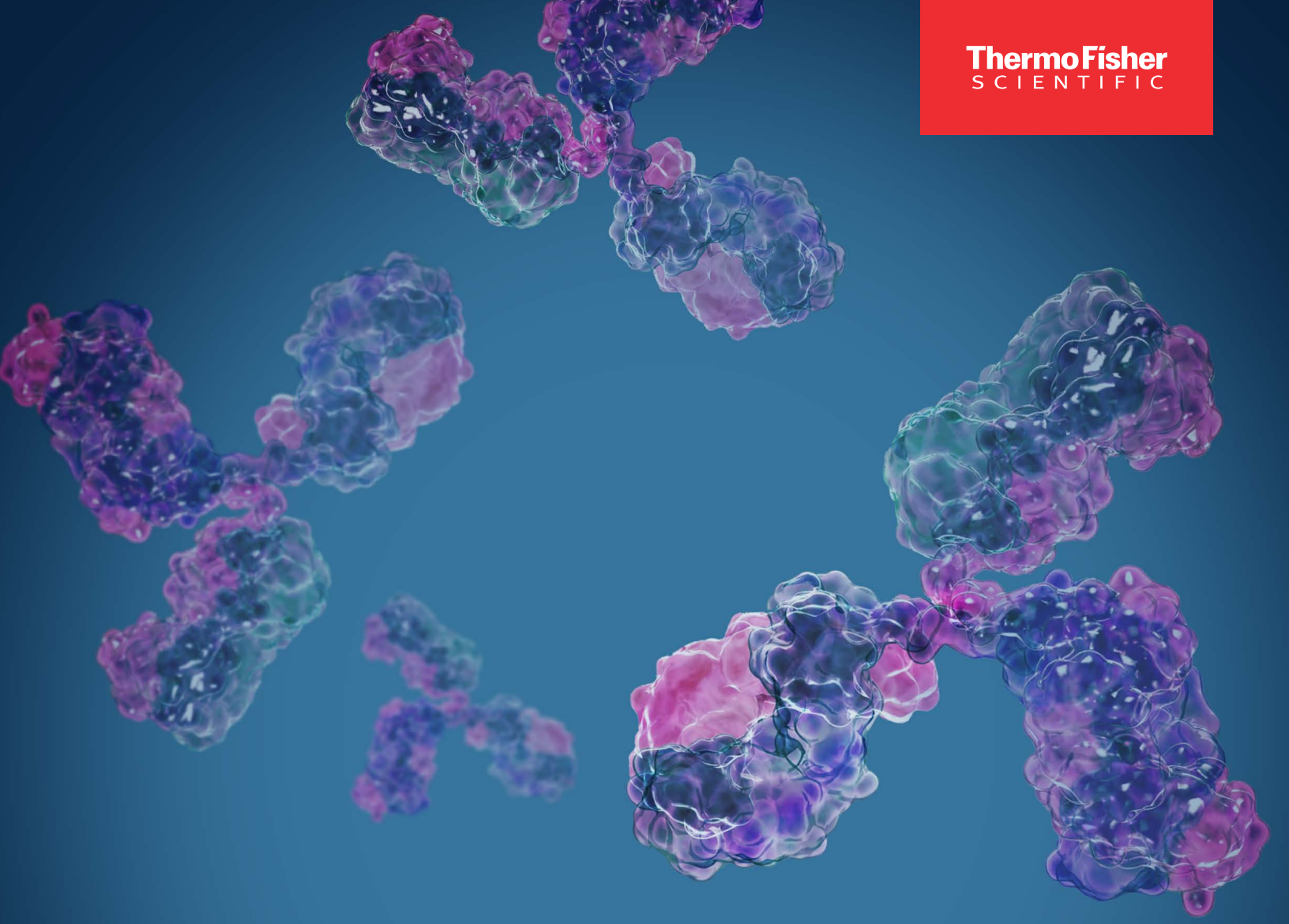


Thermo Fisher SCIENTIFIC

Bioproduction

Discover the future of mAb manufacturing

A complete guide to integrating the Gibco Efficient-Pro Medium and Feeds into your mAb manufacturing workflow.

gibco

Optimize your cell culture performance for exceptional outcomes

When developing a monoclonal antibody (mAb) manufacturing process, establishing an optimized workflow is vital to streamlining transfer to commercialization. Central to achieving this, and delivering a safe and effective therapy to the patients, is a high-performance medium and feed system that can sustain cell health and enhance viability.

