



2022 Biopharma Industry Outlook

Highlights, Trends & Opportunities

Reach the *Right Outcome*



2021 IN REVIEW — BIOPHARMA SECTOR PRIMED FOR GROWTH

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

2021 Market Recap

Rapid development of COVID-19 vaccines & therapeutic expanded investor interest

Heightened M&A deal volume compared to 2020

Significant SPAC & IPO activity for early-stage biotech; majority now trading lower than IPO price

Public market exuberance waning as COVID-related concerns diminish

Industry-Transforming Advancements & Trends



Genome sequencing & CRISPR screens enable more efficient discovery of novel targets across indications with greater clinical efficacy



Innovative drug classes, such as antibody-drug conjugates & cell therapies, facilitate precise delivery to previously undruggable targets



CNS approvals (i.e., Biogen's Aduhelm) re-ignite investor & strategic appetite, making it the second most funded indication behind oncology

Lumakras™ (Sotorasib) FDA Approval

- First successful KRAS-directed therapy, developed with novel direct targeting approach known as “tethering”
- FDA granted accelerated approval lowering barrier to market entry
- Companion diagnostics to guide marketing



2022 Biopharma Outlook

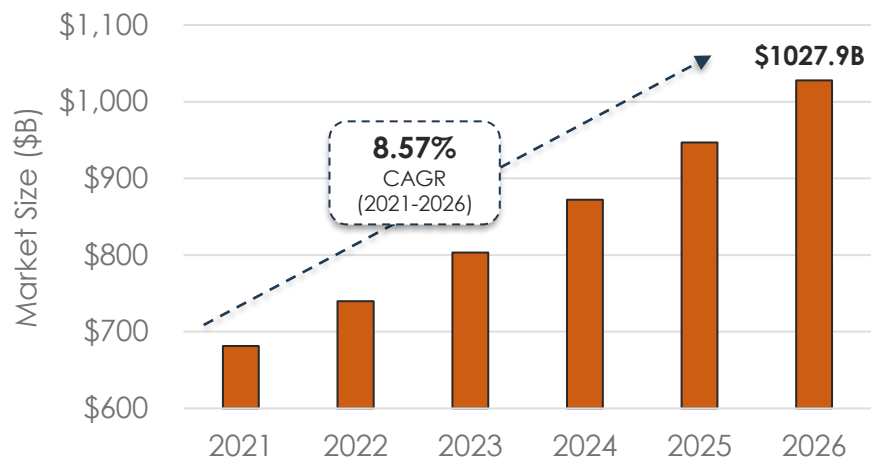
- Shift in acquisition landscape to target mid-sized companies
 - Venture-backed biotech serves as incubator for big pharma
- Impending patent cliff for large players will drive inorganic growth strategy moving forward
- Growing use of AI & big data in discovery & development
 - Seeking to decrease preclinical development time & overall cost
- Clinical shift to combination approaches
 - E.g., PD-L1 inhibition combined with other immuno-oncology MoA or bispecific antibody therapies

Accelerated Scientific Advancements Driven By COVID-19 Pandemic Shifting Market Dynamics

GLOBAL DISEASE TRENDS DRIVE MARKET DYNAMICS

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

Global Biotech Market



Select Key Players



U.S. Market Dynamics

39%

Adults classified as overweight (U.S., 2021)

80%

Deaths of adults >60 attributable to chronic, non-communicable disease (U.S., 2021)

>\$135B

2021 Biotech industry revenue (U.S., 2021)

- Growing prevalence of aging/lifestyle diseases demand novel therapeutic solutions
- Technological advances (e.g., AI, cell manufacturing capabilities) enhance & enable innovative platform solutions & therapeutic developments

