EMERGING BIOTECHNOLOGIES – GENE THERAPY MARKET ANALYSIS
Executive Summary

Gene Therapy: A Turbulent Past
Clinical research in the gene therapy field has had a turbulent past. In 1990, the first clinical trials for gene therapy approaches to combat disease were carried out. Although it was initially thought of as a revolutionary technology with the potential to cure almost any disease, the fervor surrounding gene therapy rapidly waned as clinical trial after clinical trial failed to show efficacy. Then in 1999, an adverse patient reaction to an adenovirus vector during a clinical safety trial led to the realization that the lack understanding the biology of viral vector interactions with the human immune system could have fatal consequences. The year 2002 brought the first gene therapy success case in which three children were cured of a fatal immunodeficiency disorder, but this therapy was later linked to a leukemia-like disease in two of 11 patients who had been treated. These setbacks have thwarted clinical research into gene therapies, and have overshadowed the important progress that has been made in the improvement of gene transfer technologies in recent years.

Market Turning Point: Glybera Approval
After these adverse events were reported, the FDA suspended several gene therapy clinical trials, pending its review of the ethical and technical practices in the field. As a result, scientific interest and financial investment in gene therapy nearly dried up. However, this all changed in July 2012, when the EMA approved UniQure's Glybera (alipogene tiparvovec), albeit, under strict guidelines, for treating lipoprotein lipase deficiency (LPLD), an inherited, ultra-orphan disease affecting only one in a million people and can cause severe pancreatitis. Therefore, despite past difficulties in the field, GlobalData considers the final opinion in favor of Glybera as encouraging news for the gene therapy community, as it may have sent a signal to drugmakers that the development of gene therapies is a commercially viable endeavor, and not just an academic exercise.

Gene Therapy Field Has Witnessed a Spike in Business Development
GlobalData believes the approval of Glybera laid the foundation for increased business development in the gene therapy field, including in deals activity, and tranche financing from investors. The year 2014 experienced a dramatic increase in both the number and value of gene therapy deals when compared with historical levels. Gene therapy deals increased from 16 in 2013 to 36 in 2014, while total deal value soared from $122.8 million in 2013 to nearly $5 billion in 2014. While M&A in the gene therapy space is rare, there were a couple of business combinations that are of significance. Abbott Labs acquired CFR Pharmaceuticals, a Chilean biotechnology company that is developing a gene therapy for treating alcoholism for $2.9 billion. The preclinical candidate inhibits aldehyde dehydrogenase, an enzyme produced in the liver and kidneys which aids in alcohol rejection. In addition, UniQure purchased InoCard for $4 million in August 2014. This transaction gave UniQure the
rights to InoCard’s gene therapy pipeline, which has preclinical treatments for congestive heart failure and other cardiovascular disorders. InoCard is a spin-off of the University of Heidelberg, and its acquisition represents a shift in UniQure’s strategy from focusing on rare diseases to targeting chronic diseases that affect large patient populations.

Licensing and partnerships, together with capital raisings represented the largest portion of the gene therapy deals struck since 2009. Licensing accounted for 49 deals valued at $2 billion, whereas equity offerings and venture financings accounted for 40 deals raising about $1.5 billion. In 2014, licensing hit its peak, registering 12 deals with a combined value of $893 million. Two of the largest deals were Janssen’s $292 million oncology agreement with Transposagen BioPharma to develop CART-based gene therapies for fighting cancers; and Pfizer’s deal with Spark Therapeutics for $280 million to develop SPK-FIX, a Phase II program in hematology. In February 2015, Voyager signed one of the largest licensing deals to date in the gene therapy field with Genzyme for $845 million. This agreement gives Genzyme licensing rights to Voyager’s three Phase I programs in CNS.

Equity offerings and venture financing are common sources of deal activity among gene therapy firms seeking to raise funds for their research and development or operational requirements. These include initial public offerings (IPOs), private placements by banks and other financial institutions, as well as secondary offerings for companies that are already publicly listed. Venture financing includes seed or concept-stage, startup, growth-stage, later-stage, and expansion financing, thus providing funding through different lifecycle stages of product development and commercialization. Firms that are engaged in gene therapy R&D have attracted significant investment from many life science focused venture funds over the past decade. Across the entire life science spectrum, venture financing represents a vital channel for the raising of capital for start-up biotechs and/or other small-sized companies. Nearly $1.5 billion was raised from 2014–2015, with almost $750 million as a result of Avalanche,
Executive Summary

Bluebird bio, and Spark Therapeutics going public. The investment firm Cowen and Company, has been the most active investor in the gene therapy field, having risen over $700 million since 2009, largely due to its backing of all three companies mentioned above. On March 24, 2015, Paris based-Cellectis, announced it raised $228.3 million in an IPO on the NASDAQ global market. The company will use the funds to advance its gene therapy programs from preclinical testing into Phase I clinical trials. Cellectis’ pipeline is focused on blood cancers, acute myeloid leukemia (AML), chronic lymphocytic leukemia (CML), and multiple myeloma.

