CAPRICORN SCIENTIFIC

CHOventure

CULTIVATING TOMORROW'S BREAKTHROUGHS

www.capricorn-scientific.com

» CHOventure

The name of the medium is also the nature of our project.

CHO EXPRESSION WITH THE STRENGTH OF TWO COMPANIES

To this day, CHO expression systems are THE tool when it comes to high-yield production of vaccines, antibodies, and other valuable recombinant proteins.

However, CHO expression possesses a couple of major challenges that companies must face, when establishing production processes and pipelines. Besides biological issues, like poor solubility or protein aggregation, also scale-up issues may appear. Attempts to solve technical problems are often accompanied by time and budget overruns, resulting in the abandonment of these projects in their infancy.

To assist your projects, a team of dedicated experts with specialized skills and bundled energy was formed in a strong cooperation.

ExcellGene has been handling CHO cell lines and development processes for over 20 years. They are known for developing creative solutions and their impressive track record for cutting-edge technologies in the biotech industry.

Capricorn Scientific is an expert in production that excels in the manufacturing of media under Good Manufacturing Practices (GMP) conditions, both in liquid and powdered format.

Together, we aim to optimize processes and develop innovative products to bring THE solution to you:

CHOventure: The name of the medium is also the nature of our project. The medium was born out of a cooperation between Capricorn Scientific and ExcellGene.

CONTENT

CHOventure IS MORE THAN A PRODUCT

It is a commitment to support each project individually. We know that your ideas deserve proper handling to generate future breakthroughs. Therefore, our media system excels in performance and intensive support.

OUR COMMITMENT:

- Highest performance in medium and feeds by deep understanding of CHO cell requirements
- Secured lead times for production services
- Transparency and commercial support from start up to market entry

TWO COMPANIES – ONE MISSION

With Capricorn Scientific and ExcellGene, a partnership was created, that brings expertise and knowledge about CHO growth and expression to the next level. Together, the individual strengths of both companies are elevated, resulting not only in a product but an experience:

With the force of two companies, we support you, from the initial idea to market entry, and the consecutive years after the foundation has been laid.

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- Extensive knowledge on cell culture ingredients for highest expression
- Smooth transition from R&D to GMP levels through liquid and powder supply
- Commercial support and transparent cost calculation from R&D to clinical phases and beyond

EXCELLGENE

- Deep understanding of CHO cell biology for maximum output
- Optimization of processes, cell lines, and end-product expression
- Innovative and creative solutions to accelerate projects to market entry

SPECIALISTS IN **PRODUCTION**

- Secured supply «
- Efficient scale-up «
- Tailor-made solutions «

SPECIALISTS IN **DEVELOPMENT**

- » Cell line
- » Process
- » Production

FROM THE VERY BEGINNING TO THE FINISH LINE

We want to assist you at each stage of your project.

INITIAL PHASE

Our medium and feeds support cells to reach titers of up to 15 g/L and above, and are fully scalable from R&D to clinical phases. To obtain such high yields, it is never just the medium – It is the understanding of the interaction of medium and cell line during the whole process. We understand & take care of you!

SCALE-UP PHASE

The process from DNA to a single cell, up to production of pharmaceutical batches, can be challenging and is often perceived as a most complex adventure. You can benefit from our know-how to set things right throughout the entire project and minimize time to market.

CLINICAL PHASES

It is important to have a good partner for R&D, however, it is even more critical to have a reliable partner during clinical phases. Confidentiality, trustworthy support, and a secured supply are the assets which we stand for.

CHOventure
Scalability Meets Quality

TITER EXPRESSION IN A FULLY SCALABLE SYSTEM IS NOT OUR ONLY TARGET: WE COMBINE IT WITH PRODUCT QUALITY.

The challenges in biotech scale-up are frequently accompanied by the disappointment of lower product yields, which are often linked to reduced viability of the cultures, cell death and aggregation.

When CHOventure was developed with a 15 g/L titer expression goal, our foremost effort was to achieve unparalleled product quality, while maintaining consistency across the entire product line. Scaling up in seed trains emerges as a pivotal juncture in securing success in titer expression, where both protein quality and yield are paramount considerations. Ensuring a seamless transition in the scale-up process is imperative and requires culturing expertise in cell growth, viability, and production at elevated levels.

