Simplifying Progress

CHO Media Screening Success Using Benchmarking Studies

February 5, 2024 | Dennis Karthaus, Catherine Krikelis, Swapnil Chaudhari, Dirk Mueller

Keywords or Phrases:
CHO media, Recombinant protein production, Media, Ambr® 15 , CHO feeds, Cell culture media, Media screening

SARTORIUS

Introduction

Recombinant proteins constitute well over 50% of revenue in the biopharmaceutical industry, with most falling into a cost-per-gram range of €100 to €500.[1]
This competitive landscape—and pressures from government agencies to increase access to effective, affordable medicine—means recombinant protein manufacturers must find solutions to maximize production efficiency while reducing costs.

One of the most obvious opportunities for maximizing productivity is to target the upstream process, which provides the material for the rest of production. Selecting the right cell culture conditions and matrix sparks the journey toward productive and reliable processes. However, identifying the optimal media | feed combination and feeding regime is complex and often time-consuming.

In this white paper, we outline the challenges associated with media screening and propose a simple approach to save time, reduce risk, and improve outcomes. We then present a case study showcasing a method to perform reliable media screening.

CHO Cell Cultures—The Foundation of Effective Protein Production

Chinese hamster ovary (CHO) cells are the preferred host for protein production in the biopharmaceutical industry. They can be cultured in suspension and are suitable for both fed-batch and perfusion modes, supporting robust scalability, high cell density, and high protein titers. These benefits mean CHO cells have been used for recombinant protein manufacturing for decades.

Multiple CHO subtypes—including CHO-K1, CHO-DG44, CHO-GS, and CHO-S are used to produce biomolecules. The choice of cell line depends on many features, such as the protein of interest and the desired critical quality attributes (CQAs), preferred selection system, freedom to operate, and regulatory factors.

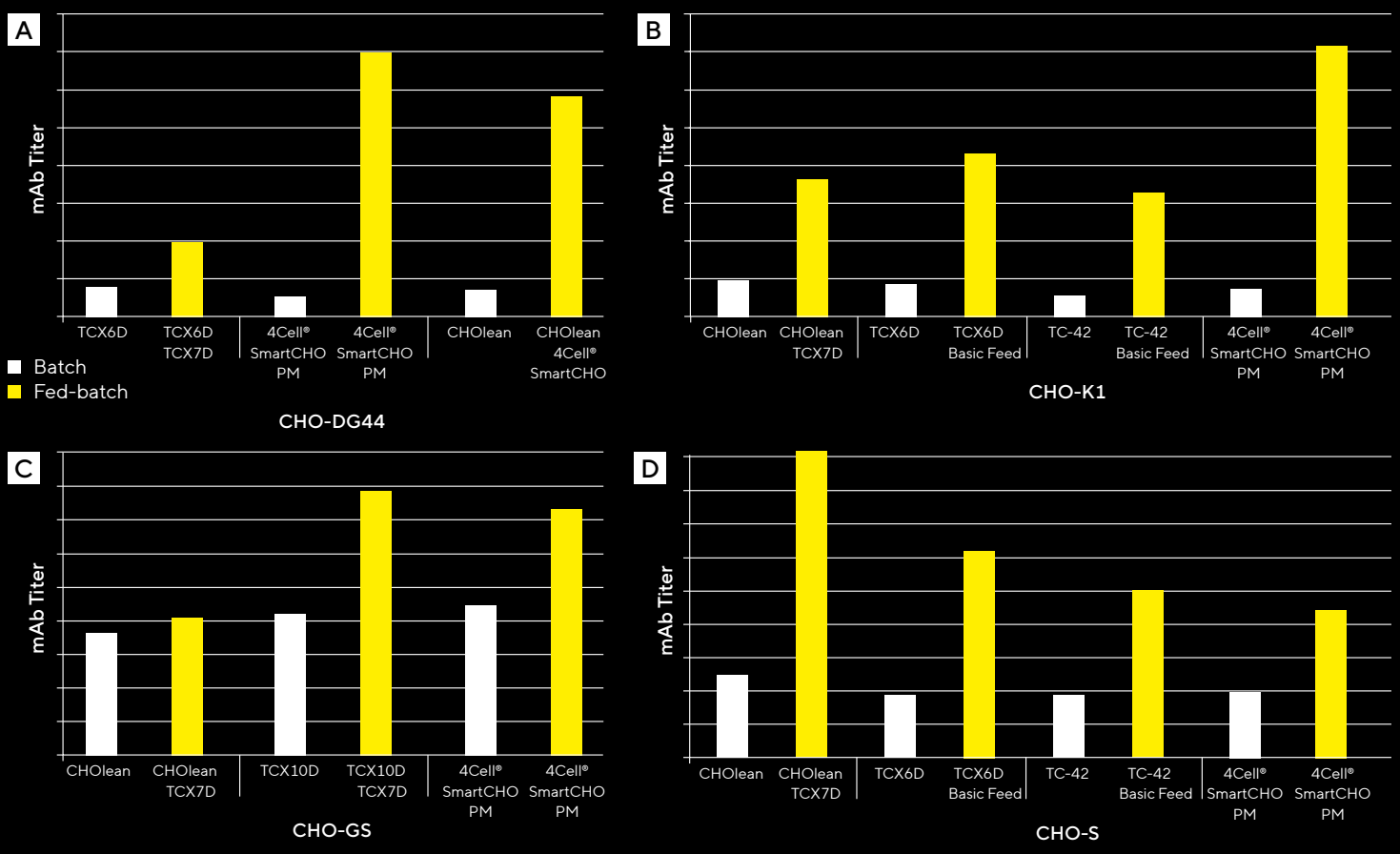
Ultimately, selecting a specific clone is essential to maximize titer, achieve stable expression, and ensure the clone's ability to grow in large-scale bioreactors.

An important consequence of the diversity within CHO cells is that each variant—and even each subclone—has distinct metabolic requirements, demanding different media | feed compositions to maximize performance. Figure 1 shows results from a preliminary benchmarking study comparing monoclonal antibody (mAb) titers produced by different CHO variants cultured in different media. A one-size-fits-all approach cannot satisfy the requirements of all CHO cell lines. As a result, it is essentially impossible to determine in advance the most effective media for a particular clone and application.

Nonetheless, using a sub-optimal media will result in a non-economic production process. Choosing the right media and feed to achieve even slight increases in titer can significantly influence the final costs of a pharmaceutical production process. Therefore, it is not cost-effective in the long run to cut corners during screening.

Additionally, strict and complex regulatory requirements make changing media during clinical trials or later stages challenging. Therefore, it is crucial that biopharmaceutical developers optimize their media strategy as early as possible to maximize cellular performance, secure the relevant CQAs, and increase the chances of successful batch release.

