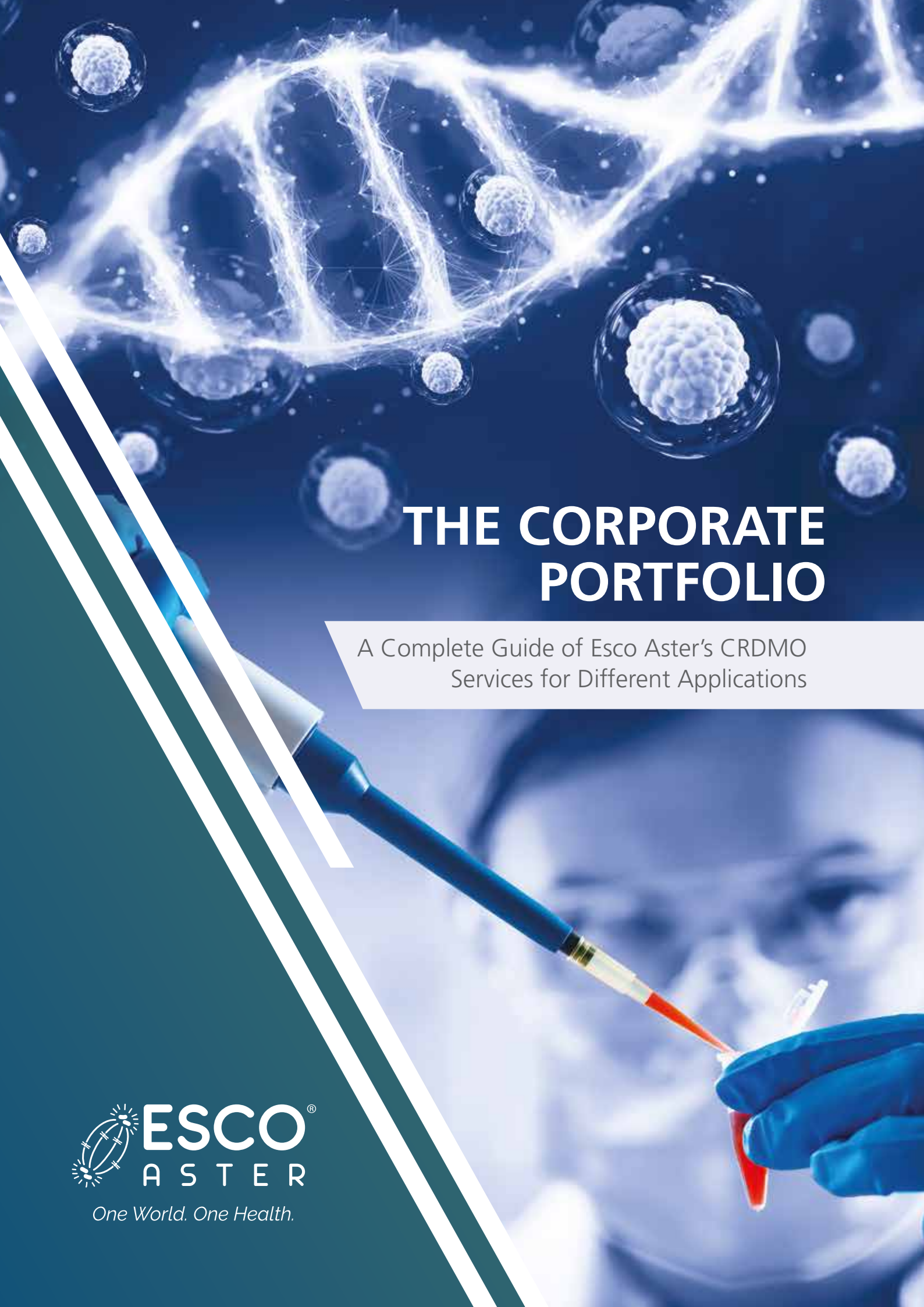


THE CORPORATE PORTFOLIO

A Complete Guide of Esco Aster's CRDMO Services for Different Applications

ESCO® ASTER

One World. One Health.

ABOUT US

Esco Aster is a vertically-integrated contract research, development and manufacturing organization (CRDMO), and a subsidiary of Esco Life Sciences group which has a rich 42-year history in life sciences, medical, and healthcare.

1978 - Esco Life Sciences Group was established.

2002 - Started providing process development (PD) services to clients.

2008 - Converted bench processes into closed systems.

2013 - Broadened Tide Motion applications from vaccines to biotech, biologics, and therapeutics.

From Early-stage Discovery to Commercial Development

2017 - Continued bioengineering Tide Motion Platforms for different applications with Esco's solutions and protocols.