To meet this challenge with CHOventure, we embarked on a comprehensive seed train analysis. This growth analysis for upscaling bioreactors included the comprehensive titer expression of three different human immunoglobulin G (IgG) biosimilars. Grown in CHOventure, cells showed outstanding performance in terms of density, viability, and nutrient consumption. During the entire seed train, CHOventure supports the lowest levels of cell aggregation.

The pursuit of quality became a guiding principle in our cooperation, driving us to refine and elevate our processes to evoke a profound sense of assurance and satisfaction.

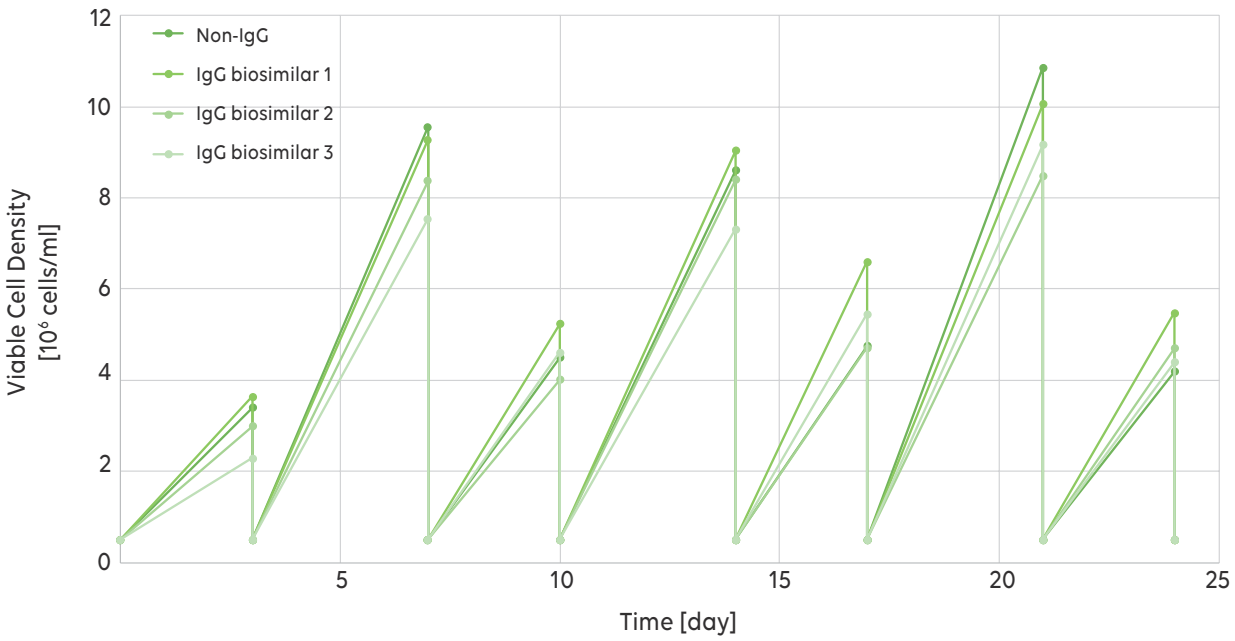

Fig. 1: Seed train analysis was performed comparatively with three different CHO clones producing IgG biosimilars. CHO cells were seeded at a density of 0.5 x 10^6 cells in CHOventure Growth Medium.

Optimal Viability and Viable Cell Density to Increase Your Output!

Higher viability and viable cell densities lead to longer cultivation times, increased harvest, and easier downstream purification. With our expression system, we could achieve a viability of up to 100% during the entire fed-batch cultivation of 14 days. We achieved peak densities of 25 million cells/ml.

YOUR RESULTS DIFFER?
Let us help and share our knowledge to take you to the next level!

UNLOCKING SEAMLESS SCALABILITY WITH CHOventure!

To further analyze the scalability of protein expression with CHOventure, we performed thorough research in the field of monoclonal antibody (mAb) production, examining benchmarking and scalability using non-instrumented small-scale bioreactors (e.g., shake-flasks and TubeSpin®) to large-scale STR.

The result: CHOventure features robust and scalable growth performance, seamlessly transitioning from small-scale experiments to large-scale bioreactors. Our cutting-edge medium delivers exceptional results, boasting high viability and outstanding titers in powdered and liquid form.

