

CHO Cell Line
Development
Services for
Therapeutic Protein
Development

Simplifying Progress

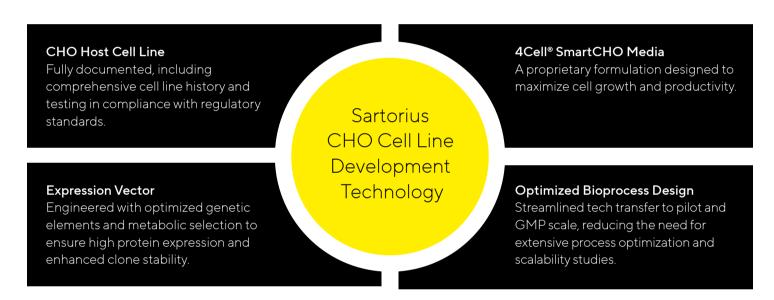
SARTURIUS

# From DNA to IND-Ready With Confidence

Sartorius' CHO Cell Line Development Service provides drug developers with a high-yielding, stable CHO cell line for the production of recombinant therapeutic proteins.

Our services are built on a foundation of expert knowledge and cutting-edge technology, and reflect decades of innovation. In 2025, we proudly mark two milestones: 10 years since Cellca – an industry leader in cell line development – joined Sartorius, and 20 years since Cellca's founding. This legacy equips us to deliver customized, effective solutions for your bioprocess.

# Key Components of Our CHO Cell Line Development Technology



## Successful Track Record

- Over 15 years of experience and more than 300 successfully completed cell line development projects
- 80+ molecules currently in clinical stages, with 7 molecules approved for
- Strong client loyalty, with many returning for over 15 collaborative projects

"We are very satisfied with the outcome of the project. The initial timeline was precisely met and the titer was better than expected for a very difficult molecule. The team at Sartorius was also responsive, capable, and easy to work with."

# **Biotech Customer**

California, USA

# Proven Performance

# High Yields Without Compromise

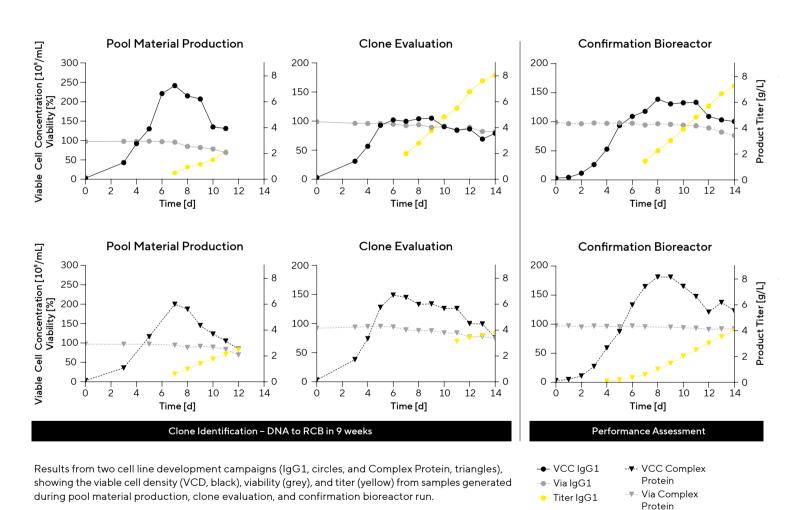
- Exceptionally high titers and productivities, even prior to process optimization
- Capabilities across diverse molecule types, including classical monoclonal antibodies (mAbs) and more complex proteins
- Rapid delivery timelines, with research cell banks (RCBs) provided within
   9 weeks and master cell bank (MCB) manufacturing and release completed in under 9 months

"We are satisfied with the whole project, project lead, and communication. The titer is amazing and gives us enough space to optimize the quality of our biosimilar. The challenge of achieving monoclonality of one clone was handled correctly and is therefore seen as positive."