Using a robust, commercially available, optimized platform medium and cell line-specific feed can help manufacturers streamline process development and help improve process performance. It can enable them to maximize their titers while maintaining the quality of the final product.

The Gibco™ Efficient-Pro™ Medium and Feeds System was developed to help address productivity and quality challenges. Comprising a state-of-the-art medium and two premium feeds, the Efficient-Pro system provides a complete workflow solution.

Revolutionize your workflow with consistency and quality

The Efficient-Pro system has been specifically formulated to enhance your mAb manufacturing workflows, offering improvements in both productivity and consistency. The medium and feeds are animal origin-free and chemically defined. This helps reduce the risk of introducing variability upstream, which can impact yield, product efficacy, and patient safety. With strict raw material sourcing and qualification protocols, you can be confident in batch-to-batch consistency and supply assurance, helping reduce the risk of costly delays so you can focus on your process goals.

The Efficient-Pro medium is fully scalable and available in both liquid and Gibco™ Advanced Granulation Technology (AGT™) formats. AGT is a granular dry media format that dissolves rapidly for faster preparation. Media in the AGT format is also pH and osmolality pre-adjusted, offering all the benefits of liquid media without the cost, storage, and transportation issues. Additionally, the Efficient-Pro feeds have been developed as one-part solutions—eliminating the need for additional reconstitution steps, further simplifying the overall manufacturing workflow.

Developed using an advanced multi-omics and bioinformatics modelling approach, the system can promote high levels of specific and volumetric productivity, while maintaining product titers and sustaining cell viability. By seamlessly integrating the Efficient-Pro system into your workflow, you could reach a new level of bioprocessing success.

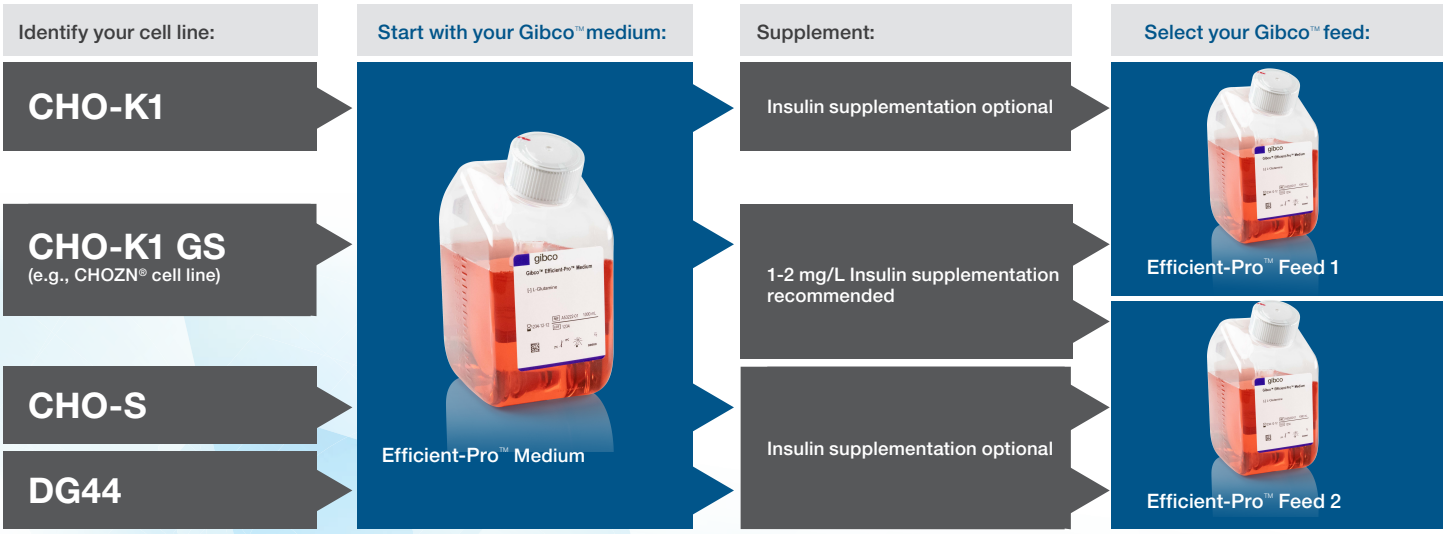
Efficient-Pro features and benefits

- **Ease of use**
- **Sustained cell viability**
- **High specific and volumetric productivity**
- **Robust raw materials qualification**
- **Animal origin–free (AOF) and chemically defined**

Finding the right product for your cell line

By bringing together two harmonious products in one advanced solution, the Efficient-Pro system can support you to optimize your cell culture performance and help accelerate your mAb manufacturing process.