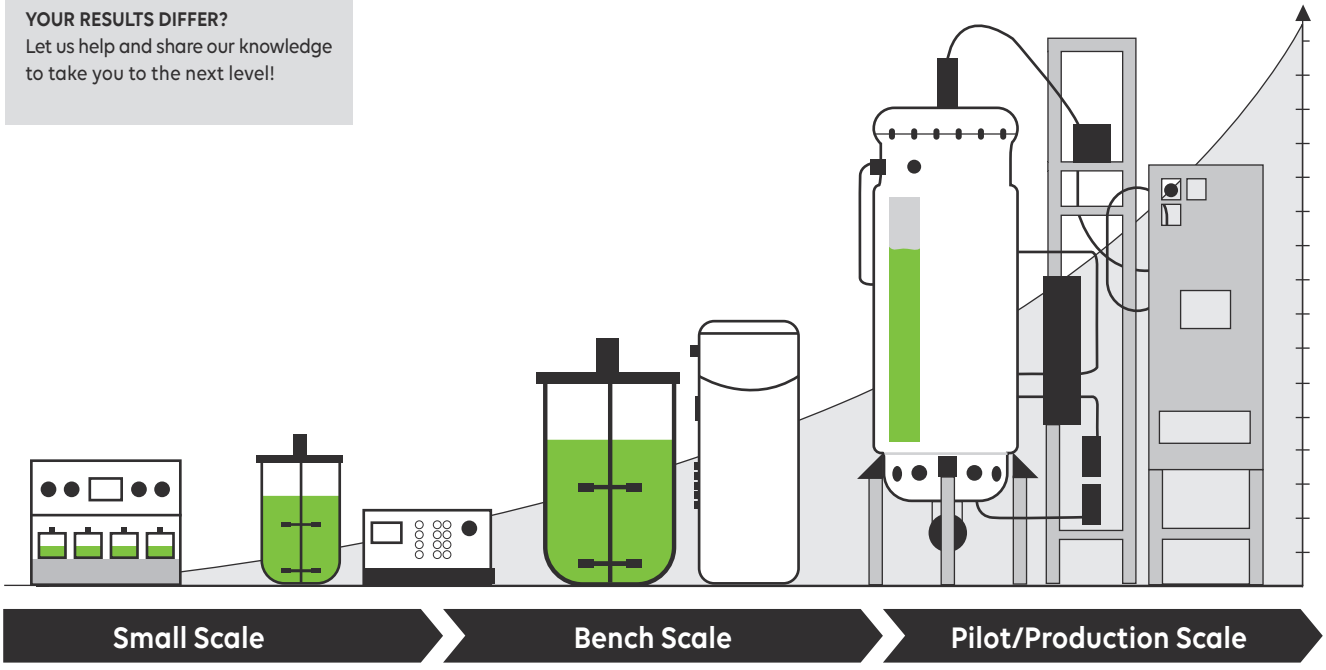

Fig. 2: With CHOventure, you can achieve your mAb production goals effortlessly, from R&D steps up to clinical phases. Elevate your production processes and choose CHOventure for unmatched performance and reliability in every situation.

CHOve

MAXIMIZED VIABILITY IN A SEAMLESSLY SCALABLE SYSTEM

Our CHOventure growth medium was developed for quick adaptation, and improved growth and production processes. It is ideal for batch and fed-batch cultivation when combined with our feeding supplements.

The chemically defined medium supports the cultivation of the most widely used CHO cell types for the recombinant production of biomolecules or biosimilars.

- **Maximizes viability, cell growth, and productivity**
- **Balances product consistency by using the right ingredients**
- **Supports a broad range of CHO cell types**
- **Fully scalable and flexible system from bags to powder**

TITER EXPRESSION
Up to 15 g/L

ADAPTATION
Directly, for most reference media

SPECIFIC PRODUCTIVITY
Up to 50 pg per cell & day

ExcellGene

enture

FEEDS FOR PERFECTLY TAILORED NUTRIENT SUPPLY

The CHOventure product line contains a growth medium and two feeding supplements. Our medium and feeds were designed and optimized for high-density suspension cultures, maximizing production. The entire system is available in liquid and powder form and is fully chemically defined in compliance with ICH guidelines and regulations.

