Article

Cell therapy

Speeding to success

Accelerating cell therapy development and manufacturing workflows

Cell therapy is one of the most promising areas of modern medicine, supporting the development of new therapeutic options for a wide range of previously untreatable conditions. In a landscape of rapid market growth with a high pace of innovation, you need to keep up to realize your therapy's full potential. Speed is therefore one of the most pressing challenges for cell therapy development and manufacturing. Discover how to streamline your workflow across cell isolation, activation, and expansion to stay ahead and accelerate your treatments to patients.

The race to commercialization

For biotech companies working in the cell therapy sector, optimizing speed-to-market is critical. This is essential to minimize costs and meet commercial goals, as well as to increase the number of potentially life-changing cell therapies available to patients. To achieve an optimized pace, developers must maximize efficiency at every stage—from R&D and process development to scale-up, scale-out, and regulatory filing.

Alongside reduced development timelines, accelerated manufacturing workflows are also vital. Many patients who are candidates for cell therapies are critically ill and have often exhausted other treatment options. This makes timely access to therapeutics imperative to improve the likelihood of successful treatment. Moreover, by shortening *ex vivo* cell isolation, activation, and expansion phases, manufacturers can reduce T cell differentiation. This can help maximize the population of T cells with early memory phenotypes, which have been shown to be associated with increased therapeutic efficacy.

Streamlining each stage

Ex vivo cell isolation and activation are typically carried out using paramagnetic beads that selectively isolate and/or activate target T cells. These cells are then separated, and the beads are removed using an instrument with magnetic separation capabilities.

The activated cells can then be expanded using an optimized cell culture medium. The overall aim of this process is to generate a highly pure population of viable T cells with the optimal phenotype, for further manufacturing into a safe and efficacious therapeutic product.

While previous isolation, activation, and expansion solutions have driven considerable advances, they have had limitations. Most notably, many are outdated, as they have not incorporated the most recent industry knowledge, technologies, and priorities into their design. This is most apparent in areas such as automation, scalability, and flexibility. There are also increasingly stringent regulatory requirements that must be met to enable a seamless transition to commercial production. As such, to truly unlock accelerated workflows and drive long-term success there is a need for next-generation alternatives.

Increasing efficiency through advanced solutions

In response to the need for improved efficiency, there has been a widespread drive across the industry to advance solutions that are designed to optimize development and manufacturing workflows. Suppliers are also focusing on enhancing their support services and manufacturing capabilities to increase confidence in their ability to support streamlined operations.

Given the range of options available, it can be challenging for developers and manufacturers to find the right solution to meet their process requirements. To accelerate the development of an efficient workflow and support long-term success, there are several key capabilities that developers should look for when evaluating potential solutions and suppliers.

• Automated processes

When considering instrumentation for cell isolation, activation, and expansion, automation is a feature that can offer a wide range of efficiency benefits. Next-generation instruments are currently being designed with automation capabilities that can significantly reduce processing time compared to manual approaches.

For example, the Gibco™ CTS™ DynaCellect™ Magnetic Separation System, a closed, automated platform for isolation, activation, and bead removal, can complete cell isolation typically in under 100 minutes when used with Gibco™ CTS™ Dynabeads™ CD3/CD28. Similarly, its automated protocol can shorten the time required for magnetic bead removal from around 5 hours to under 1 hour, without affecting cell viability.

Automation can also remove the need for manual interventions and enable a closed-system environment to be maintained throughout the process. Consequently, automation can help lower contamination risks, along with reducing the potential for human error or operator-to-operator inconsistency. Together, these can help reduce the risk of manufacturing failures and treatment delays.

For biotech companies working in the cell therapy sector, optimizing speed-to-market is critical. To achieve this, developers must maximize efficiency at every stage—from R&D and process development to scale-up, scale-out, and regulatory filing.

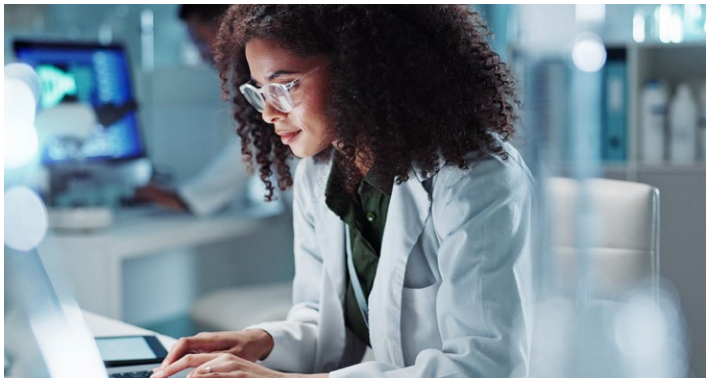
Implementation of automation within workflows can also help biotech companies optimize resource management and overcome talent shortages. By removing the need for scientists to conduct time-consuming manual work, their time can be utilized in other areas, resulting in overall efficiency gains throughout development and manufacturing.