Figure 1: *Performance of Various CHO Media and Feed Combinations in Supporting Clones in Batch and Fed-Batch Processes*



Note. mAb titer produced in (A) CHO-DG44, (B) CHO-K1, (C) CHO-GS (D) CHO-S. 4Cell®, SmartCHO PM = 4Cell® SmartCHO Production Media, FMA+B = 4Cell® SmartCHO Feed Medium A + 4Cell® SmartCHO Feed Medium B

Media Screening

Screening a large media panel in combination with different feeds and feed regimes is the most reliable way to find an optimal media | feed combination. It allows unsuitable combinations to be quickly ruled out, limiting the combinations that undergo more thorough media development and optimization. However, performing comprehensive screening experiments is associated with various potential hurdles.

Screening Challenges

Large Number of Experiments
Many experiments are required to screen a broad panel of media, feed, and regimes in combination. There is a risk of overlooking an optimal media | feed combination because of an unsuitable feeding strategy leading to over-feeding or under-feeding cells. High-throughput platforms allow you to cover many combinations and feed regimes and increase the chances of finding the best one.

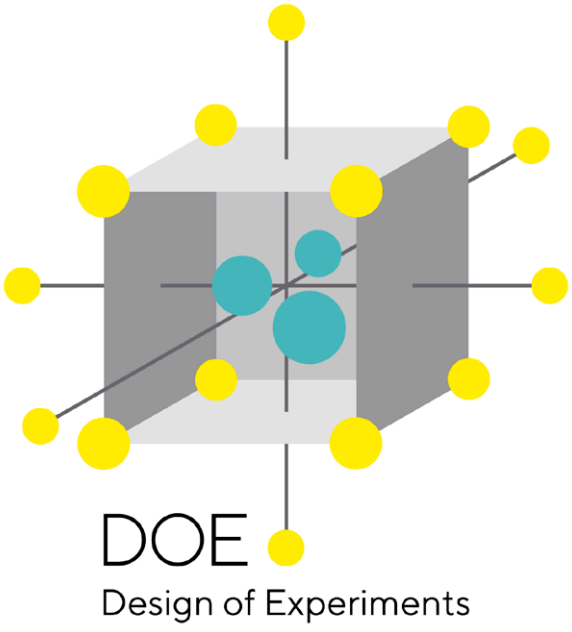
A design of experiments (DOE) approach can support media screening by simplifying the study of multiple variables and reducing the number of experiments required. However, even with a DOE approach, the complexity of cell cultures means a significant number of experiments are still necessary.

Complex Design Space
While DOE can provide optimal process conditions based on a set time point, it may not adequately account for the dynamic nature of the cultivation and expression process. Cell characteristics and cultivation conditions can change significantly during a 10-14-day fed-batch process.

For instance, it is challenging to optimize the feed rate during the cultivation process due to changes in nutrient demands, which occur as cells multiply, and as temperature, metabolism, and other parameters fluctuate. Such dynamic conditions make it difficult to determine the optimal feed rate, and it becomes necessary to adjust the nutrient supply to meet the varying demands of the cells.

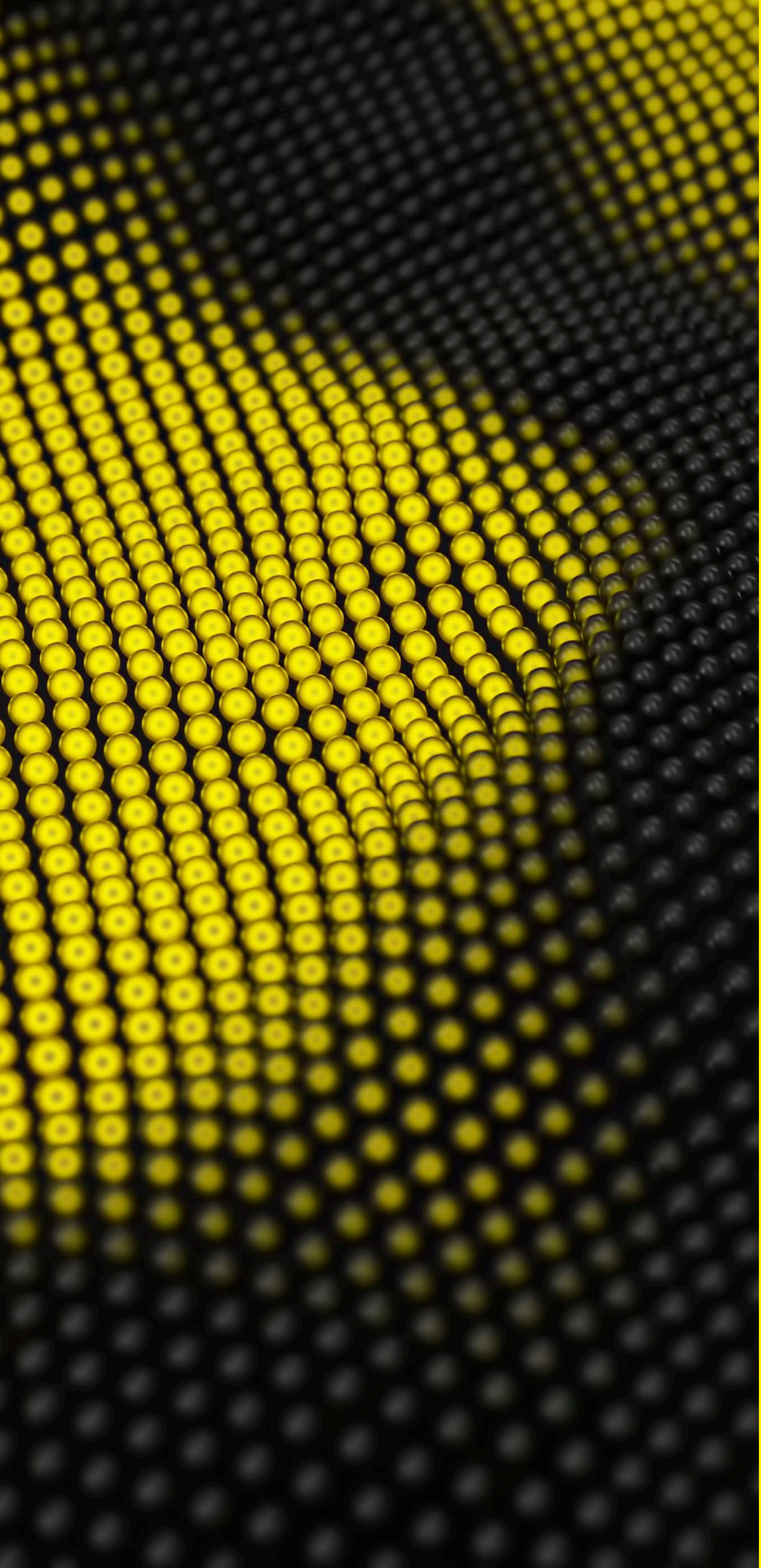
For example, the cells are initially in an exponential growth phase. This is followed by stabilization of cell density, often combined and induced by a programmed temperature down-shift to boost protein expression and improve product quality. This shift could significantly influence metabolic activities, such as limiting the consumption of glucose and nutrients , which can attenuate the accumulation of byproducts like ammonia or lactate in the culture. Later, lactate concentration might decrease again due to cell consumption when glucose concentrations in the culture are lower.