Titer Complex Protein

#### Gedeon Richter

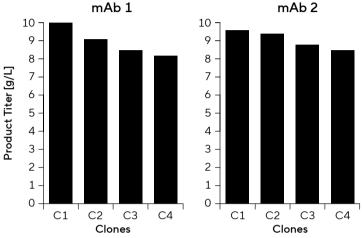
Plc, Hungary



# Expertise Across Diverse Modalities

Our CHO Cell Line Development Service team possesses a comprehensive skillset that extends to complex and challenging biomolecules, whether they are new biological entities or biosimilars, including:

Conventional mAbs: 180+ projects completed, 50+ in clinical stages, including 7 in commercial manufacturing and approved for market use. Titers reaching up to 10 g/L. Bi- and Multispecific Antibodies: Almost 40 projects completed, 12+ in clinical stages. Titers reaching above 7 g/L.

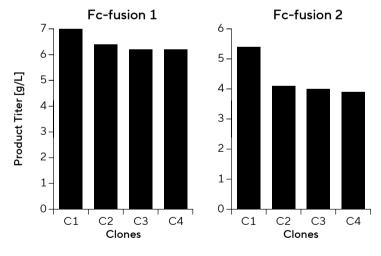


Bispecific 1 Bispecific 2 6 5 Product Titer [g/L] 5 4 4 3 2 1 1 C1 СЗ C4 C2 С3 C4 C2 C1 Clones Clones

Results from two cell line development campaigns (mAb 1, left and mAb 2, right), showing the titer of the top four clones cultured in the Ambr® 15 system under standard fed-batch conditions (unoptimized).

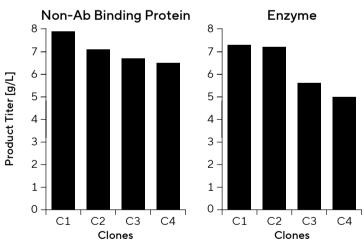
Results from two cell line development campaigns (Bispecific 1, left and Bispecific 2, right), showing the titer of the top four clones cultured in the Ambr<sup>®</sup> 15 system under standard fed-batch conditions (unoptimized).

Fc-Fusion Proteins: 50+ projects completed, 12+ in clinical stages. Titers reaching above 7 g/L.



Results from two cell line development campaigns (Fc-fusion 1, left and Fc-fusion 2, right), showing the titer of the top four clones cultured in the Ambr<sup>®</sup> 15 system under standard fed-batch conditions (unoptimized).

Non-Antibody Proteins: 40+ projects completed, 10+ in clinical stages. Titers up to 8 g/L.



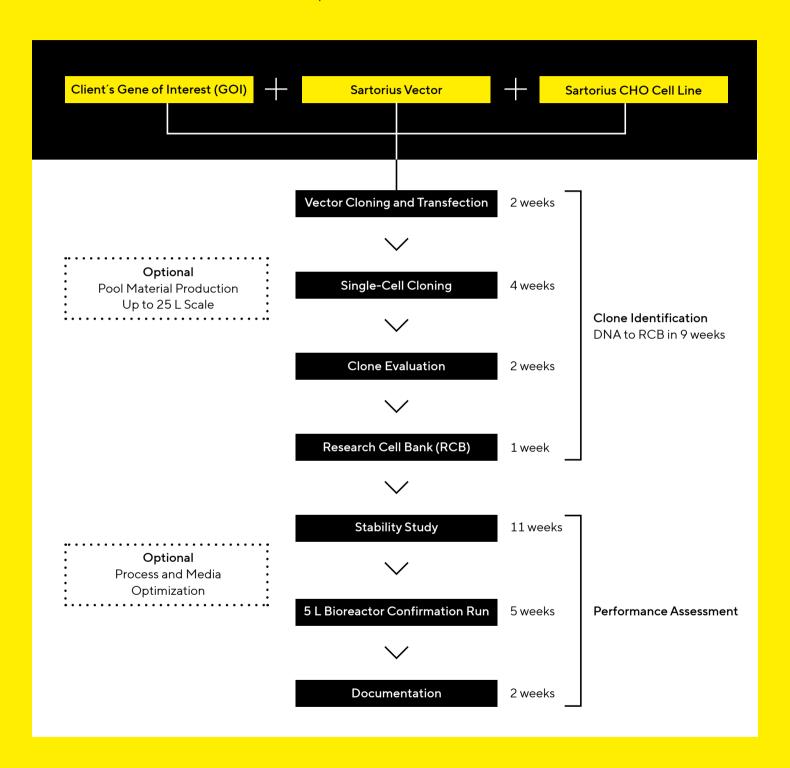
Results from two cell line development campaigns (a non-antibody binding protein, left and an enzyme, right), showing the titer of the top four clones cultured in the Ambr® 15 system under standard fed-batch conditions (unoptimized).