Our two feeding supplements, which complete the system, offer a seamlessly scalable solution that is applicable for each size of project in use especially for fed-batch cultivation.

- **Delivers high yields through enriched formulation**
- **Secures consistent results from production to production**
- **Supports viable peak cell densities during entire process**

VIABILITY
98–100% for 14 days

POPULATION DOUBLING TIME
As low as 16 hours

VIABLE CELL DENSITY
Up to 25 million cells/ml

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COMPARISON
To Market-Prominent Media

Before launching our CHOventure media system, we wanted to compare it against prominent competitors in the market. The comparison was established in a 14-day fed-batch production with a CHO cell line (CHOExpress®). Analyzing viable cell density, viability, and titer expression, the study showed that the performance of our medium was better or equal to that of our competitors.

Fig. 3:
Analysis of cell growth and viable cell density over 14 days in a fed-batch experiment. Seeding density of 5 × 10^5 cells. Feeding strategy was the same in each system: 4.0% Feed A, 0.4% Feed B after day 3. The highest VCD levels were achieved with CHOventure.

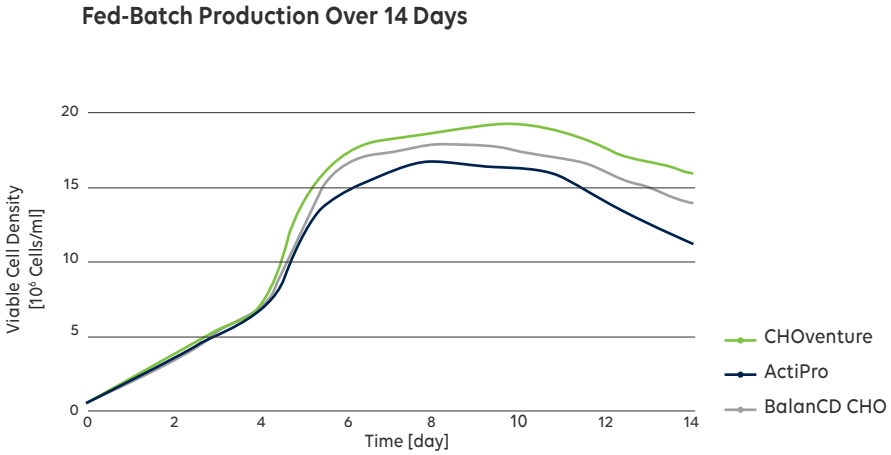
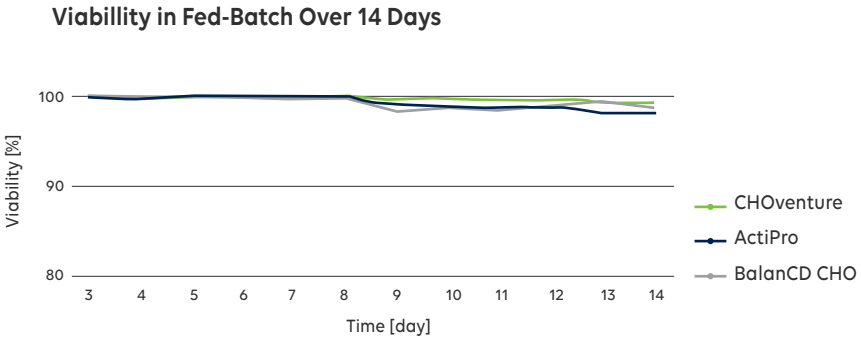


Fig. 4:
Viability analysis of CHO cells over 14 days in a fed-batch experiment. With CHOventure, a minimum of 98% cell viability was achieved for the entire run.