Appeal of Novel Therapeutics Drives Innovation

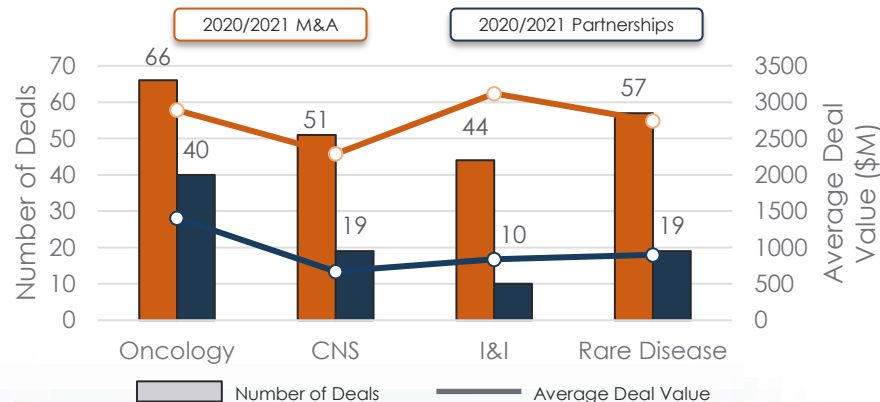
- Biological advances enable new treatment paradigms
 - Gene therapy breakthroughs can unlock new indications in rare disease markets while transforming chronic treatment regimens into single shot modalities
 - Success of mRNA vaccines during COVID-19 pandemic has resulted in high value RNA therapeutic transactions (e.g., oncology, gene therapy, inflammation)
- Platform technologies provide balanced risk/reward outcomes
- Rapid integration of digital technologies is compressing therapeutic development timelines & maximizing ROI

Public Health Trends & Technological Innovation Sustain Robust Growth Of Biopharma Market

BLUE CHIP BIOPHARMA CONTINUES INORGANIC M&A STRATEGY

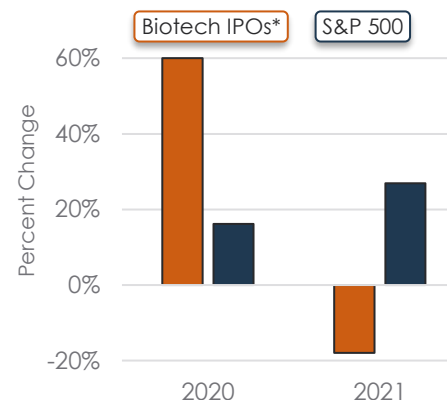
BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

Global Biopharma Market Dynamics



Inorganic Growth Drivers

- M&A provides access to cutting edge, market-moving technologies
- Platform technologies (e.g., plug-&-play antibody-based therapeutics) provide broad synergies across multiple indications
- Large strategic expertise lies in clinical development & optimizes therapeutic success & capital efficiency
- Therapeutic pipelines/portfolios constantly refreshed due to everchanging industry dynamics & strategic reprioritizations



*Change in stock price 6 months post-IPO

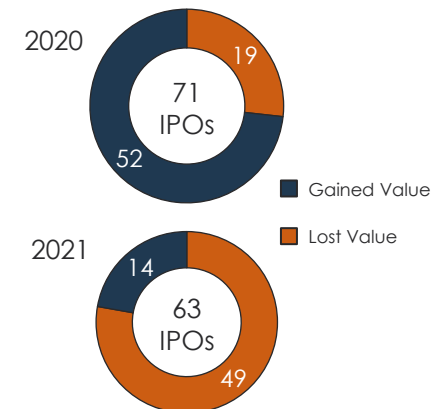
Transaction Trends

Capital focused on late-stage R&D & marketing drives early-stage biopharma growth

Strategic transactions prompt big player acquisitions to retain market share

Investment in innovative platform technologies de-risks assets while generating shareholder value



Scientific breakthroughs (gene & cell engineering, RNA technologies) enable innovation



Transactional Activity Drives Biopharma Market By Providing Strategic Advancement