## **Biosimilars**

We have successfully completed around 30 biosimilar projects, 2 approved for market use. Titers up to 9 g/L.

# Inside Sartorius' CHO Cell Line Development Service

Sartorius' CHO Cell Line Development Workflow



# Vector Cloning and Transfection

The expression vector system employed within our CHO Cell Line Development Service has been extensively developed to work synergistically with our host cell line for optimal and high expression of recombinant proteins. This includes:

- A suite of optimized genetic elements (promoters, 5' and 3' UTRs, signal sequence peptide, and S/MAR elements) to ensure optimal and stable gene expression
- Maintaining high stringency in metabolic selection using innovative genetic elements to identify high-producing clones exhibiting low copy numbers, without the need for inhibitory agents
- An optimized vector topology and gene cassettes for single- and double-gene constructs to ensure efficient expression of the therapeutic protein

By combining an optimized expression vector with effective gene delivery methodology via electroporation-mediated transfection, we can successfully generate cell lines exhibiting competitive titers for different modalities.

# **Vector Cloning and Transfection** Single-Cell Cloning Clone Evaluation Research Cell Bank (RCB) Stability Study 5 L Bioreactor Confirmation Run Documentation

# Single-Cell Cloning

Single-cell cloning is performed using the high-throughput automation capabilities of the Sartorius CellCelector™. Cells from established stable pools are inoculated and cultured in a 24-well plate, with each well consisting of 4,300 nanowells.

Monoclonality is assured by automated image-based verification using the integrated software, with a probability of 99.7%. Our proprietary Protein A bead productivity assay leverages the fluorescent detection capabilities of the CellCelector™ to identify highproducing clones only four days after single-cell cloning.

Combining the vast number of cell and expression parameters captured by the CellCelector™, with our proprietary multivariant data analysis (MVDA) tool using advanced machine learning algorithms, we can effectively differentiate and select high-producing clones to progress to clone expansion and evaluation. This approach allows us to screen thousands of clones with high expression within four days of singlecell cloning, accelerating and de-risking the cell line development program.









Day 0: detection of



Day 4: detection





Day 4: detection of Day 4: Transfer of high performing clone to 96- or 384 well plate highly secreting clone

## Clone Evaluation and RCB Generation

Once a subset of clones is selected from the single-cell cloning process, they are expanded and further characterized in two stages:

- Stage 1: Clones are evaluated within a high-throughput small-scale fed-batch system where they are cultured in a 96-deep well plate. This assay mimics the larger-scale fed-batch process, employs 4Cell® SmartCHO media and feeds, and yields indicate the performance of the individual clones.
- Stage 2: A subset of clones ranked during stage 1 are further evaluated in the Ambr® 15 for features such as growth and titer profiles. Material generated from this evaluation can also be used to perform a range of product quality analyses, including but not limited to N-glycan, charge variant, and monomer profiles (depending on the client's requirements).

This evaluation will comprehensively identify the top four clones, which are cryopreserved to manufacture an RCB.

# Vector Cloning and Transfection Single Cell Cloning Clone Evaluation Research Cell Bank (RCB) Stability Study 5 L Bioreactor Confirmation Run Documentation

# Clone Stability, Bioreactor Run, and Documentation

## Stability

- The stability of the top four clones is evaluated using an 8-week stability study that mimics the culture duration from establishing an MCB to the completion of a production run.
- Phenotypic clone stability is determined by ± 20% deviation in fed-batch titers and specific productivity (Qp) between the start and end of the culture duration
- The clones generated exhibit high and robust long-term stability (on average >80% over >70 generations)

#### **Bioreactor Run**

- A lead clone is selected and further evaluated for scalability by performing a 5 L proof-of-concept bioreactor run using Sartorius' optimized upstream process, with demonstrated scalability up to 2000 L.
- A transfer protocol from the 5 L run is provided to the client or their CDMO for continuation to process development

## Documentation

- Upon completion of all activities, a comprehensive project report will be provided, including all data generated during the program.
- This project report is adherent to future IND filing submissions

"The cell line titer is well above our target. We are very pleased with Sartorius' performance, working with Parvus to deliver a highly productive clone."