VIABLE CELL DENSITY
VCD of up to 25 million cells/ml may be achieved

VIABILITY
CHOventure supports high cell viabilities of 98–100%

TITER
Titers of up to 15 g/L can be reached

Titer After 14 Days of Fed-Batch Production

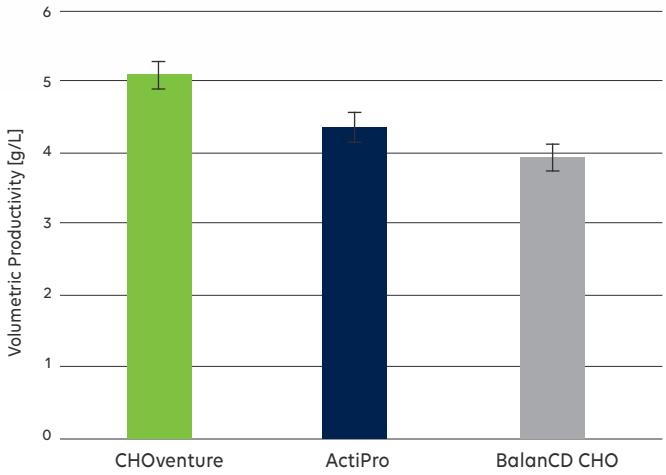


Fig. 5:
Comparison of product expression after 14 days in a fed-batch production. CHOventure shows the highest production yields. Error bars indicate standard deviation of 5%.

CHOventure – MAXIMIZED PERFORMANCE

Last but not least, our goal was to show the performance of CHOventure in a fully optimized process: 10 g/L was easily reached. We even managed 15 g/L!

CHOventure – Maximum Production

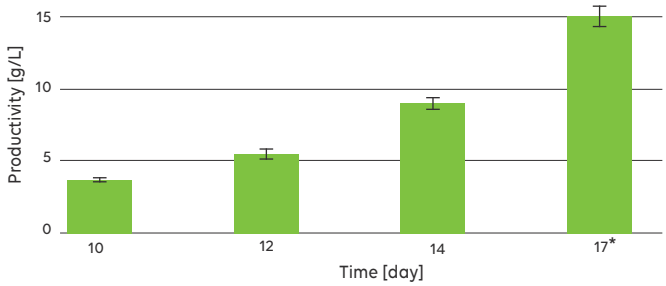


Fig. 6:
Expression yield using CHOventure and CHOExpress® cells.
Production was performed for 17 days.
With CHOventure, protein yields of up to 15 g/L could be achieved.
Error bars indicate standard deviation of 5%.

***Unable to reach 15 g/L?** We are happy to help you optimize your process. Contact our technical support team today!
techservice@capricorn-scientific.com

CHOventure IS THE FINAL RESULT OF AN INTENSIVE SCREENING, ADAPTION, AND IMPROVEMENT.

CHOventure

- Stabilizes the product quality throughout all production stages
- Secures product quality throughout the entire scale-up
- Saves time and money

USEFUL
Composition Overview

An optimal nutrient supply is key for successful CHO cultivation in small- to large-scale bioreactor systems. Hence, the formulation of CHOventure is specifically tailored to CHO expression cell lines (e.g., CHO-K1, CHO DG44, CHOExpress® & more). It further supports viability at high cell densities and ultimately increases expression titer and overall product quality from recombinant proteins and biosimilars.

Besides, the nutrient supply, cell distribution, and buffering significantly affects viability and, therefore, a successful expression. CHOventure's components are precisely balanced, resulting in buffering effects on the cells, and also supporting uniform cell distribution as well as preventing cell lethality – even in large bioreactors combined with a robust cell host.

CHEMICALLY DEFINED
Yes, CHOventure is chemically defined for maximum reproducibility and performance.

GLUCOSE LEVEL
(7 g/L in growth medium)
CHOventure contains high levels of glucose for optimal growth maintenance.

L-GLUTAMINE/ STABLE GLUTAMINE
No, it is not part of the formulation but is compatible when added.

POLOXAMER 188
Yes, CHOventure contains Poloxamer 188 for shear protection.

TRACE ELEMENTS
Yes, CHOventure contains a well-balanced composition of trace elements.

HYPOXANTHINE, THYMIDINE & GLYCINE
Yes, CHOventure contains hypoxanthine, thymidine & glycine to support growth.

LIPIDS
Yes, CHOventure contains essential lipids for cell protection and optimal nutrient supply.

GROWTH FACTORS
No, CHOventure already contains all the necessary components for optimal growth.

PHENOL RED
No, CHOventure does not contain phenol red, as to not interfere with industrial purposes.

Our benchmark: New things must be better.

We want to reach the top together with our customers – and that's why it's up to us to offer you the products, traceability of ingredients and, above all, the SERVICE you need to get started right away.