You can benefit from a high-performance basal medium combined with the flexibility to choose a feed specifically formulated for your CHO cell line. Follow our flow chart to discover the perfect feed option for your process.



The CHO-K1 cell line can also be supported by the Gibco™ Dynamis™ Medium. The CHO-S cell line can be supported by the Gibco™ ExpiCHO™ Stable Production Medium in combination with Efficient-Pro Feed 2.

How can the Efficient-Pro System be integrated into your workflow?

Once you have discovered the perfect combination of medium and feed for your workflow, discover how they can be successfully integrated into your process.

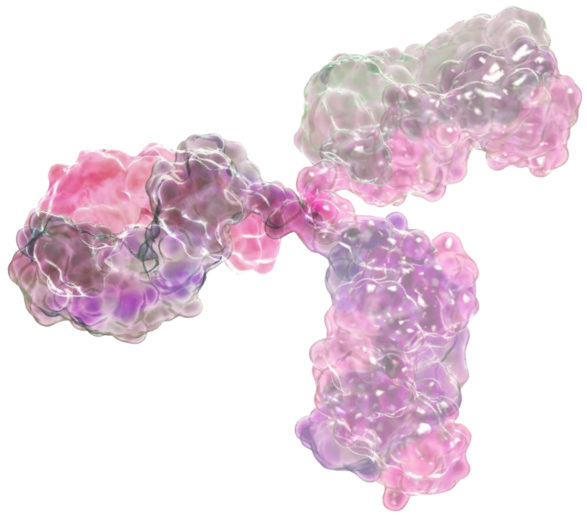
Efficient-Pro Medium user guide

Contents and storage

Product	Cat. No.	Size	Storage	Shelf life
Efficient-Pro Medium	A5322201	1 L	2°C to 8°C; Protect from light	12 months
	A5322202	10 L		
	A5322203	20 L		
Efficient-Pro AGT Medium	A5322301	1 L		
	A5322302	10 L		
	A5322303	100 L		
	A5322304	500 L		

Culture conditions

- Medium: Efficient-Pro Medium
- Cell line: CHO cells
- Culture type: Suspension
- Temperature range: 36°C to 38°C
- Incubation atmosphere: Humidified atmosphere of 8% CO_2 in air. Ensure that proper gas exchange is achieved in culture vessels and minimize exposure of cultures to light.
- Culture vessels: Shake flasks, spinner flasks (rpm may vary with shaker platform/impeller design and should be empirically determined for optimal cell growth), or bioreactor.



Protocol steps

Reconstitute Efficient-Pro AGT Medium (If needed)

1. Measure 90% of the final volume deionized or distilled water at room temperature (15°C to 30°C).
2. Add Efficient-Pro AGT Medium at 27.3 g/L to water.
3. Mix for a minimum of 20 minutes.
4. Use a calibrated vessel to dilute to final production volume with ambient deionized or distilled water.
5. Mix for an additional 20 minutes.
6. Measure the pH, then check and record osmolality.
7. Sterilize immediately by membrane filtration (positive pressure recommended).

Note: Once the product is filtered, use immediately or store at 2 to 8°C for up to 6 months. Protect from light.

Prepare complete medium

1. Supplement Efficient-Pro Medium with L-glutamine or GlutaMAX™ Supplement at 4-6 mM final concentration prior to use.

Note: The recommended L-glutamine and/or GlutaMAX Supplement concentration is 6 mM.

2. Add 10 mL/L of HT Supplement for use in applications not requiring DHFR amplification.
3. Glucose supplementation may be required for terminal batch cultures and should be determined empirically.
4. Add Anti-Clumping Agent (1 mL/L) to the medium to reduce cell aggregation, if required.
5. Add 1-2 mg/L insulin, if the cell line is dependent on insulin.

Note: Consider reducing L-glutamine concentration for fed-batch or perfusion protocols, or if the cell line in-use is sensitive to ammonia. Addition of a surfactant such as Pluronic™ F-68 is not required.

Recover frozen cells

1. Rapidly thaw (<1 minute) frozen cells in a 37°C water bath.
2. Transfer the entire contents of the cryovial into a 125 mL shake flask containing 30 mL pre-warmed complete Efficient-Pro Medium.
3. Incubate at 37°C in a humidified atmosphere of 8% CO_2 in air on an orbital shaker platform rotating at 115–135 rpm.
4. Maintain a cell density of 0.5×10^6—1×10^6 viable cells/mL for the first two passages following recovery; thereafter, return to your normal maintenance schedule.