Oncology and CNS Disorders Receive the Most Clinical Attention

As illustrated in the figure below, the number of gene therapy clinical trials has consistently declined since 2009 largely due to trials having been withdrawn or discontinued. This is clearly a sign of the difficulties of conducting clinical research into gene-based therapeutics, with the primary obstacle being the inability to deliver genes efficiently to obtain sustained expression.

In recent years, progress has been made in the development of cancer gene therapies, particularly viral vector delivery of genes into cancer cells. Of the top five therapeutic areas targeted, oncology leads the pack with 80 (22%) clinical trials, followed by CNS disorders with 59 (16%) trials, ophthalmology with 45 (12%), genetic disorders with 42 (11%) trials, and finally, cardiovascular with 39 (11%) clinical trials. While oncology holds the majority of gene therapy clinical trials, these are spread across some 35 different indications with melanoma and glioblastoma being the front runners.

Gene therapy research into neurodegenerative disorders is another field of interest. Indications such as, Amyotrophic Lateral Sclerosis (ALS), Parkinson’s and Alzheimer’s diseases garner the bulk of clinical trials in this area, as investigators examine pathways to curb disease progression through restoring neuroprotective growth factors, and the enzymes that are responsible for dopamine synthesis. An example of this is...
Sangamo BioSciences Phase II candidate, CERE-110, an adeno-associated virus (AAV) vector that encodes the gene in a region of the brain where cholinergic nerve cell degeneration occurs in Alzheimer’s disease.

Gene Therapy Clinical Trials by Therapy Area, 2009–2014

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2  Introduction

2.1  Report Scope

GlobalData’s PharmaSphere: Emerging Biotechnologies – Gene Therapy Market Analysis report is an essential source of information and analysis on the gene therapy field. Using detailed company data, deal analysis, corporate strategy, and market trends analysis, GlobalData provides an in-depth analysis of the current and future growth drivers of the gene therapy market. The report discusses the key factors shaping and driving the gene therapy business, and provides insights on the competitive landscape and emerging strategies expected to significantly influence the market positions of companies currently involved in the development and commercialization of gene therapies.

Key Questions Answered

- What are the drivers of the gene therapy field?
- Who are the leading companies involved in the development of gene therapies?
- What are the major trends in gene therapy clinical trials?
- What specific therapeutic areas and indications are receiving the most clinical research?
- What progress has been made in terms of viral vector technology and gene delivery?
- What specific business development activities are taking place in terms of partnerships or mergers and acquisitions (M&As)?
- Has investor confidence been restored in the gene therapy field?

Key Benefits

This report will enable you to:

- Identify the key players in the gene therapy market
- Analyze and track the strategies that companies are using to strengthen their position in the gene therapy field; independent source for due diligence
- Organize your sales and marketing strategy to identify companies with proprietary technologies in order to maximize opportunities for licensing, partnership, investment, or takeover
Introduction

- Understand the flow of investment from capital markets into the gene therapy field

2.2 Companies Mentioned


2.3 Upcoming Reports

- The publication dates for the following reports are to be determined, and the titles are subject to change.

2.4 Recently Published Reports

9 Appendix

9.1 Bibliography


9.2 Research Methodology

GlobalData's dedicated research and analysis teams consist of experienced professionals with marketing, market research, and consulting backgrounds in the pharmaceutical industry, and advanced statistical expertise. GlobalData adheres to the codes and practices of the European Pharmaceutical Market Research Association (EphMRA, ephra.org). All GlobalData databases are continuously updated and revised. The following research methodology is followed for all databases and reports.