2021 Industry-Defining M&As

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

Target	Acquirer	Value	Insight	Lead Asset
		\$11.5B	This acquisition complements & strengthens Merck's cardiovascular portfolio & pipeline.	Luspatercept-AMT (Reblozyl) is a recombinant fusion protein marketed for several blood disorders. It functions as a modified activin receptor type IIB fusion protein & GDF11 & GDF-8 inhibitor.
		\$12.3B	Enables Vifor Pharma to leverage CSL's capabilities to bring more products to patients within its key categories & accelerates growth in cardiovascular-metabolic, renal & transplant areas.	Difelikefalin Acetate (Korsuva) is a synthetic hydrophilic tetrapeptide indicated for the treatment of kidney disease & several forms of pain that acts by targeting the κ-opioid receptor.
		\$6.7B	Accelerates the clinical development of etrasimod & offers potentially new, differentiated best-in-class approach to address unmet needs of patients with immuno-inflammatory diseases.	Etrasimod (APD-334) is a small molecule in Phase III development for the treatment of several autoimmune diseases by targeting the S1P1, S1P4, & S1P5 receptors.
		\$3.3B	The acquisition of Dicerna's RNAi platform supports the strategy of using a broad range of technology platforms applicable across all Novo Nordisk's therapeutic focus areas.	Nedosiran is an oligonucleotide in Phase III development for the treatment of primary hyperoxaluria type I, type II, type III & alpha-1 antitrypsin deficiency by targeting lactate dehydrogenase enzyme.
		\$3.2B	Adding Translate's mRNA technology platform further accelerates Sanofi's efforts to develop transformative medicines using mRNA technology.	MRT-5005 is an mRNA complexed with bPEI in Phase II development for the treatment of cystic fibrosis. It acts by targeting the cystic fibrosis transmembrane conductance regulator.

Inorganic Growth Through Acquisition Has Enabled Big Pharma To Adapt With Changing Markets

ADVANCES IN CELL ENGINEERING FUEL ONCOLOGY APPLICATIONS

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

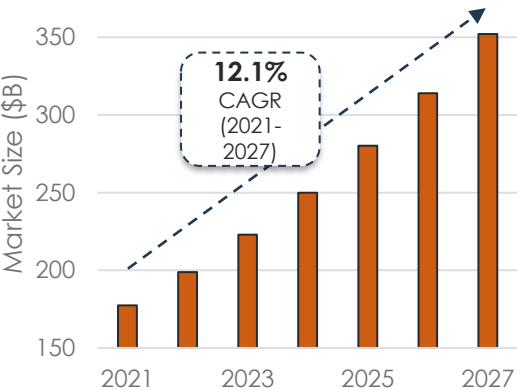
Global Oncology Market

34%
Biotech assets are oncolytic (2021)

\$198B
Market size (2022)

\$19B
Raised in venture financing (2021)

739
Oncology-related M&A, licensing, & partnerships (2021)



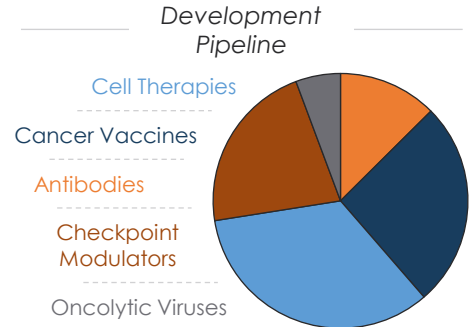
Leading Innovators



Key Challenges

- Intratumoral heterogeneity & delivery differences in pre-clinical & clinical models
- Lack of targetable neoantigens & predictive biomarkers to assess clinical efficacy
- Prohibitive manufacturing costs associated with precision immunotherapies

Immuno-Oncology Applications Enable Novel Solutions



Market Dynamics

- >\$32B 2021 checkpoint modulation market; 15.67% CAGR, 2021-2026
- Expanded biological capabilities enable novel cell therapy developments
- Emergence of combination immunotherapies provides opportunity to refresh current therapeutic options
- Rapid market growth cultivates active investment across all development stages



