook.com
Healthcare Services
Healthcare IT

Rudy Yang
rudy.yang@pitchbook.com
Enterprise Fintech
Retail Fintech