ABZENA

End-to-End Clinical & Commercial Manufacturing Support for Biologics

Developing therapeutic biologics—whether monoclonal antibodies (mAbs), recombinant proteins, or other complex modalities—demands stringent quality, consistency, and regulatory compliance at every phase. As programs transition from early clinical development to commercial supply, the stakes only rise. Maintaining product integrity across larger bioreactors, meeting evolving regulatory expectations, and minimizing cross-contamination risks in multiproduct facilities are just a few of the hurdles that can determine a biologic's success.

At Abzena, we've built our Clinical & Commercial Manufacturing capabilities to mitigate these precise challenges. Our dedicated cGMP facility in San Diego, CA is designed to deliver high-quality recombinant proteins and antibodies at scales up to 2000 L, incorporating single-use bioreactors and two standalone production trains to safeguard product quality. By combining deep scientific expertise, a robust Quality Management System (QMS), and flexible capacity, Abzena provides the integrated support needed to progress seamlessly from clinical batches to full-scale commercial production.

Technical Excellence

Abzena has established a robust, end-to-end manufacturing platform in our San Diego facility that is meticulously designed to produce high-quality biologic drug substance for clinical and commercial use. From the initial thaw of a master cell bank (MCB) to the final bulk drug substance, each unit operation is carried out under strict cGMP conditions. Below are the key technical elements that ensure both product integrity and operational efficiency at scale:

cGMP Facility & Multiproduct Design

- **ISO-Classified Cleanrooms:** Our San Diego site operates ISO Class 7 and ISO Class 8 manufacturing spaces, with ISO Class 5 biosafety cabinets (BSCs) for critical operations, such as cell bank filling.
- **Two Dedicated Production Trains:** We offer parallel manufacturing campaigns within segregated upstream and downstream suites. By allocating dedicated single-use flow paths and product-dedicated purification columns/resins, we mitigate cross-contamination risks and enable flexible scheduling.
- **Full cGMP Compliance:** Comprehensive quality oversight spans from raw material inspection and weigh-dispense activities, through in-process monitoring and final bulk drug substance release. Our Quality Management System (QMS) integrates documentation, deviation management, change management, and the analytical controls required for both clinical and commercial regulatory standards.

Single-Use Technology

- **Bioreactors (up to 2000 L):** Fluid contact surfaces—including bioreactor bags and downstream tubing—are single-use. This design eliminates the need for cleaning and sterilization validation (CIP/SIP), significantly reducing turnaround times between batches.
- **Minimized Contamination Risk:** Since each batch uses fresh, disposable components, there is no carryover between production runs, ensuring a multiproduct facility can operate without cross-contamination risk or compromising product quality.
- **Efficient Changeovers:** Single-use assemblies and a flexible facility design can be swapped out or reconfigured quickly to accommodate new campaigns or scale adjustments, enabling sponsors to move from clinical pilot-scale batches to larger commercial campaigns in a streamlined manner, typically without requirement for engineering runs.

Upstream Manufacturing Process

- **Master Cell Bank Thaw & Expansion:** Production starts by thawing a vial from a GMP Master Cell Bank (MCB.) The culture is carefully expanded over approximately 2–3 passages, moving from shaker flasks (e.g., 125 mL, 250 mL, 1 L) before being transferred into the seed train, typically a Wave RTP (25 L).
- **Seed Train:** Once the initial expansion (N-2 stage) in the Wave bioreactor meets target cell density, it is transferred to a stirred-tank reactor (N-1). Cells are grown for an additional 3 days under optimized conditions—removing selection agents if required—before inoculation into the final production reactor.
- **Production Bioreactor (Up to 500–2000 L):** Operated in fed-batch mode, the production vessel is monitored for pH, dissolved oxygen, and temperature. Precise feed strategies and agitation profiles maximize cell viability and product titer. Upon reaching the desired endpoint, the culture is cooled and prepared for harvest.