These fluctuating conditions create a complex design space, increasing the number of experiments required to build a reliable picture of the process.



Poor Scalability
Small-scale screening experiments are traditionally performed in flasks or deep well plates that rely on shaking for agitation, unlike the stirring motion employed in most bioreactors. They also do not provide adequate control over critical parameters such as dissolved oxygen (DO) and pH . These parameters strongly impact cell behavior and overall cell growth, titer, and product quality outcomes that might not be representative of scaled up runs in controlled production bioreactors.

As such, a media | feed regime that performs well in shake flasks might not show reproducible performance in larger volume bioreactors, requiring lengthy optimization activities.

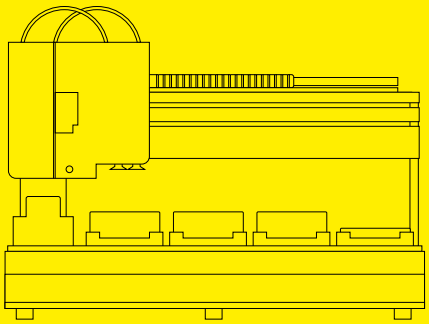


Automated Platforms Help Overcome Screening Challenges

Manual experimentation using shake flasks is not the only way to perform media screening. Small-scale multi-parallel bioreactors, such as the Ambr® 15, allow the evaluation of multiple cultures in an automated, controlled system.

With comparable conditions to production-volume bioreactors, scaled-down systems simplify the transfer of the process to a larger volume, controlled production environment.

Additionally, many conditions (i.e., media | feed and feed regime combinations) can be evaluated in parallel, supporting high-throughput screening informed by multi-factor DOE studies. Lastly, the high degree of automation and traceability ensures maximum reproducibility and documentation of the process without overburdening human resources.



Benchmarking Studies Support Media Screening

In-house benchmarking studies allow us to quickly eliminate media and feed combinations unsuitable for culturing our CHO cells and the production of our recombinant protein.

The combination of our comprehensive media portfolio and an automated high-throughput screening platform allows us to perform a large number of experiments in a shorter time with minimum resources. Moreover, the screening platform supports cultivations in a controlled environment suitable for robust scale-up.

Below, we provide a step-by-step guide to help you integrate these principles into your own media development strategy. The specific methods and findings from our study are available in the Case Study (pg. 10), which can inform your approach. It is important to note that the performance of each media and feed combination will vary depending on the clone.

Step 1: Pre-Culture – Adapt Cells to Different Media in Shake Flasks

First, cells should be adapted to different culture media to identify conditions that support high cell-specific growth rates and viability – key to providing economic seed train conditions. Media that show no or insufficient adaptation can be excluded from further studies. Thus, many media can be screened to create a small pool for further studies.

At this stage, metabolites like glucose and lactate can be measured to determine glucose consumption rate and obtain preliminary information on CHO cell metabolism in the different media. These rates can serve as an initial estimate for the maximum concentration after feeding (target concentration) in the production culture for specific cell densities and to develop a feed regime.

In addition, cell morphology traits (such as aggregation and stress) can support the decision of which media are further investigated for the next experiments. The results can be bolstered with expert knowledge and existing data, such as cultivation performance in the reference medium used in the current process (if already established).

Step 2: Test Different Media and Feeds in Scaled-Down Bioreactors

The media identified in Step 1 can be combined with different feeds to identify the best media | feed combination. Conducting these experiments in an Ambr® 15 offers a controlled setting that simulates large-scale processes, avoiding the variability associated with manual screening experiments.

Furthermore, the Ambr® 15 system allows for automated experimentation, improving efficiency, resource allocation, and repeatability while mitigating risks. The instantaneous availability of results means users can quickly get a comprehensive view of the culture and make fast, data-driven decisions.

As described above, one challenge is planning a feed regime that avoids under- or over-feeding the culture. There are many potential approaches, creating a high number of experiments and significant expense. The Ambr® 15 offers a process step called "Add Liquid To Culture Vessel Concentration," a trigger-target strategy that provides a simplified approach to feeding at this early screening stage (Box 1).

During the cultivation, cell density, viability, glucose, lactate, ammonia, and osmolality could be monitored to provide real-time data for tight process control, which results in high-quality production. Additional samples should be taken to measure product titer and quality and carry out spent media analytics. For more advanced applications, detailed in-process media monitoring can be performed (for example, by connecting the Ambr® 15 with the BioAccord™ LC-MS System) to gather comprehensive information about cell culture performance.[3]

Box 1 Add Liquid To Culture Vessel Concentration

"Add Liquid To Culture Vessel Concentration" is a trigger-target strategy can be used to run a feed regime on the Ambr® 15. It adapts to the metabolic dynamic of the culture during the cultivation, often providing an optimized feed regime, that can be easily transferred to larger scale. This feature also reduces the number of experiments, because there is no need to run many feed regimes.

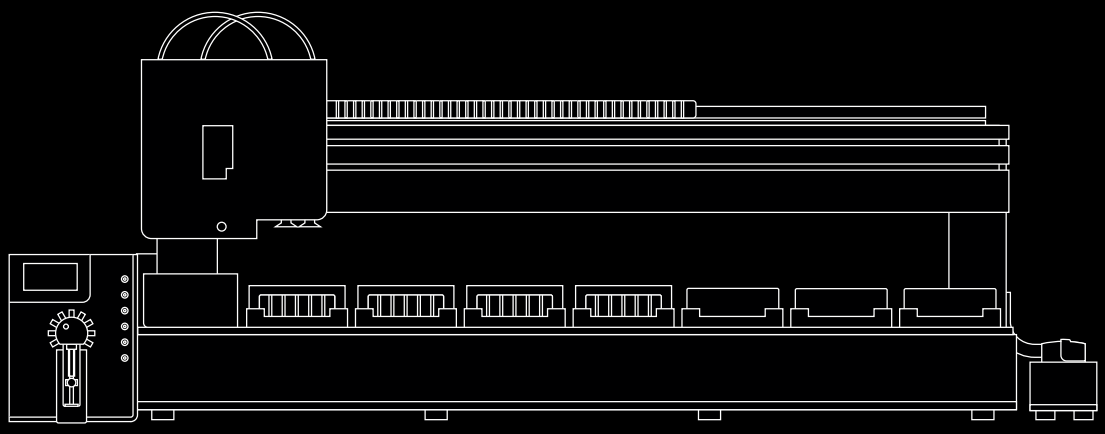
In the trigger-target strategy, the feeds are treated like a glucose stock solution, and the frequency and volume of feed added are based on the glucose concentration measured before feeding. During the programming of the step, a glucose target concentration is defined. Secondly, the glucose concentration of the feed is entered into the program. The feed volume added corresponds to the amount of glucose that is necessary to achieve the target glucose concentration in culture.

The trigger concentration defines the glucose concentration that initiates the addition of feed.

