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Prepping for commercialization through supply chain logistics

Cell and gene therapies (CGT) are bringing new hope to patients experiencing rare and serious diseases. And they are disrupting the biopharma market in new and challenging ways.

Patients experiencing rare and serious diseases have seen a steady increase in possibilities for treatment as nearly 1,308 developers (as of 2021) were investigating regenerative medicine and advanced therapies (RMAT) in over 2,400 clinical trials globally. The RMAT sector included $22.7 billion of investments in 2021, a 14% increase from its $19.9 billion record in 2020.[1]

US regulators are responding to this growth and the tremendous patient need by establishing new guidance and procedures including expedited programs for regenerative medicines.[2] Because there is no reason to believe that demand and market growth will slow any time soon, the CGT space must recognize and prepare to mitigate supply chain challenges that result from and further limit current capacity. Here we discuss several industry challenges and pain points as clients prepare for commercialization of CGT products.

Challenges with cell and gene therapy supply chain logistics

Ultra-low temperature control

CGTs require ultra-low temperature control, a difficult and sometimes risky requirement. Product integrity typically requires that the product be maintained at frozen and cryogenic temperatures with an aim at eliminating time out of environment. Maintaining this strict temperature control creates challenges not only during storage, but also during other aspects of the value chain from pick and pack to secondary labeling to shipping. As such, CGT developers may choose to outsource their ultracold storage and sample management to a reliable service provider that offers flexibility and scale-up capacity.

Aggressive and changing timelines

Successful logistics for any product requires adherence to carefully planned timelines—when to pack an item to have it ready for pickup and when to have it at the airport or other means of transportation in order to ensure timely delivery to a patient in need. With standard therapies, this can generally be accomplished using standard forecasting and logistics planning methods, but with CGTs, the timeline is often dependent upon patient readiness and need, which can be unpredictable. Specifically, autologous cell therapy includes a very limited window of manufacturing and distribution ("vein-to-vein" time). Allogeneic cell therapy and gene therapy may be similar to biopharma production (e.g., they can be made in bulk), but they still require late-stage customization. Working with tight and sometimes moving timelines can be frustrating if processes are not in place to facilitate quick response and flexibility. Similarly, accommodating and planning for just-in-time processes (e.g., manufacturing, packaging, labeling, and shipping) is a crucial capability in CGT supply chain management.

Documentation and tracking requirements

Further challenges in CGT supply chain logistics center around maintaining the chain of identity, chain of custody, and chain of control/condition. These types of documentation and tracking are critical to the integrity of the materials and the process and should be kept top of mind among CGT supply chain managers. Chain of identity is particularly important for personalized medicine where the drug product is made with the patients' own biological material. It is absolutely critical that chain of identity is maintained during the entire process from clinical to commercial.

In addition, the US Drug Supply Chain and Security Act (DSCSA)[3] and EU Falsified Medicines Directive (FMD)[4] require serialization for secondary packaging. This requirement increases the security of the drug distribution supply chain but requires specialized equipment and software to enable global distribution.

Maintaining chain of control/condition is especially important for temperature sensitive shipments, requiring temperature and shipment monitoring devices.

Scale-up requirements

Another challenge for CGT developers and manufacturers centers around the need to scale up product manufacturing. Simply adding resources is not sufficient to appropriately expand CGTs to commercialization. Instead, technological enablement should be a focus. Commercial scale for CGTs often includes many small lots, which increases documentation, tracking, and shipping requirements as well. Innovative approaches to supply chain logistics are required to manage the full spectrum of challenges associated with scale-up. Some experts suggest that the industry may move toward closed manufacturing systems, which would likely enable decentralization of manufacturing, affecting related storage and distribution services as well.

Communication challenges

In any complicated process, communication is key to success and avoidance of major hurdles. Many different stakeholders and service providers work together to ensure that each step along the path from clinical to commercialization of a CGT is planned, performed, and documented appropriately. Tight and shifting timelines make communication even more difficult, but that much more important. A delay in one point of the value chain could result in delays in many other areas. Careful, flexible, responsive coordination and communication of activities is a critical component and a huge challenge of CGT supply chain management.

Potential solutions to cell and gene therapy supply chain challenges

As technologies evolve, and new challenges emerge, innovative solutions must be developed to address them. One of the most important strategies to keep in mind when preparing for commercialization of CGTs is to find an experienced partner who can support many different aspects of the value chain. Together, you and your supply chain partner should ensure you understand regulatory guidelines associated with CGTs and keep an eye on the evolving regulatory environments of all geographies of interest. Work with a partner who can grow with you, who shares your focus on patient-centricity, and who has the appetite for the investment needed to grow with a nascent industry and the flexibility to adjust as new challenges develop.

A successful partnership will also include the provision of or support to build flexible solutions and just-in-time processes. Additionally, a service provider should be prepared to offer global solutions when clients expand globally.

Thermo Fisher's Advanced Therapy solutions

In addition to Advanced Therapy development and manufacturing, Thermo Fisher offers a unique and comprehensive approach to solving current industry challenges in CGT supply chains with multiple service offerings and a broad team of highly knowledgeable experts. A thorough understanding of the complexities of these innovative therapies and the challenges of bringing them to patients drives the development of well-defined and carefully managed processes and services. Below are a few ways Thermo Fisher can help address the common pain points listed above.

Ensure product integrity through cold chain logistics expertise

Thermo Fisher Scientific's Bioservices & Specialty Logistics business brings 35+ years of experience managing critical biological material at ultracold and cryogenic temperatures. The organization offers more than 400,000 sq. ft. of GMP space for ultracold storage and distribution, completes more than 400,000 global shipments annually (36% of which are cold or refrigerated shipments), and has a proven record of offering logistics solutions for all aspects of the cold chain. They operate with a "Zero Temperature Excursion Mindset" for packaging, labeling, storing, and distributing clinical supplies. As such, more than 99% of all their controlled shipments arrive without temperature excursion. Click here for more information on cold chain management and mindset at Thermo Fisher.

Adhere and manage timelines with specialized services

Thermo Fisher services help clients minimize risks through perfectly timed studies, just-in-time processes (e.g., manufacturing, packaging, labeling, and shipping), and dedicated project management support. Additional time (and cost) savings comes through the Direct-to-Patient offering, which includes Direct-to-Clinical Site and Direct-to-Pharmacy, and through their specialized courier service (with a 99%+ on-time pick-up and delivery record). These offerings may become even more important in the future if technology innovations lead to a shift toward a decentralized manufacturing and clinical trial model for CGTs.

Maintain chain of custody/identity with end-to-end solutions

Thermo Fisher has implemented comprehensive processes and verification steps throughout the entire product journey to minimize the risk of mix-ups and ensure product integrity. Serialization services in particular create a unique product identity that can be tracked from the packaging site through distribution to the hospital or point of care, and enable compliance with the Drug Supply Chain and Security Act and Falsified Medicines Directive.

Scale-up with minimized risk through collaboration with experienced partners

In addition to the above services, Thermo Fisher supports scale-up of CGTs in a manner that centers on optimizing quality, adhering to regulatory requirements, understanding industry best practices, and leveraging the expertise of highly trained personnel.

All of these offerings, when viewed together, form a comprehensive solution to many of the industry challenges associated with CGT supply chains. Finding a partner with end-to-end capabilities (rather than multiple service providers) enables more efficient movement through each component of the supply chain process, higher confidence in the integrity of the materials being developed and transported, and easier communication between process stakeholders. Most importantly, a successful CGT supply chain allows for better, faster, and more reliable delivery of potentially life-changing cell and gene therapies to patients who need them.

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