Downstream Purification & Viral Safety

- **Harvest & Clarification:** Harvested Cell Culture Fluid (HCCF) is generated through either depth filtration or centrifugation to remove cells and debris. The clarified fluid is filtered through a 0.2 µm filter, reducing bioburden and preparing it for chromatographic purification.
- **Protein A Capture & Viral Inactivation:** For antibody products, Protein A chromatography is typically used as the first purification step. Eluted material undergoes a low-pH hold to inactivate potential viral contaminants, aligning with global regulatory expectations.
- **Polishing Steps:**
  - Anion Exchange (AEX) Flow-Through—further removes host cell proteins (HCP), DNA, and aggregates.
  - Cation Exchange (CEX) Bind/Elute—enhances purity and focuses on removing product-related variants or higher-molecular-weight species.
- **Viral Filtration**: Inline pre-filters and dedicated virus filters provide an additional viral clearance barrier. All process filters must satisfy a post-use integrity test before the resulting material can progress to the next step.
- **Ultrafiltration/Diafiltration (UF/DF) & Final Formulation**: The purified product is concentrated and buffer-exchanged to its final formulation. After a final sterile filtration, the bulk drug substance (BDS) is ready for freezing or direct fill operations.

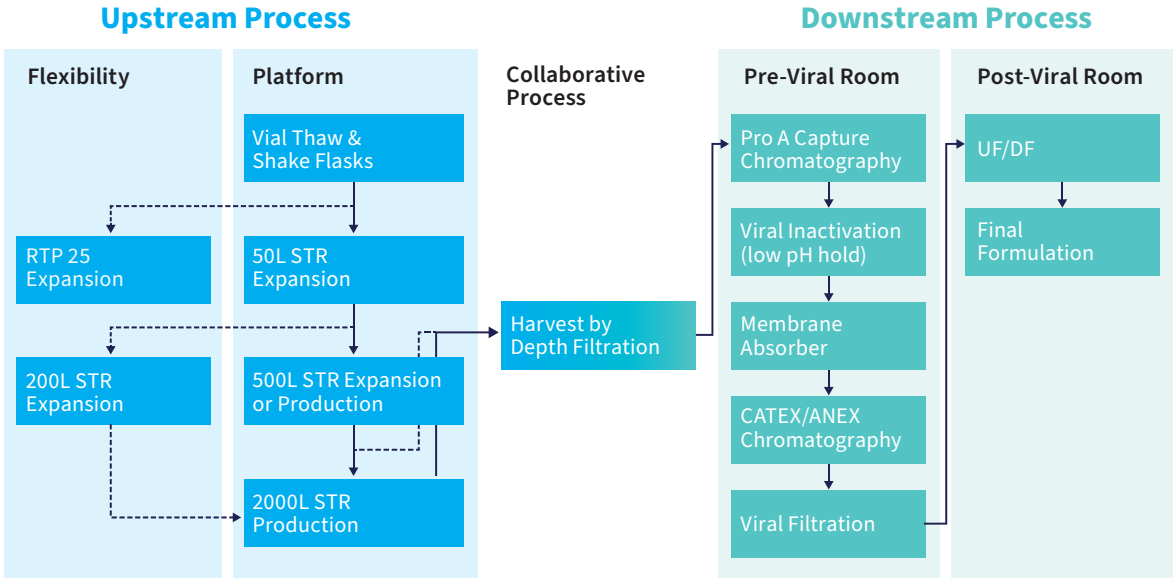

Figure 1: Abzena's Platform Process for San Diego

Clinical & Commercial Readiness

- **Scalable Manufacturing Campaigns:** With two manufacturing trains, we can simultaneously produce material at different scales—supporting multiple clinical programs or enabling a commercial campaign in parallel with earlier-stage development batches.
- **Regulatory & Analytical Support:** Abzena's analytical and bioassay teams are integrated into every manufacturing campaign, ensuring real-time data on critical quality attributes (CQAs). This holistic support helps sponsors navigate IND/BLA submissions and maintain compliance throughout commercialization.

By combining a purpose-built cGMP facility, single-use disposable platforms, and rigorously validated processes, Abzena delivers a clear, scalable, and compliant pathway from cell bank to bulk drug substance. Our end-to-end solution is structured to minimize risk, maximize quality, and help you successfully advance your biologic through clinical development and into the commercial market.

Summary

Scaling a biologic from early development to commercial supply requires more than simply increasing batch size; it demands strong technical oversight, unwavering quality, and consistent processes at every stage. Abzena's fully integrated approach ensures a smooth and de-risked transition from pilot runs to commercial campaigns in a multiproduct setting. By leveraging single-use bioreactors, parallel manufacturing trains, and rigorously validated process flows, we help safeguard product integrity, minimize turnaround times, and maintain full compliance with cGMP and global regulatory requirements.

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With all manufacturing phases—from cell expansion through final drug substance—consolidated under one roof, Abzena is well-equipped to support your program's journey toward successful clinical outcomes and reliable commercial supply. Interested in learning more about our fully integrated development and manufacturing capabilities for biologics? Visit **Abzena.com**.

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