The target concentration is established based on the glucose consumption determined in the pre-culture (Step 1), prior knowledge of the cells, and the expected cell density during cultivation. Typically, the target concentration should be set to a level that 1-3 g/L glucose remains in culture the next day, and the trigger concentration should be set to 60% - 70% of the target concentration. In case the glucose consumption decreases dramatically (for example, during a temperature shift), the feed regime automatically switches from a daily to a two-day feeding regime to avoid overfeeding the culture. If the glucose consumption is higher, cultures are fed daily to avoid under-feeding.

Of course, it is possible to feed a portion of the needed glucose using a glucose stock. In this case, the demand for glucose can be supplied by feed and the glucose stock solution. Moreover, even without automated systems like the Ambr®15, this strategy can be carried out in bioreactors or shake flasks, with manual calculations of glucose concentration.

Following the first runs, spent media analytics can provide insights to fine-tune target and trigger concentrations.



Visit our shop to find out more about our spent media analytics
https://shop.sartorius.com/de/p/spent-media-analysis/Spent_Media_Analysis

For more information about optimizing cell culture performance, donwload the white paper
www.sartorius.com/en/whitepaper-value-spent-media-analytics-optimizing-cell-culture-performance-1500048

Step 3: Pre-Culture—Analyze Results and Choose the Best Media | Feed Combination

The information gathered in Step 2 can inform the selection of the most suitable media | feed. The best combination should provide high titers of products that satisfy the necessary CQAs. Secondary factors affecting the choice may include a preference for a lean media formulation, which simplifies material sourcing and provides the freedom to add more supplements and features. As such, lean media are well-suited for creating a flexible media platform.

The Ambr® 15 can track the daily added feed volume and the vessel volume at the time of feed addition. This information can be transferred into a feed regime (the percentage volume of feed added daily to the culture). Adjustments of the feed to achieve a more stable glucose | nutrient profile in the next experiment can be done if necessary. These data are easily transferred to other processes like 2 L benchtop bioreactor experiments. Results from spent media analytics can complete the picture by providing insights into metabolic processes and allow further adjustments to the feed strategy.

Because the media | feed composition and regime have been simultaneously assessed, the identified media and feeds are much more likely to be the best choices. However, even if the feed regime is sufficient to identify the top media | feed combinations, it might require further optimization to maximize cell performance.

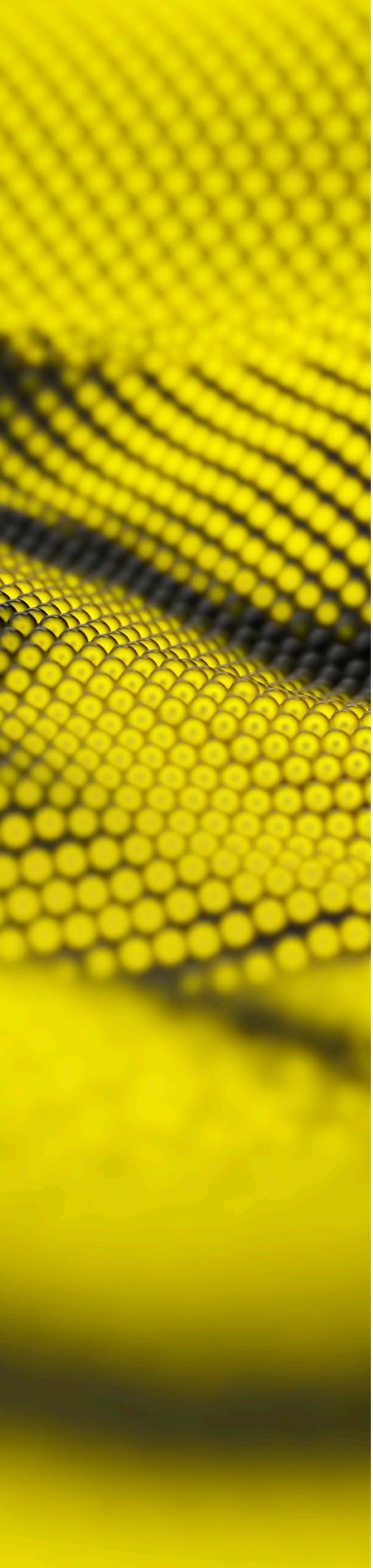
The following case study shows an example of such an approach in practice.

Future Outlook— Scale Up and Feed Regime Optimization

Based on the screening results and spent media analytics, the feed regime can be further optimized. Parameters could include feed volume, time of feed, and whether a continuous or daily feed is conducted. Additional supplements and process parameters, like pH values, temperature shift, inoculation density, and stirring speed, can also be included in the process optimization experiments.

Because only one media | feed combination needs to be optimized, DOE can be an effective strategy for these evaluations at this stage. Finally, the optimal media | feed regime can be transferred to a larger scale.

This comprehensive approach increases the chance of developing a high-performing media | feed strategy.



Case Study: Benchmarking to Streamline CHO Media Screening

Our customer had a reference process but sought greater yield in their manufacturing process. They wanted to test our portfolio of CHO media to find a media and feed combination to achieve 5 g/L productivity. Routine analyses (glucose, lactate, osmolarity, ammonia, cell density, and cell viability) were also carried out to ensure CQAs were maintained.

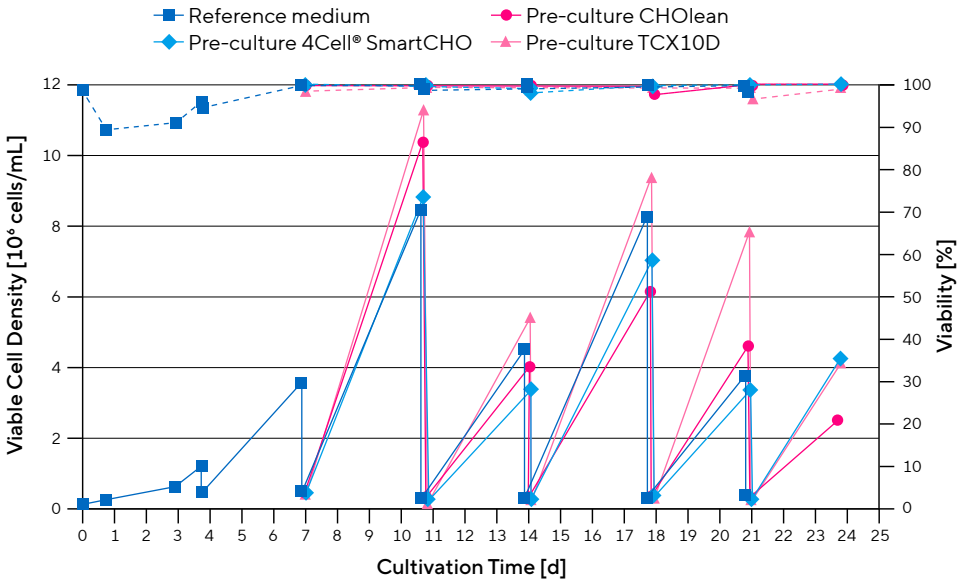
Their CHO-GS cell line was adapted to three Sartorius media: CHOlean, 4Cell® SmartCHO, and TCX10D (tested media and feed combinations are shown in Table 1). After thawing and passaging the cells in the reference process medium for two passages, cells were centrifuged, the supernatant was discarded, and the pellet was re-suspended in the new media. Cell density and viability were measured daily (Figure 2). Specific cell growth rate is shown in Figure 3.