• Modular instrumentation

Modularity is another key capability to look for when assessing instrumentation. This is crucial to efficiently manage the diverse requirements of specific workflows, such as the different scalability targets of allogeneic and autologous therapies. Additionally, for developers with existing workflows, modular equipment that can be easily integrated into current processes can help accelerate optimization. Within this area, modular instruments designed for both R&D and clinical manufacturing can provide further benefits. By enabling the same process to be used from development to production, developers can avoid delays associated with changing systems when scaling up or out.

> Successfully establishing a cell therapy workflow requires developers and manufacturers to be able to implement solutions that can support accelerated processes—from shorter processing times to efficient scale-up or scale-out.

To streamline processes when using modular solutions, developers should look for a software solution that can provide digital connectivity across the workflow. Off-the-shelf, open platform solutions, such as Gibco™ CTS™ Cellmation™ Software, can offer considerable advantages by reducing the need for time-consuming development and validation, while enabling integrated control and automation of multiple instruments.



Following the transition to clinical and commercial production, these solutions can also help enable regulatory compliance by facilitating traceable, reproducible, and secure data storage.

• Flexible solutions

In addition to modular instrumentation, to improve process efficiency and enable specific workflow requirements to be met, flexible media and reagents are equally important. For instance, choosing an agile cell expansion medium, such as Gibco™ CTS™ OpTmizer™ One SFM, with a formulation optimized for compatibility with multiple platforms, culture vessels, and workflows, can help simplify development. To support increased production volumes, this flexibility should also extend to the range of packaging options available. In particular, media should be available in large bioprocess containers to avoid the need for pooling of media during production, helping to increase efficiency and reduce contamination risks.

Another area where flexible, next-generation solutions can increase manufacturing efficiency is cell separation reagents. The Gibco™ CTS™ Detachable Dynabeads™ platform can offer considerable time savings by enabling users to actively detach the magnetic beads rather than wait for passive dissociation that can often take 5 days. Additionally, the platform's flexibility can provide control over the duration of activation, helping manufacturers reduce differentiation and preserve the early memory T cell phenotypes that are correlated with higher treatment efficacy.

• Regulatory support

During cell therapy development, applying for regulatory approval is a critical milestone and avoiding delays at this stage is necessary to maintain development timelines. Suppliers can play a key role in supporting this by providing easy access to required traceability documentation, including Certificates of Analysis (COAs),

Certificates of Origin (COOs), Safety Data Sheets (SDSs), and Certificates of Compliance (COCs). Some products may be supplied with additional documentation such as Regulatory Support Files (RSFs) and Drug Master Files (DMFs), which can streamline the filing process by enabling suppliers to liaise directly with regulatory bodies on their customers' behalf. As such, choosing a vendor with an experienced, proactive technical support team can prove highly advantageous.

• Supply assurance

To further support a streamlined progression to clinical and commercial manufacturing, the vendor's supply assurance should also be assessed. To minimize the risk of supply interruptions and potentially life-threatening production delays, developers and manufacturers should look for a supplier with a multisite network offering manufacturing redundancy. The network should be supported by a robust site-to-site equivalency program—harmonizing the raw materials, manufacturing equipment and processes, and quality control measures used. This is useful to provide assurance that batch-to-batch product consistency will be maintained between sites.

Accelerating progress with a trusted supplier

Successfully establishing a cell therapy workflow requires developers and manufacturers to be able to implement solutions that can support accelerated processes—from shorter processing times to efficient scale-up or scale-out.

Working with a knowledgeable global supplier that can offer a diverse portfolio of advanced solutions with the modularity, flexibility, and scalability to meet their specific workflow needs can help dramatically simplify this process. Using their experience and extensive capabilities, the supplier can also offer trusted guidance and dependable supply assurance from R&D to commercial production. This collaboration can enable developers and manufacturers to overcome previous limitations, enhance therapeutic safety and efficacy, and ultimately increase the number of life-changing therapeutics that are available to patients.

Streamline your workflow
Set the pace

All of the Gibco™ Cell Therapy Systems (CTS™) solutions have been designed with efficiency in mind to support streamlined cell therapy development and manufacturing.

Our portfolio combines CGMP-manufactured media and reagents with flexible, automated instrumentation to enable the development of optimized, closed workflows. We also offer off-the-shelf software to facilitate full physical and digital workflow integration, providing data traceability and supporting regulatory requirements.

With a globally harmonized manufacturing network and extensive support capabilities, you can depend on us to help you accelerate therapeutic development, navigate regulatory hurdles, and secure long-term success.

Learn more about how the Gibco CTS portfolio can help you increase efficiency and unlock your cell therapy process edge at thermofisher.com/performance

Learn more at **thermofisher.com/performance**

For Research Use or Manufacturing of Cell, Gene, or Tissue-Based Products. Caution: Not intended for direct administration into humans or animals.