9.2.1 Coverage

The objective of updating GlobalData's coverage is to ensure that it represents the most up-to-date vision of the industry possible. Changes to the industry taxonomy are built on the basis of extensive research of company, association, and competitor sources. GlobalData aims to cover all major news events and deals in the pharmaceutical industry, updated on a daily basis. Company coverage is based on three key factors: revenues, products, and media attention/market potential.

- The estimated revenues of all major companies, including private and governmental, are gathered and used to prioritize coverage.

- Companies that are making the news, or that are of particular interest due to their innovative approach, are prioritized.
9.2.2 Secondary Research

The research process begins with exhaustive secondary research on internal and external sources being carried out to source qualitative and quantitative information relating to each market. The secondary research sources that are typically referred to include, but are not limited to:

- Company websites, annual reports, financial reports, broker reports, investor presentations, and US Securities and Exchange Commission (SEC) filings
- Industry trade journals, scientific journals, and other technical literature
- Internal and external proprietary databases; relevant patent and regulatory databases
- National government documents, statistical databases, and market reports; procedure registries
- News articles, press releases, and webcasts specific to the companies operating in the market
Appendix

9.3 About the Author

9.3.1 Adam Dion, Senior Industry Analyst

Adam Dion, MSc.

Adam Dion is Senior Industry Analyst in the Healthcare Industry Dynamics Team at GlobalData. Mr. Dion is the author of GlobalData’s PharmaLeaders Benchmark reports, which rank the competitive positions of the top companies in the pharmaceutical, biotech, and CRO/CMO and generic drug manufacturing sectors. Adam is the lead author of the Pharmaceutical Benchmark Report and the Innovative Mid-Cap Biotech Benchmark Report. He also provides coverage of trends in the healthcare IT space, including mHealth and cloud computing.

Prior to joining GlobalData, Mr. Dion was an Analyst with Technology Business Research, a leading market research and consulting firm. In this role, he was responsible for coverage of blue-chip hardware, software, and BPO companies, such as Dell, Apple, SAP, Acer, Wipro, and Tata Consultancy, analyzing these companies’ go-to-market and vertical integration strategies, financial forecasting and competitive benchmarking. Adam also has been involved in a number of primary market studies in the consumer space, analyzing the market penetration of tablets, Netbooks, e-readers and mobile devices. His analytical commentary has been quoted by leading sources, such as The Wall Street Journal, Bloomberg, Forbes, Financial Times, The Guardian, PharmaLive, Drug Discovery News, ComputerWorld and eWeek. Adam received his BS in Neuroscience from Merrimack College, and MSc in Marketing from the University of New Haven.
9.4 Global Head of Healthcare

Bornadata (Bonnie) Bain, PhD

Bonne Bain, PhD, is Global Head of Healthcare for GlobalData in Boston, managing the Medical and Pharmaceutical arms of the business. Prior to this role, she was Vice President and Global Research & Analysis Director for Informa, where she oversaw the global strategy and operations for Datamonitor Healthcare’s syndicated business. Bonnie has over 15 years’ experience in the healthcare sector and a proven track record of developing innovative solutions on both the client and vendor sides of the business. Prior to joining Informa, Bonnie was Director of Product Development at Wood Mackenzie, where she oversaw development and management of two product lines. Bonnie also worked for several years at Decision Resources as an Analyst and Project Manager. On the client side of the industry, Bonnie worked for several years as a Senior Manager in Marketing Strategy and Analytics at Boston Scientific, where her work contributed to the successful commercialization of the first-ever Access and Visualization Platform at the company. She has a PhD in Biochemistry and Molecular Biology from Purdue University, and was a Post-Doctoral Fellow in Molecular Pharmacology at The University of Miami School of Medicine.

9.5 About the Industry Dynamics Team

GlobalData’s Industry Dynamics Team provides in-depth reports based on solid financial and strategic analysis to help clients make informed decisions. Our PharmaLeaders and PharmaSphere portfolios give clients access to premium-level analysis on an industry-wide basis of the established and emerging players within the global pharmaceutical marketplace.
Appendix

9.6 About GlobalData

GlobalData is a leading global provider of business intelligence in the healthcare industry. GlobalData provides its clients with up-to-date information and analysis on the latest developments in drug research, disease analysis, and clinical research and development. Our integrated business intelligence solutions include a range of interactive online databases, analytical tools, reports, and forecasts. Our analysis is supported by a 24/7 client support and analyst team.

GlobalData has offices in New York, San Francisco, Boston, London, India, Korea, Japan, Singapore, and Australia.

9.7 Disclosure Information

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