Market Growth Drivers

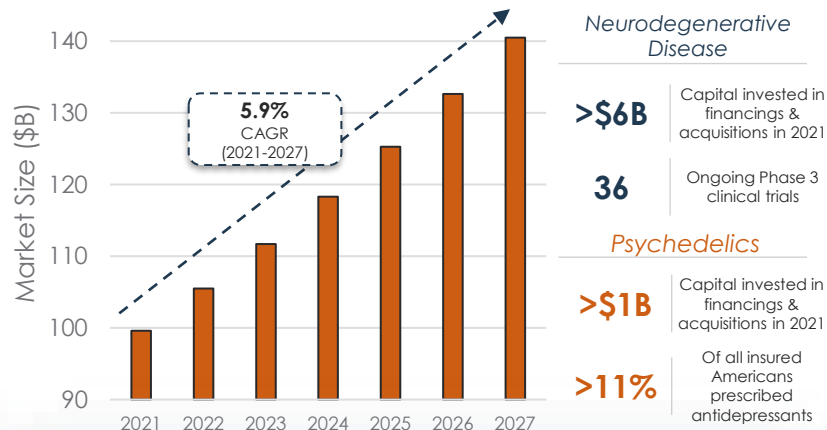
- Innovative biologic modalities provide early-stage solutions
- Shift toward value-based precision medicine cancer treatments
- FDA pathways provide new regulatory options (e.g., Fast Track, Breakthrough Therapy Designation, RMAT, Orphan Drug Designation)
- Advances in large batch & allogeneic cell preparations reduce development & manufacturing costs

Technological & Biological Innovations Drive Immuno-Oncology Advancement

HIGH PROFILE FAILURES UNDERPIN NEED FOR NOVEL TREATMENTS IN CNS

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

Global CNS Therapeutics Market



Growth Drivers

- COVID-19 pandemic increased awareness of mental health disorders & adoption of telehealth modalities
 - Opportunity to streamline psychedelic treatment protocols through telehealth implementation
- Increasing prevalence of neurodegenerative & mental health diseases
- Ineffective treatments fail to meet demands of global mental health crisis
- FDA Fast Track designation accelerates pathway to approval

Negative Outcomes Present Opportunities for New Therapies

Neurodegenerative Disease

>250
Compounds in clinical development

~100%
Historical failure rate of clinical compounds

- Acquisition & investment strategies shaped by intense competition to be first to deliver breakthrough therapy in a \$14B global market

Key Challenges

Ill-defined Mechanisms of Action confound clinical trial results

Ineffective delivery technology limits therapeutic penetration to target CNS tissues

Early-stage validation suffers from lack of relevant model systems

Psychedelics

\$11B
Expected global market by 2027

971M
Global population with mental health problems

- Serious side effects of current pipeline creates demand for new treatment options
- Increased acceptance of seeking treatment
- Leading indications: Depression, PTSD, Substance Abuse

Market Concerns

Market viability determined largely by DEA regulations & drug re-scheduling

Treatment adherence & reimbursement challenges caused by complex protocols

Market leaders (Zoloft, Paxil) increase risk of suicide driving need for novel therapeutics



Ineffective Treatments & Mental Health Awareness Drive CNS Investment Activity

GROWING DEMAND DRIVES IMMUNOLOGY & INFLAMMATION MARKET

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

Global I&I Market

>20M

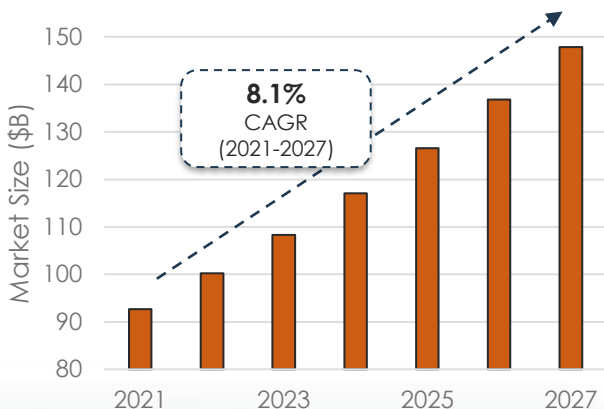
US population affected by autoimmune disease (2021)

