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From early innovations to commercial triumphs: One viral vector partner for every stage of gene therapy development

Gene therapies harness the transformative power to correct diseases at their genetic core, but their success hinges on the sophisticated process of viral vector manufacturing. Viral vectors are the molecular couriers of gene therapies, tasked with safely delivering new genetic material into cells. As gene therapy technology becomes more advanced, the process of producing viral vectors becomes more challenging, requiring a manufacturing partner that is not only versed in the intricate science of viral vector production but also agile enough to adapt to the shifting tides of therapeutic innovation.

A closer look at the experiences of two companies—an emerging biotech with its sights set on Parkinson's disease and an established company focused on the commercialization of gene therapies for several genetic disorders—offers insights into what companies at different stages of the development and manufacturing cycle need in a Contract Development and Manufacturing Organization (CDMO) partner for viral vector manufacturing.

NysnoBio: A pioneer in early-onset Parkinson's therapy

Jennifer Johnston, PhD, has dedicated more than two decades to researching Parkinson's disease. In recent years, she has focused her efforts on the Parkin (PRKN) gene, a ubiquitin E3 ligase, which is implicated in Parkin-PD, an early-onset form of the chronic degenerative central nervous system disease.

"Parkin-PD is the most potent known genetic form of Parkinson's, with almost 100% penetrance," Johnston explained during a recent event at Thermo Fisher Scientific's viral vector manufacturing site in Plainville, Mass. "Patients affected are typically younger than 35 years old, with significant disability in the prime years of their life."

Having pioneered the basic biochemistry and therapeutic potential for the Parkin gene, Johnston and her research colleagues founded San Francisco-based NysnoBio in 2019 to take aim at this target. With a goal of developing a Parkin gene replacement therapy, NysnoBio is in the early stages of its journey and their challenges are manifold: navigating the gene therapy landscape, ensuring their work's reproducibility, and above all, scaling production without compromising quality.

Their efforts got a significant boost in July 2023, when the company was awarded a research grant from the Michael J. Fox Foundation for Parkinson's Research.

The funding is supporting product manufacturing to enable the IND safety studies in preparation for human clinical trials.

Like many emerging companies that have innovative ideas and investor support, NysnoBio doesn't have the employees, infrastructure, or manufacturing space to develop and manufacture the therapy they are pioneering. Rather than commit the time and money it would take to establish their own production capabilities, the team opted to work with a CDMO partner that has the platform, the people, and the preclinical models to support the work. "For us, partnering with a CDMO that has experience in different technologies and products and a strong track record in viral vector development and process engineering makes the most sense," Johnston explained. "We want to focus on innovation."

Their search for a manufacturing partner led them to Thermo Fisher Scientific. "Our challenge is ensuring that our work is reproducible and scalable, so we need a collaborator familiar with the nuances of early-stage gene therapy, one who can evaluate our project from every angle—scientific, technical, operational, cost, and regulatory—and offer guidance and reliability," Johnston explained. "We also need a partner not just for now, but for the future, who can grow with us, which is why we chose Thermo Fisher."

Scaling up and reading out: bluebird bio paves road to commercialization

While NysnoBio is focused on early phase development, Massachusetts-based bluebird bio is focused on the other end of the spectrum: late-stage clinical development and commercialization.

With an established portfolio focusing on severe genetic diseases, bluebird bio already has treatments that have made significant impacts on conditions like β-thalassemia and cerebral adrenoleukodystrophy (CALD). In December 2023, the company received FDA approval for its one-time gene therapy for sickle cell disease.

Given their focus on the later phases of development, bluebird bio's partnership needs revolve around scaling their operations, ensuring consistent quality, and optimizing supply chains for a broader patient base.

The supply chain consideration is essential, according to Tom Klima, the company's Chief Commercial and Operating Officer. "When you think of gene therapy and the supply chain, you're taking a piece of a patient and making it part of your supply chain, and every partner along the way plays a critical role. It's a huge mistake to think that you can only start thinking about this later in development. All the decisions you make early in development have a huge impact as you get closer to commercialization."

Furthermore, the responsibility toward patients is paramount. Klima explains, "Often, if there are mistakes along the way, people forget that there's a doctor and a patient at the other end. You need to call and explain why their cells were not produced properly. Those are hard conversations to have. Having a trusted partner like Thermo Fisher, who understands that they're a massively important part of patient care, is super important."

As therapies progress and target larger patient populations, the scale of manufacturing has to evolve concurrently. "This is something you have to think about years before launch," Klima said. "With CALD, we started with a smaller population of about 40 patients, but then moved to a bigger population with beta thalassemia of about 1,500 patients in the United States. Now, we're looking at sickle cell disease, where there are about 20,000 patients that could benefit from gene therapy."

Meeting this challenge requires adopting more efficient, scalable viral vector production methods. For bluebird bio, it meant shifting from traditional adherent cell culture, where cells grow attached to a surface, to suspension culture, in which cells can grow freely in a bioreactor. “[Suspension culture] is more scalable and produces about 10 times greater yield,” Klima noted.

For an established company like bluebird bio, the partnership with a CDMO is less about guidance and more about competence, Klima stressed. “We need a partner with the infrastructure and expertise to handle large-scale productions, ensuring that quality remains uncompromised as quantities increase.”

Finding the right partner for your project

To effectively navigate the complexities of gene therapy development, partnering with an experienced CDMO that offers expertise in viral vector manufacturing is crucial for both emerging and established companies in the field. Whether tackling early-stage challenges or scaling up for wider patient reach, the “right” partner is the one that can provide essential support and innovation when and how you need it.

Learn more about how Thermo Fisher Scientific can support your gene therapy journey throughout the product lifecycle.

Find your missing element with Thermo Fisher Scientific.

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