

CASE STUDY

Flexible Freeze Containers in Gene Therapy Manufacturing



Introduction

Cell and gene therapies have emerged as one of the most rapidly expanding areas of the biotechnology sectors. For patients facing devastating conditions with unmet treatment needs, these products represent a wealth of lifesaving potential. However, extremely specialized manufacturing remains a rate-limiting step in the development and use of these drugs, requiring weeks to months of cell growth, processing, purification, and formulation. Each batch is a massive financial and logistical investment that patients are depending on, so it's critical that manufacturers get it right at every step, including their choice of containers for bulk drug substances.

What unique challenges of gene therapy manufacturing make this choice so critical? The extreme and varied conditions involved in this process require durable containers to ensure product integrity. Storage and handling in bottles and bags present potential contamination risks and challenges with safe transport. Additionally, process intermediates and bulk drug substances are regularly frozen, stored, and shipped at temperatures below -80° C to maximize stability and eliminate mechanical agitation throughout the processing chain. However, these freeze-thaw processes present considerable risks to product stored in traditional single-use plastic storage bags and containers.

According to a 2015 Bioplan survey, nearly 75% of biopharmaceutical manufacturers¹ cite bag breakage and leachables as problems that limit their ability to employ single-use plastics in manufacturing. In cold-chain handling, many plastic films become brittle at extremely low temperatures and can develop small leaks or break if mishandled. Even the tiniest leak has a substantial impact on operations, creating the risk of material loss, product contamination, or rejection

of batch. Each batch of a gene therapy comes at a considerable cost, so the money and time lost in a compromised batch makes a significant impact. More importantly, any loss of product means a loss of its potential to reach patients.

About the Product

GORE® STA-PURE® Flexible Freeze Containers were developed to circumvent the vulnerabilities of single-use plastic containers commonly used in biopharmaceutical manufacturing. Using a highly durable proprietary composite film (polytetrafluoroethylene, or PTFE) material, Flexible Freeze containers were designed specifically for bulk pharmaceutical cold chain applications.

Why are Flexible Freeze Containers Ideal for Storage of Biopharmaceutical Intermediates?

- **High Purity & Low Extractables Profile** – Fluoropolymer material is biologically & chemically inert with a low extractables profile, minimizing the risk of drug interaction or contamination
- **Proven Strength & Durability** – When frozen at -86° C, containers resist cracks, breaks, or leaks if accidentally dropped and maintain integrity through multiple freeze-thaw cycles or long-term storage
- **Flexibility in Configuration** – Containers are available in a range of sizes from 50 mL to 12 L and are suitable for both plate and blast freezers
- **Secure & Protective Design** – Connectors maintain closed conditions throughout handling and optional outer hard-shell carriers protect tubing, make handling easier, and maximize freezer space

About the Customer

The customer is a U.S.-based biopharmaceutical company with a significant emphasis on AAV-based gene therapies.

Why Flexible Freeze?

In 2018, the Company was looking for a storage solution for bulk drug substances in their relatively new gene therapy applications. Though these substances are not the final processed material, they are still the product of a huge investment of time, money, and specialized effort, making any container breach a significant loss. The Company's choice would have to ensure that every drop could ultimately reach patients in a safe and sterile fashion.

A conference presentation about the capabilities of Flexible Freeze products piqued the interest of a leader in Pharmaceutical Development at the Company, who shared it with colleagues. The visual impact of a video showing a Flexible Freeze bag being dropped while frozen without any breakage or leaking gave a striking positive impression. Upon further research, the team was confident in the extensive validation data Gore provided and knew they could trust these bags to maintain the integrity of their products for patients.

While the decision was made in the early days of their gene therapy program, the Company saw Gore as a partner in their growth. "We didn't know exactly at that point what our needs would be, but it was clear from speaking with Gore that there were many options for supporting our scale up," said a key decision-maker at the Company. "We also needed a bag that could handle going from room to room, to another location, freezing and refreezing— however the process would pan out as we grew." The Company implemented Flexible Freeze bags that year, along with the hard-shell barrier wrap for storage and transport of finished drug substance.

"I haven't identified another vendor that has a solution meeting the same standards that GORE does with Flexible Freeze. The breadth of available bag sizes and the performance in low-temperature conditions have been perfect for our specific needs. It's clearly a premium product and GORE offered so much of the information we needed to make the decision to use Flexible Freeze."

- Customer, on decision to implement Flexible Freeze

The Positive Impact of Flexible Freeze

The implementation of Flexible Freeze containers was a key decision that has continued to serve the Company throughout their trajectory. They've grown considerably since 2018, expanding operations to multiple locations and manufacturing partners, and Flexible Freeze has helped them keep up. Dependable storage in Flexible Freeze containers and hard-shell barriers has ensured that all frozen therapeutic products can proceed safely to final processing at partner locations.

While the adaptation to using Flexible Freeze's aseptic connectors required some training, the Company was quickly able to catch on with reliable support from Gore and have appreciated their advantage over bottle storage. "Not only do we get the performance of the bags, but we also have a closed system that helps us maintain sterility," noted the key decision-maker. Beyond the high quality of the containers, the Company has cited their experience in working with Gore as one of the highlights of their decision to implement Flexible Freeze. While they were already impressed with the existing supporting data, the Company was able to request additional testing of the products under specific conditions to fully validate their use. Gore has also been responsive and hands-on with training and troubleshooting when any questions arise, finding an appropriate solution as quickly as possible.

In choosing to use Flexible Freeze containers, the Company has not only selected the right product for their needs, but the right service partner as well. "To me, if a company in our space didn't take this route, there'd be some shortcomings," said a primary stakeholder on the supply chain team. "We've felt really happy with the solution."

Contact us to learn more about Flexible Freeze Containers.

"Very few vendors have reached anywhere near the level of support we get from GORE. We can always reach out on the phone or by email and get responses right away. So not only do we know we have a great product, but we also have the support needed to implement it at our sites."

- Customer, on support from Gore since implementing Flexible Freeze

Gore PharmBIO Products

Our technologies, capabilities, and competencies in fluoropolymer science are focused on satisfying the evolving product, regulatory, and quality needs of pharmaceutical and bioprocessing customers, and medical device manufacturers. GORE STA-PURE Flexible Freeze Container, like all products in the Gore PharmBIO Products' portfolio, are tested and manufactured under stringent quality systems. These high-performance products provide creative solutions to our customers' design, manufacturing, and performance-in-use needs.

GORE STA-PURE Flexible Freeze Containers are NOT INTENDED FOR USE in medical device or food contact applications or with radiation sterilization.

All technical information and advice given here is based on our previous experiences and/or test results. We give this information to the best of our knowledge, but assume no legal responsibility. Customers are asked to check the suitability and usability of our products in the specific applications, since the performance of the product can only be judged when all necessary operating data is available. Gore's terms and conditions of sales apply to the purchase and sale of the product.

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