64%

Market share held by mAb therapies (2020)

\$100B

Market size (2022)



Growth Drivers

- Advances in CRISPR/Cas9 mediated technologies represent novel treatment modalities to address autoimmune indications
- Increased prevalence of chronic immunological disorders associated with aging
- Diagnosis rates are increasing as knowledge of underlying mechanisms increases
- Success of Cyltezo (1st biosimilar of Humira) has increased demand for biosimilars

Autoimmunity Shapes the I&I Market

Market Dynamics

Gene editing techniques pervade early-stage development programs

Big biopharma remains the dominant market actor

Autoimmune disorders accounted for nearly 50% of Immunology & Inflammation M&A

- 321 of 683 total deal volume (2021)
- \$65.4B of \$127.9B total deal value (2021)

Lead Innovators



Applications

Atopic Dermatitis

Inflammatory dermatological disease affecting **more than 9 million children & 16.5 million adults** in the US.

Rheumatoid Arthritis

Most common form of autoimmune arthritis affecting **more than 1.3 million Americans**, predominantly women

Plaque Psoriasis

Autoimmune dermatological disease affecting **~8 million Americans**, 80-90% of people living with psoriasis

Inflammatory Bowel Disease

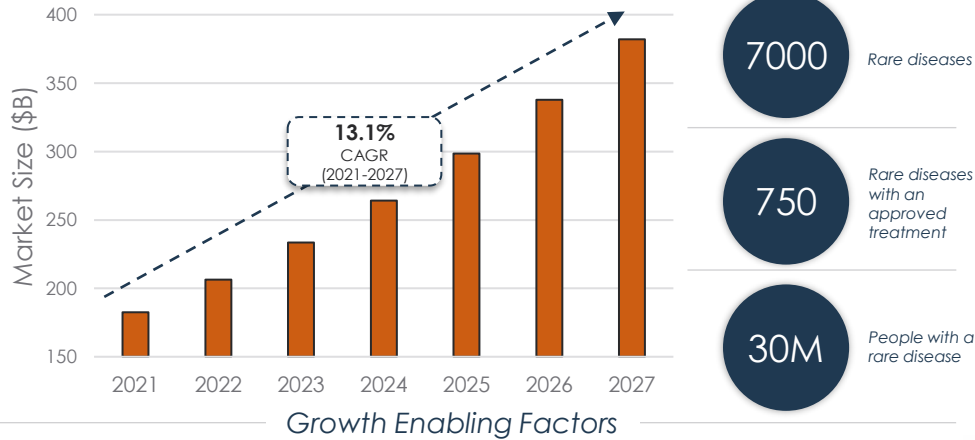
Gastrointestinal disease defined by chronic inflammation of the GI tract (Crohn's disease & ulcerative colitis)

Heightened Prevalence Of Autoimmune Disorders & Immunological Disease Drive Growing I&I Market

GENE THERAPY BREAKTHROUGHS FULFILL NEED IN RARE DISEASE MARKET

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

Global Rare Disease Market



Growth Enabling Factors

- Industry leaders acquire clinical-stage companies addressing rare disease indications as a vehicle to access multifunctional platform technologies
 - Monoclonal antibodies, RNA, gene, & stem cell therapy generating platforms are redirected to strengthen pipelines of industry leaders
- Cross-indication platform utility enables healthy ROI in traditionally risky, low population rare disease market
- Advances in gene therapy promise cures for >5000 rare diseases

Key Challenges

Government revenues depleted by COVID-19 complications may affect incentive funding

Rare disease awareness remains low, limiting provider diagnosis & patient's ability to seek care

Gene Therapy Advances Unlock Rare Disease Treatment

80%

Of rare diseases have a monogenic cause

312

Therapies in clinical trials in the 8MM

Major Influencers

Favorable U.S. regulatory environment spurs continued development

Shift to value-based payment increases payer adoption of expensive therapies

Increased COVID-19 investments in RNA-based therapeutics spill into gene therapies