Cooperation: ExcellGene and Capricorn Scientific

ORDERING *Information*

KIT

PRODUCT	VOL.	CAT.NO.
CHOventure Starter Kit Including: 1x CHOventure Growth Medium (500 ml) 2x CHOventure Feed A (100 ml) 2x CHOventure Feed B (10 ml)	Kit	VEN-K1

LIQUID

PRODUCT	VOL.	CAT.NO.
CHOventure Growth Medium, with Hypoxanthine, with Thymidine, with Pluronic™, w/o Insulin, w/o L-Glutamine	500 ml	VEN-500ML
CHOventure Growth Medium, with Hypoxanthine, with Thymidine, with Pluronic™, w/o Insulin, w/o L-Glutamine	10 L Bag (3 ports)	On request
CHOventure Growth Medium, with Hypoxanthine, with Thymidine, with Pluronic™, w/o Insulin, w/o L-Glutamine	20 L Bag (3 ports)	On request
CHOventure Feed A, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	500 ml	VENFA-500ML
CHOventure Feed A, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	100 ml	VENFA-100ML
CHOventure Feed B, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	50 ml	VENFB-50ML
CHOventure Feed B, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	10 ml	VENFB-10ML

POWDER

PRODUCT	VOL.	CAT.NO.
CHOventure Growth Medium, Powder, with Hypoxanthine, with Thymidine, with Pluronic™, w/o Insulin, w/o L-Glutamine	10 L	VEN-P10
CHOventure Growth Medium, Powder, with Hypoxanthine, with Thymidine, with Pluronic™, w/o Insulin, w/o L-Glutamine	1 L	VEN-P1
CHOventure Feed A, Powder, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	10 L	VENFA-P10
CHOventure Feed A, Powder, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	1 L	VENFA-P1
CHOventure Feed B, Powder, Feeding Supplement for CHO cells, w/o Insulin, w/o L-Glutamine	1 L	VENFB-P1

***More Unit Sizes and Customization Available.**

FAQs
Frequently Asked Questions

How is the CHOventure cultivation system used?
CHOventure growth medium may be used for cultivation of CHO cell lines in recombinant expression systems. CHOventure Feed A and Feed B may be optionally added to supply CHO cells with additional valuable nutrients, increasing the productivity and cell growth. The modular feed system allows for combinatorial variations and adaptations for efficient recombinant CHO cultivation.

Which cell lines may be cultivated in CHOventure?
CHOventure supports a broad range of CHO cell types, e.g., CHO DG44 and CHO-K1. The special formulation of CHOventure is specifically tailored to the demands of CHO expression clones in bioreactor systems and compadible with all transposon derived cell lines.

How is adaption to CHOventure performed?
For adapting CHO expression clones to CHOventure, sequential adaption may be perfomed easily. If cells were previously cultured in a chemically defined system, the medium can even be simply exchanged by CHOventure without any further adaption steps.

Which batch sizes are supported by CHOventure?
CHOventure allows for seamless upscaling from small-scale test runs to maximum-sized large-scale bioreactors. Our medium and feeds were designed and optimized for high-density suspension cultures and maximized production in all sizes of production systems.

Which titers may I expect during expression?
CHOventure enables the production of high-quality proteins with titers of up to 15 g/L without affecting cell viability.

How are the high cell viability and living cell density achieved?
CHOventure is composed of a variety of valuable nutrients and trace elements, perfectly tailored to CHO cell lines and recombinant expression. Additional components, such as Pluronic™, provide culture conditions that enable an even distribution of cells in bioreactors, without aggregate or clump formation.

FURTHER OPTIONS OF SUPPORT:

- Customization of formulation
- Bulk ordering
- Titer optimization
- Cell line development
- Process optimization

MORE INFORMATION
ABOUT CHOventure:

» www.capricorn-scientific.com/**CHOventure**

ORDERING
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WHY US?

» Your Partner in Cell Culture

We are a company dedicated to cell culture.
Our specialists offer their experience to support your manufacturing processes.

» Competence, Commitment, and Improvement

Our ISO 9001:2015 certification confirms that we are regularly audited and certified by an independent organization, to continuously improve our quality system and our standards, processes, and products.

» Fast and Efficient Order Processing

Secured just-in-time delivery due to short administrative channels and good knowledge on product quality, stability, and delivery conditions.

» Customized Production and Development

We design your media according to your recipe, or create innovative solutions that can improve the performance and efficiency of your specific processes.

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