Table 1: *Media and Feed Combinations Tested During Benchmarking Study*

Medium	Feed
TCX10D	TCX7D
CHOlean	TCX7D
4Cell® SmartCHO	TCX7D
TCX10D	4Cell® SmartCHO Feed Medium A + 4Cell® SmartCHO Feed Medium B
CHOlean	4Cell® SmartCHO Feed Medium A + 4Cell® SmartCHO Feed Medium B
4Cell® SmartCHO	4Cell® SmartCHO Feed Medium A + 4Cell® SmartCHO Feed Medium B

Note. Feed Medium B volume was 10% of Feed Medium A volume

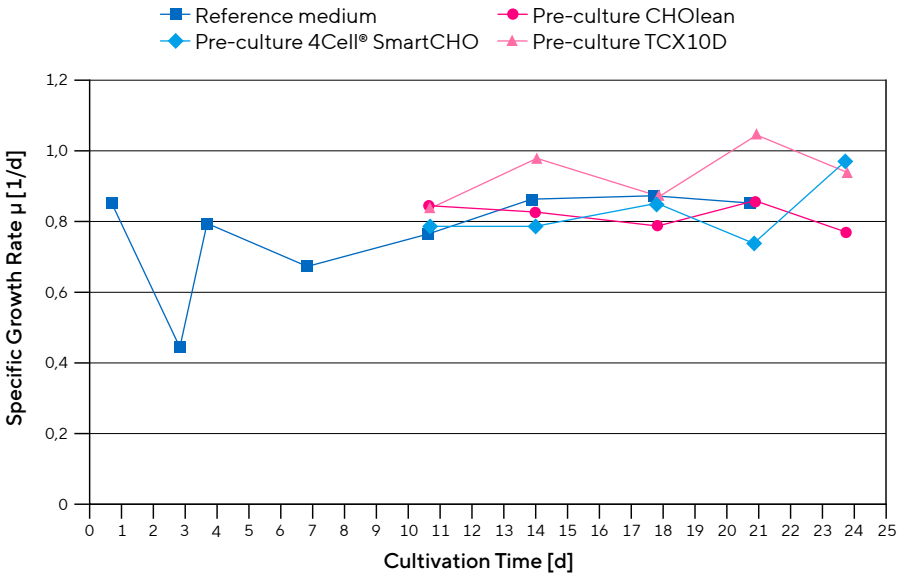
Figure 2: *CHO-GS Viable Cell Density and Viability in Pre-Cultures with Three Media Types*



Note. Frozen cells were thawed in customer reference medium and seeded into new media (TCX10D, CHOlean, and 4Cell® SmartCHO) at passage 2. Pre-cultures were performed in 125 mL shake flasks. Dashed lines = viability, solid lines = viable cell density.

All three Sartorius media supported immediate cell adaption. Cell growth and viability were comparable or higher than the media of the customer's reference process, indicating high growth performance. Therefore, all media were selected for the fed-batch study (i.e., Step 2).

Figure 3: *CHO-GS Specific Growth Rate in Pre-Cultures with Three Media Types*



Note. The following equation was used to calculate specific growth rate: $\mu = \frac{LN(VCD_{ti}) - LN(VCD_{ti-1})}{t_i - t_{i-1}}$

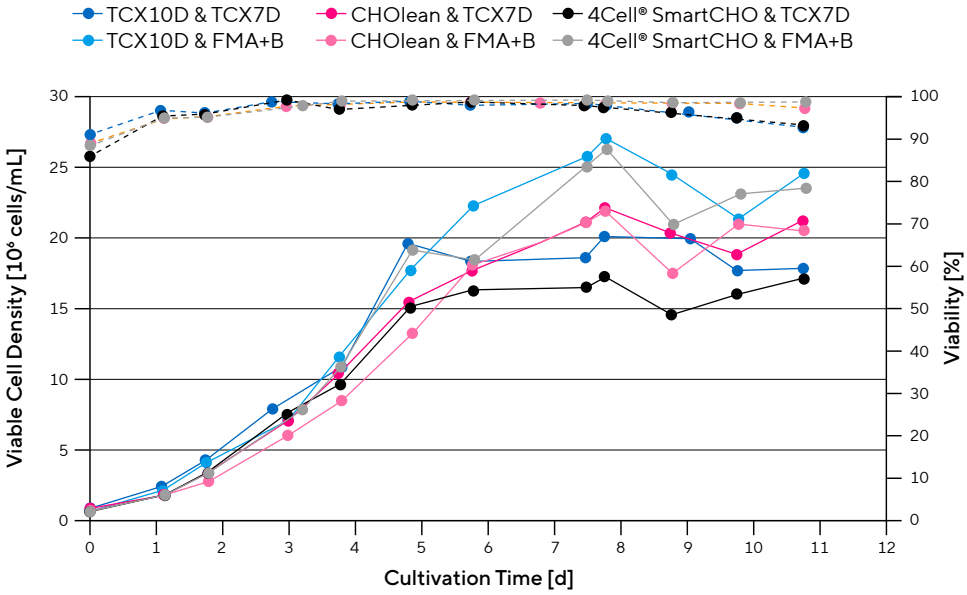
Table 2: *Culture Parameters and Media | Feed Regimes.*

Shake Flask	Ambr® 15	2 L Bioreactor
Vessel: 125 mL plain shake flask	Seeding cell density: 9×10^5 cells/mL	Seeding cell density: 9×10^5 cells/mL
Thaw 1 vial in reference medium		Inoculation volume: 1300 mL (corresponds to 70% of the total reactor volume)
Seed into new media (TCX10D, CHOlean, and 4Cell® SmartCHO Production Medium) at passage 2		
Temperature: 37 °C	Temperature: 36.5 °C	Temperature: 36.5 °C
CO_2*: 5%	Temperature shift: 32 °C on day 5	Temperature shift: 32 °C on day 5
Orbital hub: 50 mm	Proprietary pH strategy	
Shake speed: 120 rpm	Stirring speed: 700 rpm	Stirring speed: 200 rpm with 3-bladed impeller | Rushton
Passage every 3 – 4 days (two 3-day passages before Ambr® 15 inoculation)		
Ambr® 15 inoculation at passage 7		

*Please note 7.5% CO_2 is typically the standard condition for 4Cell® SmartCHO cultures

Our customer's cells were cultivated in different media in an Ambr® 15 microbioreactor according to the cultivation parameters provided in Table 2. The cells stably produced an IgG antibody product. Each medium was combined with two different feed systems, including 4Cell® SmartCHO Feed Medium A and Feed Medium B (FMA+B), according to Table 1. Each experiment was run in duplicate, resulting in 12 experiments. Cell density and viability were measured daily (Figure 4).