Leading Innovators











Transaction Drivers Within Rare Disease Market

- Multi-function platform technologies strengthen existing pipelines using rare disease indication as proof of concept
- Regulatory incentives de-risk platform development
- High cost of gene therapies creates need for innovation to boost market adoption
- Therapeutic complexity requires acquisition of both new technologies & expert personnel

Multifunction Platform Technologies Developed For Rare Disease Strengthen Existing Pipelines

Recent High-Value Transactions Signify Demand Within Biopharma Verticals




BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

	Target	Acquirer	Deal Size	Insight	Lead Drug in Deal
Oncology			\$1.7B	Clinical biopharmaceutical company that focuses on the development of novel therapeutics for the treatment of serious unmet medical needs of patients, especially cancers associated with abnormal gene expression.	Pelabresib (CPI-0610), a small molecule in Phase III of development for the treatment of hematological cancers. It functions as a bromodomain-containing protein inhibitor, arresting the cell cycle & resulting in apoptosis.
			\$470M	Pre-clinical stage biotech company that engaged in a novel mRNA-based approach for in vivo reprogramming of immune cells for applications in both immuno-oncology & inflammation.	An oligonucleotide in preclinical development for the treatment of solid cancers. It acts by delivering in vitro-transcribed mRNA encoding M1-polarizing transcription factors targeting IRF5 & IκB Kinase.
			\$2.26B	Clinical stage immuno-oncology company, which develops novel therapies for the treatment of cancer. The company uses biologic & small molecule-based approaches to develop its portfolio.	TTI-621 (SIRPa Fc), a fusion protein in Phase II development for treatment of hematological & solid cancers. It consists of the CD47-binding domain of human SIRPa linked to the Fc region of human IgG1 & functions by targeting CD47.
			\$1.9B	Clinical state biopharmaceutical company focusing on the research & development of novel treatments for cancer & inflammatory disorders. The company's developmental pipeline is based on the discovery platform & library of therapeutic proteins.	Bemarituzumab [FPA-144], a mAb therapy in Phase III development for the treatment of solid tumors. It acts as an immunotherapy by targeting a splice form of FGFR2 on FGFR2b-overexpressing tumors & is designed to recruit tumor-killing NK cells into the tumor microenvironment.

Biopharma Races To Expand Capabilities By Acquiring Platform Technologies With Broad Applicability

