Pharma spends big to access key cell and gene therapy assets

High-value cell therapy deals are driving investment in the cell and gene therapy field, but new approaches such as gene editing are also beginning to contribute.

Credit: mkarco / Alamy Stock Photo

Mike Ward

In the ever-evolving landscape of biotechnology and pharmaceuticals, one sector has emerged as particularly promising in the quest to combat previously untreatable diseases: cell and gene therapy. Half a century after scientists proposed the idea of modifying defective genes to treat diseases with a genetic root, the approach is beginning to bear fruit.

To date, the United States Food and Drug Administration (FDA) has approved 31 cell and gene therapies, ten of which are targeting oncology indications. It has also approved multiple oligonucleotide-based drugs, while all eyes are currently on whether the agency will approve the first therapy developed using a gene-editing technology for sickle cell disease and beta thalassemia in December 2023.

Groundbreaking cell and gene therapy technologies have the potential to revolutionize medicine, offering new hope to patients facing previously insurmountable challenges and so have emerged as an attractive target for pharmaceutical companies. However, the journey from discovery to market is fraught with complexity, and therefore dealmaking could play a pivotal role in shaping the future of the field.

In the 12 months to the end of September 2023, according to BioWorld, 246 partnership deals focusing on cell and gene therapy programs and platforms were signed, of which 43 also disclosed financial details. During this 12-month period, the three highest valued deals were signed in 2022. In 2023, the leading ten transactions have a potential value of $16.8 billion.

Cell therapy-focused deals

Many of the deals signed in the cell and gene therapy space involve cell therapies for cancer, and several deals in recent years have been penned for pharma companies to access next-generation cell therapy opportunities. For example, in August 2022, Roche signed a deal with Poseida Therapeutics to develop allogeneic CAR-T cell therapies for blood cancers including multiple myeloma, B cell lymphomas and other indications. Poseida will receive an upfront payment of $110 million, and if milestones are met Poseida could receive up to $6 billion, which makes this deal one of the most potentially valuable in the field in recent years. Also targeting multiple myeloma through a high-value deal, Arcellx and Kite Pharma joined forces in December 2022 to co-develop and co-commercialize Arcellx's phase 2 cell therapy CART-ddBCMA (Table 1).

Big pharma Bristol Myers Squibb (BMS) also signed a couple of high-value oncology-focused deals earlier in 2022. In January 2022, BMS partnered with Century Therapeutics to use their induced pluripotent stem cell (iPSC)-based allogeneic cell therapy platforms to develop up to four iPSC-derived, natural killer cell and/or T cell programs to treat hematologic malignancies and solid tumors. BMS then expanded its relationship with Immatics to develop allogeneic TCR-T/CAR-T programs using Immatics' gamma delta T cell-derived, adoptive cell therapy (ACT) platform, ACTallo.

Enter gene editing

Beyond cell therapies, some other notable partnering deals signed recently involved gene editing technologies, particularly those based on CRISPR-Cas9 systems. Since the publication of the pioneering research on programmable DNA cleavage by the Cas9 nuclease just over a decade ago, which won its inventors a Nobel Prize in 2020, such systems have been widely explored for inactivating genes by making targeted cuts, as well as for correcting specific mutations in an approach known as base editing.

With the first therapeutic based on CRISPR-Cas9 technology, developed by CRISPR Therapeutics and Vertex Pharmaceuticals, in line for FDA approval as a treatment for sickle cell disease and beta-thalassemia by the year end, it is possible that we will see more partnering deals to access gene-editing technologies. According to Cortellis Clinical Trials Intelligence, the eight leading target indications for gene editing are all oncology-related, but some of the most lucrative recent partnering deals have involved non-oncology indications.

The largest gene-editing partnership signed in 2023 is a collaboration between Novo Nordisk and gene-editing company Life Edit Therapeutics to develop base-editing therapies against certain therapeutic targets, which was penned in May.

The partnership involves the development of up to seven programs to target genetic and cardiometabolic diseases. Life Edit received an upfront cash payment and could receive development, regulatory, and commercial milestones of $335 million for each of the first two development programs. A further $250 million could be paid for the remaining five programs. Novo Nordisk will handle research and development costs and Life Edit could receive tiered royalties on potential future net sales of therapeutic products. Also included in the deal, Novo Nordisk secured an equity investment in Life Edit's parent company ElevateBio.

Life Edit also partnered with Moderna earlier in the year to collaborate on the development of in vivo mRNA gene editing therapies to target genetic diseases. The deal will harness Moderna's mRNA platform for the delivery of gene-editing technology.