Figure 4: *CHO-GS Viable Cell Density and Viability in Ambr® 15 Cultures With Six Media | Feed Combinations*



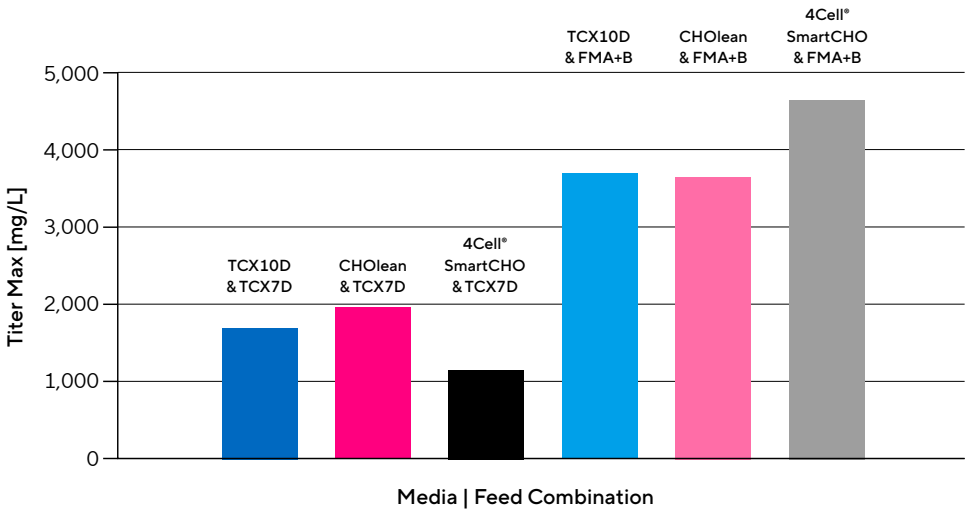
Note. Data shows an average of two biological replicates for each condition. FMA = 4Cell® SmartCHO Feed Medium A, FMB = 4Cell® SmartCHO Feed Medium B. Dashed lines = viability, solid lines = viable cell density

Feeds were added based on the trigger-target step on the Ambr® 15 (Box 1). Target and trigger glucose concentrations were set based on the glucose consumption, growth of the pre-cultures, and information from the customer process. Adjustments of trigger or target concentrations were made based on the glucose profile in each vessel.

All media feed combinations supported high cell growth and cell densities (Figure 4). TCX10D and 4Cell® SmartCHO media reached higher cell density in combination with the 4Cell® SmartCHO feeds (FMA+B). The viability of all cultures was >90% during the entire cultivation process.

In this clone, antibody titers were significantly higher in cultures supplemented with 4Cell® SmartCHO feeds (FMA+B) compared to cultures supplemented with TCX7D feed (concentrations greater than 4.5 g/L compared to a maximum of 2 g/L; Figure 5).

Figure 5: *CHO-GS Antibody Titers With Different Media | Feed Combinations*

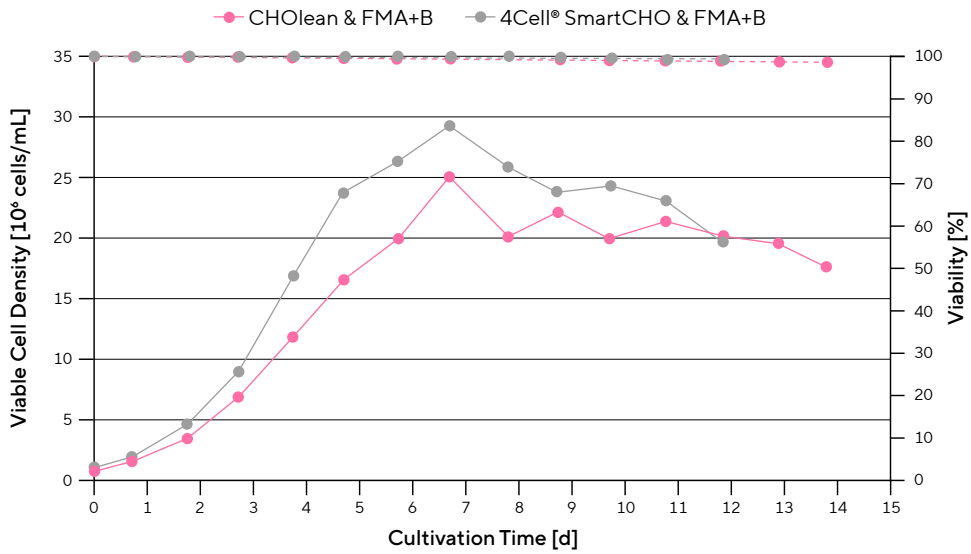


Note. FMA = 4Cell® SmartCHO Feed Medium A, FMB = 4Cell® SmartCHO Feed Medium B

Experiments were scaled up to a 2 L bench-top bioreactor, based on the feed regime extracted from the Ambr® 15 as described in the previous chapter, (i.e., Step 3). Based on the results obtained thus far, we trialed CHOlean and 4Cell® SmartCHO PM media, both with 4Cell® SmartCHO feeds. CHOlean is a lean formulation with fewer components, offering more flexibility and potentially simplicity for some applications. Thus, it could be an interesting alternative to the 4Cell® SmartCHO media.

Cultures with CHOlean or 4Cell® SmartCHO media with the 4Cell® SmartCHO feeds generated high cell densities of 25 × 10^6 cells/mL and 30 × 10^6 cells/mL, respectively. Viability was >98% throughout the entire process (Figure 6).

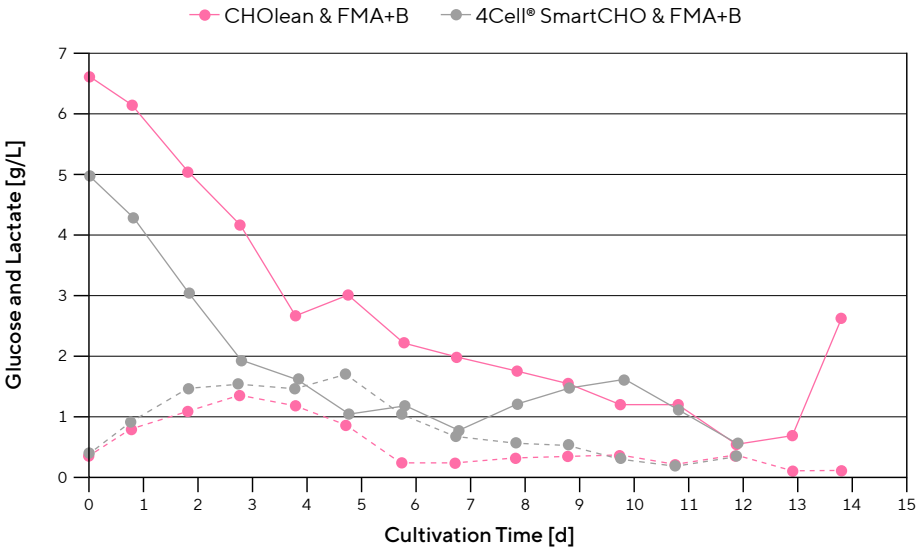
Figure 6: *Viable Cell Density and Viability of CHO-GS Cells in a 2 L Bioreactor*