Recent High-Value Transactions Signify Demand Within Biopharma Verticals

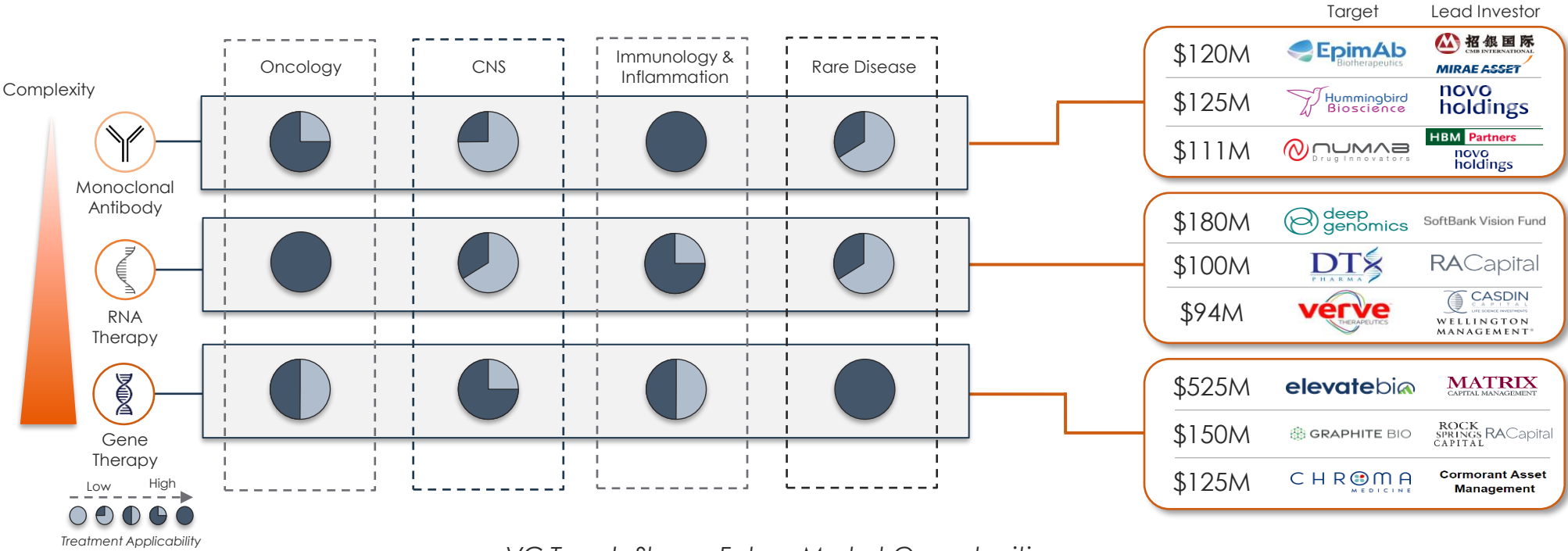
BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES

	Target	Acquirer	Deal Size	Insight	Lead Drug in Deal
CNS	 ARVELLE THERAPEUTICS	 ANGELINI PHARMA	\$960M	Biopharmaceutical company with the mission of bringing innovative solutions to patients suffering from CNS disorders.	Cenobamate (Xcopri/Ontozry), a small molecule sodium channel blocker marketed for treatment of partial seizures & tonic-clonic seizures.
	 GW pharmaceuticals	 Jazz Pharmaceuticals	\$7.2B	Biopharmaceutical company that discovers, develops & commercializes novel therapeutics from its proprietary plant-derived cannabinoid product platform.	Nabiximols (Sativex), a mucosal spray comprised of CBD & THC, is indicated for treatment of spasticity due to MS, agitation in dementia, & multiple forms of pain.
Immunology & Inflammation	 VIELABIO	 HORIZON	\$3.05B	Biotechnology company that develops novel therapies for treatment of autoimmune inflammatory diseases.	Inevilizumab-cdon (Uplizna), a IgG1k mAb directed against the B-cell-specific membrane protein CD19, marketed for the treatment of several autoimmune diseases.
	 Kadmon	 sanofi	\$1.9B	Integrated biopharmaceutical company that discovers, develops & markets small molecules & biologics for autoimmune & fibrotic diseases, various types of cancer, & genetic diseases.	Belumosudil mesylate (Rezurock/ Rholistiq), a small molecule inhibitor of Rho Kinase 2, is marketed for cGVHD & under development for several autoimmune diseases.
Rare Diseases	 CAELUM BIOSCIENCES	 ALEXION	\$500M	Clinical-stage biotechnology company that developing treatments for AL Amyloidosis, a rare & life-threatening hematologic disorder.	CAEL-101, a chimerized 11-F4 IgG1k mAb directed against amyloid-related, conformational epitopes on LC related fibrils, in Phase III development for the treatment of AL amyloidosis.
	 STRONGBRIDGE BIOPHARMA	 xeris BIOPHARMA	\$267M	Commercial-stage biopharmaceutical company that develops & commercializes therapies for rare diseases.	Dichlorphenamide (Keveyis), a small molecule inhibitor of carbonic anhydrase belonging to the meta-disulfamoylbenzene class, is marketed for several rare diseases affecting the CNS.