Note: Do not centrifuge the cells after thawing as they are extremely fragile upon recovery from cryopreservation.

Subculture cells

1. Determine viable cell density using a Countess™ Automated Cell Counter (alternate automated or manual methods may also be used).
2. Ensure that the cell density is ≥1×10^6 viable cells/mL, viability is ≥90%, and the growth rate is in mid-logarithmic phase prior to subculturing.
3. Calculate the volume of cell culture and medium necessary to seed a flask at 2×10^5—3×10^5 viable cells/mL in a total volume of 30 mL fresh Efficient-Pro Medium per 125 mL shake flask.

Note: If cell density does not reach 1×10^6 viable cells/mL within 5 days of recovery, centrifuge cells at 100 × g for 5 minutes and resuspend the cell pellet in 20—30 mL of fresh complete Efficient-Pro Medium.

4. Incubate at 37°C in a humidified atmosphere of 8% CO_2 in air on an orbital shaker platform rotating at 115–135 rpm.

Efficient-Pro Feed 1 & 2 user guide

Contents and storage

Product	Cat. No.	Amount	Storage	Shelf life
Efficient-Pro Feed 1	A5208801	1,000 mL	2°C to 8°C; Store dark and dry.	12 months
Efficient-Pro Feed 2	A5221401			
Efficient-Pro AGT Feed 1	A5209101	1 L		
	A5209102	10 L		
	A5209103	100 L		
Efficient-Pro AGT Feed 2	A5221601	1 L		
	A5221602	10 L		
	A5221603	100 L		

Reconstitute Efficient-Pro AGT Feed 1 and 2 (If needed)

1. Measure 80% of the final volume deionized or distilled water at room temperature (15°C to 30°C) into formulation vessel.
2. Add Efficient-Pro AGT Feed 1 (181.4 grams/L) or Efficient-Pro AGT Feed 2 (164.2 grams/L).
3. Mix for 60 minutes or until completely dissolved.
4. Using a calibrated vessel, dilute to the final production volume with deionized or distilled water.
5. Mix for an additional 30 minutes for Feed 1 or an additional 10 minutes for Feed 2, or until the solution is homogenous.
6. Measure pH and osmolality.
7. Sterilize immediately by membrane filtration (positive pressure recommended).

Procedural guidelines

- Efficient-Pro Feed 1 and 2 can be added to the culture as multiple discrete additions every 1—2 days or as a continuous feed.
- Daily feed volume can range from 1% to 3% of the original culture volume, depending on the cell line and process. To optimize performance, it is recommended to test in 0.5% increments between 1% to 3% of Efficient-Pro Feed 1 or 2 daily.
- For best results, it is recommended to initiate feeding only after reaching mid- to late-exponential phase.
- It is recommended to pair this strategy with the basal medium, Gibco Efficient-Pro Medium, for optimized results.
- If current processes are supplemented with insulin or other growth factors, it is recommended to continue use of these supplements.

Recommended feed strategies:

Cell type	Culture days													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
High-titer/ Osmo insensitive cell line	-	-	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	-
Low-titer/ Osmo sensitive cell line	-	-	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	-

Feed optimization

Figure 1 shows a feed optimization study example.

Figure 1: IgG titers in CHO-DG44 cells compared to competitor system. Efficient-Pro Medium with 1.5% Efficient-Pro Feed 2 resulted in the highest IgG titer.

Related products

Unless otherwise indicated, all materials are available through thermofisher.com.

Product	Cat. No.
L-Glutamine, 200 mM (100x), liquid	25030
GlutaMAX™ Supplement	35050
HT Supplement, (100x), liquid	11067030
Anti-Clumping Agent	0010057
FoamAway™ Irridiated AOF	A10369
Gibco rHu AOF Insulin sourced from Biocon, 1 gram	A11282II
Gibco rHu AOF Insulin sourced from Biocon, 5 gram	A11382IJ

ThermoFisher SCIENTIFIC

The future of mAb manufacturing

The Efficient-Pro medium and cell line-specific feeds provide manufacturers with the solutions to help achieve stronger productivity and improve product quality. Supported by decades of technical expertise in media and feed development, our complete workflow solution can help you maintain your competitive edge and get your vital therapies to the people who need them the most.

To learn more about the Efficient-Pro system visit: **thermofisher.com/chomedia**

gibco

EXT4250