Another big pharma company claiming its stake in the gene-editing pie is Eli Lilly. In October 2023, Lilly paid the gene-editing company Beam Therapeutics $200 million for its stake in base-editing candidates being developed for cardiovascular disease by

Table 1 | Selected recent cell and gene therapy partnering deals

Principal company	Partner company	Details	Headline deal value ($ million)	Date
Poseida Therapeutics	Roche Pharma	Companies inked a research collaboration to develop off-the-shelf, or allogeneic, CAR-T cell therapies to tackle certain blood cancers.	6,200	August 2022
Arcellx	Kite, a Gilead company	Agreed global strategic collaboration to co-develop and co-commercialize CAR T-ddBCMA, to treat relapsed/refractory multiple myeloma.	4,225	December 2022
Wave Life Sciences	GSK	Four-year R&D deal provides GSK access to Wave's PRISM oligonucleotide platform. GSK to advance up to eight preclinical programs.	3,695	December 2022
Alnylam Pharmaceuticals	Roche Pharma	Companies partner to co-develop and co-commercialize zilebesiran for hypertension.	3,110	July 2023
Quell Therapeutics	AstraZeneca	AstraZeneca takes option from Quell to develop, manufacture, and commercialize Treg cell therapies for type 1 diabetes and IBD.	2,085	June 2023
Life Edit Therapeutics	Novo Nordisk	Life Edit to develop and commercialize Novo Nordisk's gene editing therapies for rare and cardiometabolic diseases.	1,920	May 2023
Gentibio	Bristol Myers Squibb	Companies agreed to develop T_{reg} therapies to re-establish immune tolerance and repair tissue in IBD patients.	1,900	August 2022
Generation Bio	Moderna	Companies collaborate to develop non-viral genetic medicines worldwide.	1,876	March 2023
Immatics	Moderna	Companies to develop and commercialize cancer vaccines and TCR therapeutics worldwide.	1,820	September 2023
Voyager Therapeutics	Neurocrine Biosciences	Neurocrine to develop and commercialize Voyager's gene therapies for neurological diseases, worldwide.	1,685	January 2023
Scribe Therapeutics	Prevail Therapeutics	Prevail and Scribe to develop CRISPR-based in vivo genetic therapies for serious neurological and neuromuscular diseases.	1,575	May 2023
Shape Therapeutics	Otsuka Pharmaceutical	Companies to develop novel treatment options for people with serious eye diseases.	1,500	September 2023
Scribe Therapeutics	Sanofi	Companies expanded their collaboration to use CRISPR-based technologies with targeted non-viral delivery technologies for the treatment and prevention of genomic diseases.	1,240	July 2023
Prevail Therapeutics	Sangamo Therapeutics	Prevail obtained option from Sangamo to develop AAV capsids against multiple neurological targets worldwide.	1,190	July 2023

Source: BioWorld; Cortellis Deals Intelligence. AAV, adeno-associated virus; BCMA, B cell maturation antigen; CAR, chimeric antigen receptor; IBD, inflammatory bowel disease; TCR, T cell receptor.

Verve Therapeutics, which licensed gene-editing technology from Beam in 2019. It means Lilly will own opt-in rights to develop the cardiovascular disease-focused therapeutics. Under the terms of the deal, Eli Lilly will also pay Beam $50 million for an equity share and pay a further $350 million on the completion of future milestones.

In November 2023, AstraZeneca announced that it was partnering with Cellectis to develop cell and gene therapy candidates in areas such as immunology, oncology, and rare diseases. Cellectis will apply its gene editing technology (which is based on nucleases known as TALENs) and manufacturing expertise to explore 25 targets reserved for AstraZeneca, ten of which could be developed into candidates. AstraZeneca agreed to pay Cellectis up to $245 million, composed of $25 million in cash and up to $220 million as an equity investment, as well as milestone payments.

Freedom to operate

One of the challenges for companies attempting to establish cell and gene therapy partnerships is to ensure that they have all the elements in place to have freedom to operate. In addition to the scientific challenges, issues around manufacturing and scale-up need to be addressed, often requiring access to the intellectual property estates of other organizations. Indeed, with CRISPR-Cas9 platforms, the challenge potential partners face is the fact that the United States and European Union have given primacy to different patent estates.

While the biggest headline-grabbing transactions have involved pharmaceutical companies getting access to promising therapeutic candidates, most of the deals are focused on tapping into the technologies that are essential to developing and manufacturing these new generations of therapies. Indeed, some of the transactions associated with manufacturing technologies can be very complex as pharma stack up the patents needed to have freedom to operate.

Clearly, the promise of cell and gene therapy is immense, with the potential to revolutionize the treatment of numerous diseases. So, as the industry evolves and technologies advance, the art of deal-making will remain at the forefront of bringing these life-changing therapies from the laboratory to the clinic, offering hope to patients who have long awaited a cure.

Mike Ward is Global Head of Life Sciences & Healthcare Thought Leadership at Clarivate.