Note. Cells were cultivated in either CHOlean or 4Cell® SmartCHO, both with 4Cell® SmartCHO feeds. FMA = Feed Medium A, FMB = Feed Medium B. Dashed lines = viability, solid lines = viable cell density

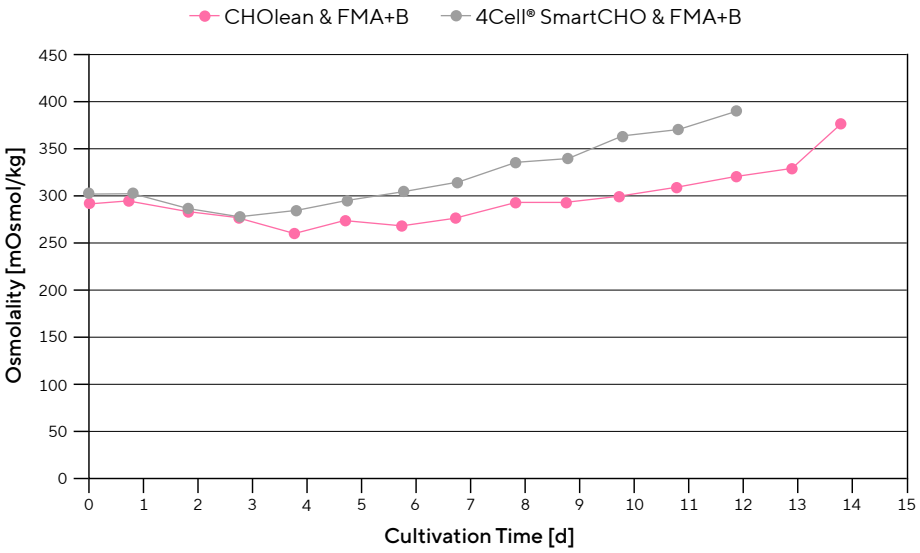
Both underfeeding (indicated by complete consumption of glucose) and overfeeding (indicated by high glucose concentrations) were also avoided in both cultures (Figure 7). Lactate concentration was kept below 2 g/L in both cultures and was thus maintained below critical levels. Lactate was also consumed during the cultivations, minimizing lactate levels.

Figure 7: *Glucose and Lactate Levels in CHO-GS Cultures in a Scaled-Up (2 L) Bioreactor*



Note. Cells were cultivated in either CHOlean or 4Cell® SmartCHO, both with 4Cell® SmartCHO feeds (FMA+B). Dashed lines = lactate, solid lines = glucose

Figure 8: *Osmolality of CHO-GS Cultures in a Scaled-Up (2 L) Bioreactor*

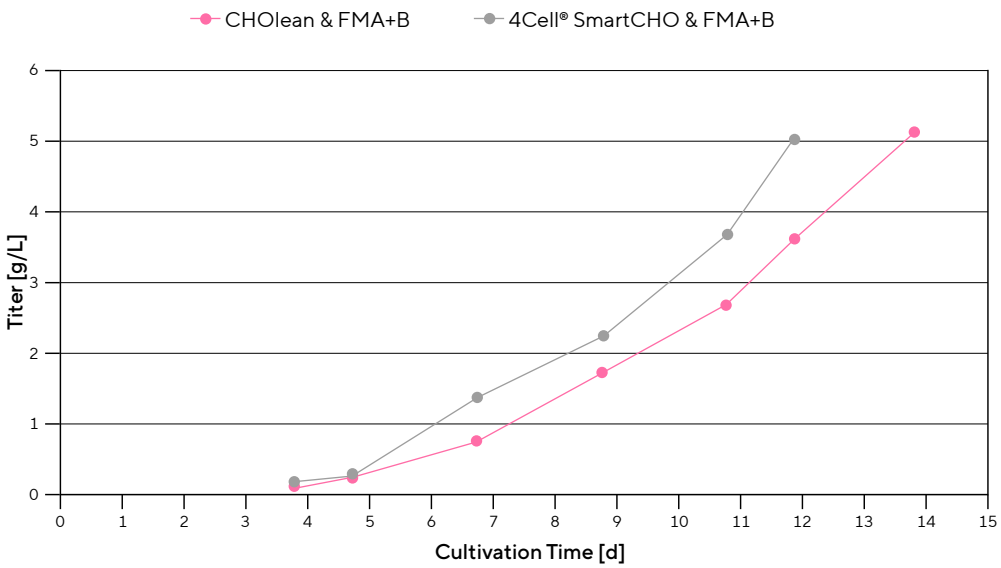


Note. Cells were cultivated in either CHOlean or 4Cell® SmartCHO, both with 4Cell® SmartCHO feeds (FMA+B)

4Cell® SmartCHO-supported cultures required a higher feed volume because of lower glucose levels compared to CHOlean. Therefore, osmolality was higher than during these cultivations. However, osmolality was maintained below 400 mOsmol/kg until the end of the process and thus did not reach a critical level (Figure 8).

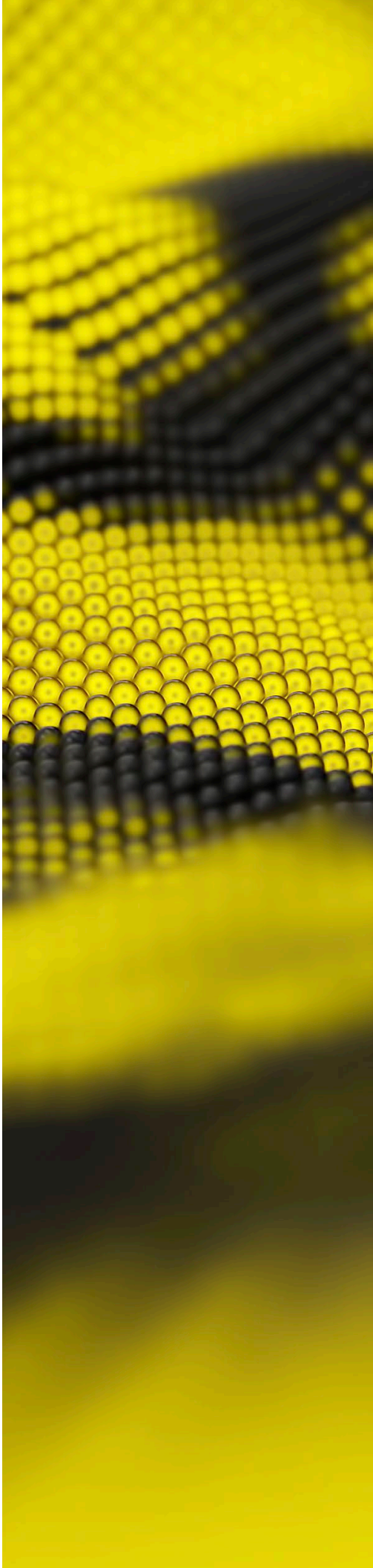
The titer of both cultures reached 5 g/L (Figure 9). The 4Cell® SmartCHO cultivation was terminated after 12 days when the maximum filling volume of the bioreactor was reached. Due to the lower daily feed volume, the CHOlean reactor's maximum volume was reached two days later on day 14. The cell specific process productivity (qProcess = final titer/integral of viable cell concentration (IVCC)) was 24 pg/(cell × day) for the 4Cell® SmartCHO cultivation and 23 pg/(cell × day) for the CHOlean cultivation.