#### **Louis Demers**

Parvus Therapeutics, USA

# Customization Options

Explore some of the customization options that we offer to secure your success and future-proof your process.

## **Pool Generation**

Our DNA to Pool service enables fast, parallel candidate screening in-house or at Sartorius to evaluate the manufacturability of the molecule. We also offer a mini-pool approach that ensures the lead clone meets the targeted quality profile, reducing risks in cell line development.

#### **Engineered Cell Lines**

We offer additional cell line engineering to improve host cell and | or bioprocessing performances. This includes an FUT8 knock-out service to enhance antibody-dependent cellular cytotoxicity, and other custom gene knock-out services to boost growth, yield, and quality.

#### **Intensified Processing**

We can implement a range of Ambr® 15 scale-down tools to directly select the best clones for perfusion or high-inoculation fed-batch (HIFB) during cell line development. These tools also guide the selection of the optimal manufacturing mode for specific molecules.

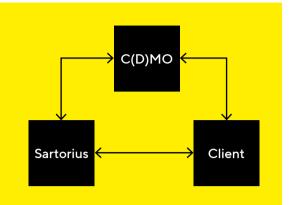
#### Seamless Tech Transfer

By prioritizing long-term performance, scalability, and regulatory compliance during the early stages, we minimize risks during the transition to clinical and commercial phases. Our cell lines are fully transferable to any CDMO—successfully executed with 25+ global partners.



## DNA to GMP Services

Looking for a "one-stop solution" from cell line development to GMP manufacturing services? We have established strategic collaborations with selected CDMO partners globally to support a seamless, end-to-end development process. Our cell line development services have been integrated into their overall offering to streamline processes and allow our clients to benefit from both companies' expertise.



## **Excellent Customer Service**

A dedicated team of client managers provides a single point of contact throughout the cell line development process, from DNA to released master or working cell bank, as well as the transfer to the CDMO of the client's choice. This streamlines the flow of information, so you can reach IND-readiness more quickly.

- One point of contact with regular updates on your project
- Expert technical assistance and guidance throughout the early stages





# Beyond Cell Line Development

Our CHO Cell Line Development Service is enhanced by a suite of additional services designed to support you beyond your cell line development activities. Leverage our extensive expertise to optimize in-house resources and expedite your journey to IND filing.

# Process Development

Our experienced team can support your development activities with our Ambr® 250 technology, design of experiment setups, and MVDA, which support the optimization of process conditions, feeding regimes, supplement additions, and scale-up.

## Material Generation

We can support initial downstream process trials by providing pool-based material or early material produced by your clone in 25 L rocking-motion bioreactors before the cell line is transferred.

## **Testing Services**

Our assay lifecycle management and GMP-qualified | validated, ready-to-use assay packages and platforms from our GMP testing facility help you meet regulatory requirements and free up in-house resources.

# Cell Banking

Our dedicated GMP cell banking facility and expert support team specialize in delivering tested MCBs in four months. Closed-system manufacturing allows our partners to achieve high cell quality with sufficient cell densities and viabilities to transition smoothly to the production phase without delay.

## Cell Culture Media Services

We can combine high-throughput cultivation capabilities with our large proprietary library of media and feeds, a broad range of validated media analytics methods, and advanced data analytics approaches for fast and effective media optimization.



# Flexible Cell Line Development Service Packages

We offer highly adaptable cell line development solutions, from fully outsourced projects to licensing models that allow in-house implementation of our technology.

## Outsourced Cell Line Development

Outsource your cell line development process (partially or entirely) to Sartorius as your extended laboratory bench and trusted drug development partner.

- DNA to Pool (feasibility | manufacturability assessment)
- DNA to Research Cell Bank (RCB)
- DNA to Master Cell Bank (MCB)

#### In-House Cell Line Development

Get access to our cell line development technology for your in-house development, including our host cell line, vector, media, and methodologies.

- Research technology license (DNA to Pool)
- Commercial technology license (DNA to Research Cell Bank)



For more information, visit sartorius.com/cho-cld-services





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