Strategic Acquisition Allows Biopharma To Diversify Pipeline While Adding Necessary Expertise

Venture Capital Financing Forecasts Market Growth

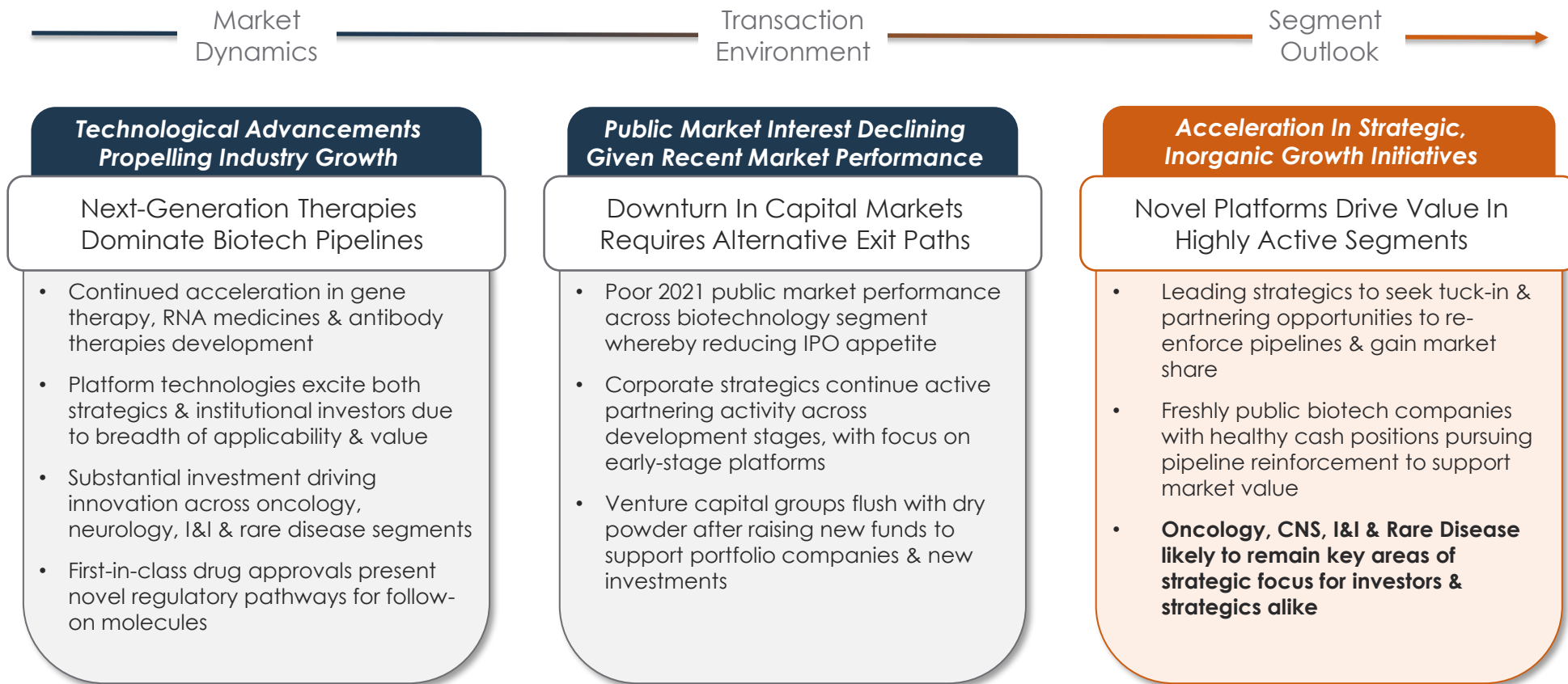
BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES



Early-Stage Financing in Innovative Technologies Drives Future M&A & Partnering Deals

Inorganic Growth To Fuel Biopharma Pipelines

BIOPHARMA SECTOR | HIGHLIGHTS, TRENDS & OPPORTUNITIES



Active Partnering & M&A Environments Expected To Persist & Enhance Shareholder Value



99 High Street
Suite 2900
Boston, MA 02110
(617) 431-4886

www.outcomecapital.com

Reach the *Right Outcome*