Figure 9: *Antibody Titers in CHO-GS Cultures in a Scaled-Up (2 L) Bioreactor*



Note. Cells were cultivated in either CHOlean or 4Cell® SmartCHO, both with 4Cell® SmartCHO Feed Medium A (FMA) and Feed Medium B (FMB)

In summary, we developed an efficient process with a titer of 5 g/L by directly transferring the results from an Ambr® 15 study to a bench-top bioreactor. The glucose profile and measured osmolality reveal a process without over- or under-feeding of the cultures. In addition, cell growth and productivity of cultures between Ambr® 15 and 2 L benchtop bioreactor show a high degree of conformance, especially as no optimization was conducted before scaling up the experiments.



Conclusion

In conclusion, this white paper presents a comprehensive study on the development of a robust media | feed combination for CHO cell cultivation. Immediate adaptation of cells to Sartorius media enhanced the screening process and allowed us to quickly and reliably identify the best combinations

Using the selection framework, two media | feed combinations that provide a high antibody yield (5 g/L) while maintaining a viability of >98% throughout the entire cultivation time were identified. A robust feed regime was also designed to promote lactate consumption while avoiding over- or under-feeding of cells. The small-scale Ambr® 15 results agree well with the 2 L bioreactor results, verifying the suitability of the Ambr® 15 system for media | feed screening.

These findings show that the screening process is an efficient and effective method for identifying the best media | feed combination within a relatively short timeframe (around two months including cell adaptation to media, Ambr® 15 screening, and scale up). By avoiding the need for a large number of experiments or DOE, this process saves time and resources while still providing reliable results. Additionally, the screening was conducted in a controlled environment that provided all the necessary information for an effective scale-up. Overall, this screening process offers a streamlined approach to bioprocess development that can potentially improve efficiency and effectiveness while reducing costs.

In addition to the findings of the case study, it is important to note that the Sartorius CHO media portfolio provides a variety of off-the-shelf products with basal and feed media for different CHO cell lines and clones. The combination of these products is easy to implement to optimize the best basal and feed media combination for individual cell lines | clones. The in-house expertise can provide the technical background needed to choose media for specific cell lines.

To perform similar screening experiments, we recommend taking advantage of programs such as Sartorius Free CHO Media Sample Kits, which allow you to trial a selection of media from our comprehensive portfolio.

Request your cell culture media sample
www.sartorius.com/cell-culture-media-sample

Choose a winning culture for your protein production process
www.sartorius.com/cho-media

For more information contact our Product Manager, Catherine Krikelis
catherine.krikelis@sartorius.com

Author Bio

Dennis Karthaus
PhD, Manager of Media and Processes Product Development, CMTS, Sartorius

Dennis is a highly experienced biotech professional with over a decade of experience in the industry. In 2022, he decided to focus strongly on his passion for cell cultivation processes and joined Sartorius Xell, where he currently serves as the manager of the Media and Process Development team (part of Cell Line, Media, and Testing Solutions).

Dennis and his team specialize in the development and optimization of cell cultivation and production processes for HEK293 and CHO cell lines for both internal and custom service projects. They have developed highly complex Ambr ®15 processes for the evaluation of CHO media feed screenings in different cell lines.

Dennis holds a PhD in biotechnology from the Leibniz University Hannover and has worked extensively in the field of mammalian protein production and cell line development, as well as downstream applications such as versatile protein purification and analytic technologies.

Catherine Krikelis
Product Manager, Cell Line, Media, and Testing Solutions (CMTS), Sartorius

Catherine is the global product manager for protein production media at Sartorius. She has been with Sartorius since 2021 and believes that media and feed strategies have been one of the main drivers of yield, titer, and cell density improvements over the last 15 years, especially for CHO cultures.

She holds a degree in biology from the University of Poitiers, France, and professional diplomas from the Chartered Institute of Marketing and the Pragmatic Institute. Catherine is a customer-focused product manager, passionate about helping pharmaceutical companies succeed in drug development.

Dirk Mueller
PhD, Manager of Media and Process Development, Sartorius

Dirk Mueller heads a product development team within Cell Line, Media and Testing Solutions at Sartorius. Dirk obtained his PhD in Biochemical Engineering from Stuttgart University and conducted post-doctoral research in Computational Systems Biology at ETH Zurich.

Before joining Sartorius, Dirk worked at Insilico Biotechnology in several positions, including team lead for optimization of mammalian and microbial bioprocesses using predictive computational cell models.

In his current function, Dirk heads a group developing media formulations for mammalian cell lines and early-stage cell culture processes with a knack for intensified process formats.

Swapnil Chaudhari
PhD, Manager Cell Culture Media Development, Product Development, (CMTS) Ulm

Swapnil is part of the Cell Line, Media, and Testing Solutions (CMTS) product development team, where he manages a group of scientists developing media and customized media platform solutions.

Swapnil joined Sartorius in 2017 as a cell culture media development scientist in the Media and Process Development team. He was instrumental in developing the new 4Cell® SmartCHO media platform.

Previously, he led a team developing a high-throughput media customization platform as a service platform for media development and optimization. He has made a significant contribution to establishing a broad range of spent media analytics methods at CMTS using UHPLC and LC-MS. Swapnil obtained a master's and PhD in Biotechnology from the University of Bielefeld, Germany.

References

1. BioPlan Associates. (2023). Twentieth Annual Report and Survey of Biopharmaceutical Manufacturing Capacity and Production. A Study of Biotherapeutic Developers and Contract Manufacturing Organizations.
2. Sartorius. (2023). 4Cell ® CHO Media and Feed Portfolio. Retrieved from https://www.sartorius.com/download/1400034/cho-media-and-feed-portfolio-datasheet-en-b-pdf-data.pdf
3. Alelyunas, Y. W., Prochaska, C., Kukla, C., Wrona, M. D., & Yu, Y. Q. (2022). In-Process Media Monitoring Using the BioAccordTM LC-MS System for the Automated High Throughput Multi-Parallel Ambr ® 15 Microbioreactor System.

Germany
Sartorius Stedim Biotech GmbH
August-Spindler-Strasse 11
37079 Goettingen
Phone +49 551 308 0

UK
Sartorius Stedim UK Ltd.
Longmead Business CentreBlenheim Road,
Epsom, Surrey KT19 9QQ
Phone +44 1372 737100

USA
Sartorius Stedim North America Inc.
565 Johnson Avenue
Bohemia, NY 11716
Toll-Free +1 800 368 7178

For more information, visit
sartorius.com

Status: 03 | 2024