2019 - Carried on with the outfitting of a cGMP compliant PD, GLP, Phase 1 and 2 clinical trial facility

2020 to 2021 - Gained food processing license to manufacture cell-based cultivated meat from Singapore Food Authority (SFA)

Being the first mover in scalable biomanufacturing platforms and services

2022-PRESENT - Awarded the stringent FSSC and ISO 22000 food safety certifications for the cultivated meat scene and became independent of Esco Lifesciences Group.

We are founded and deeply rooted by scientists enabling fellow scientists to translate their benchwork into life-saving diagnostics, medicines, therapies, cosmeceuticals, and cellular agriculture, at affordable prices for self-sufficiency of the country.

We make complex manufacturing simple via our proprietary best-in-class continuous manufacturing platforms providing a reliable and linearly scalable outcome with a track record of being used in 8 commercial human and animal health vaccines.

We continuously invest in meeting unmet clinical needs by unlocking manufacturing bottlenecks for current and new platform modalities.

Together, we are working on an interconnected one health approach to bring your next molecule into the clinic and life.

Join us for the world we are making redefining food and medicine for the current and future generations to come.

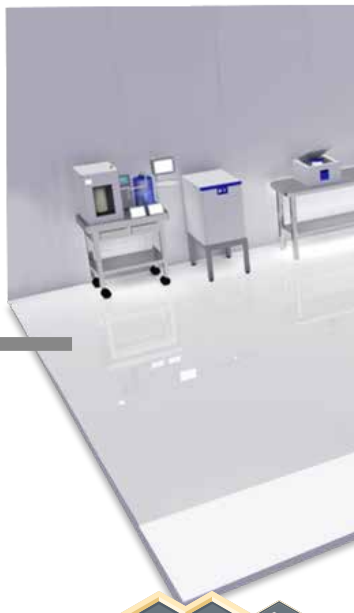
Esco Aster.
One World. One Health.

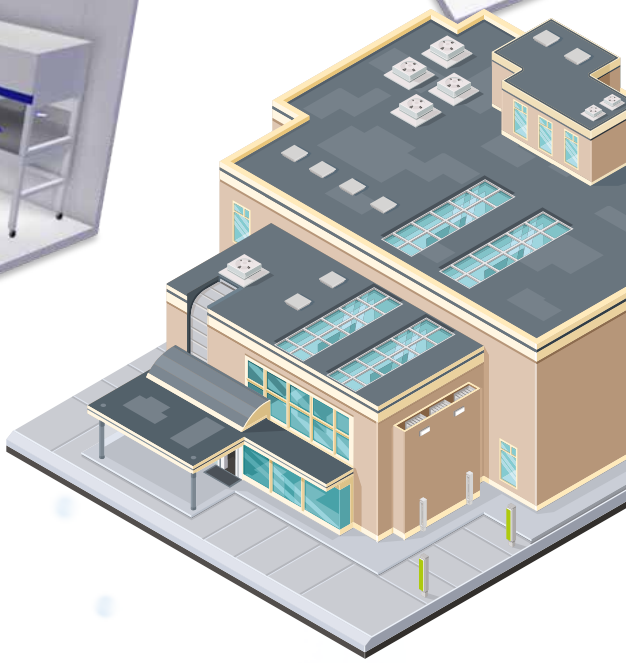
ESCO ASTER
MISSION AND VISION

To be the leading cGMP CRDMO globally in adherent bioprocessing/ continuous processing using flow chemistry utilizing our own in-house proprietary/patented platforms and accelerate the discovery to delivery process of vaccines (human, animal, cancer), oncolytic viruses, cell/gene therapy, tissue engineering, mabs/recombinant proteins, diagnostics, small molecules, cosmeceuticals, peptides, biopolymers, bioscaffolds, and cosmetics/fast-moving consumer goods (FMCG).

As a a vertically-integrated contract research, development and manufacturing organization (CRDMO) in Singapore, with presence in the United States - Esco Aster has forged closer networks with Singapore Health Sciences Authority (HSA), National Medical Products Administration of China (NMPA), Indonesia National Agency for Food and Drug Control/Badan Pengawas Obat dan Makanan (BPOM), Korea, Taiwan and US Food and Drug Administration (FDA), UK Medicines and Healthcare Products Regulatory Agency (MHRA) and Pharmaceutical Inspection Co-operation Scheme (PIC/S) global alliance.

BelloCell™ is used in laboratory scale production of adherent cells. Its bottles are single-use which is essential when culturing viruses for vaccine production or other biologics. This system is placed inside a CO_2 incubator for oxygen transfer, pH control and temperature control.

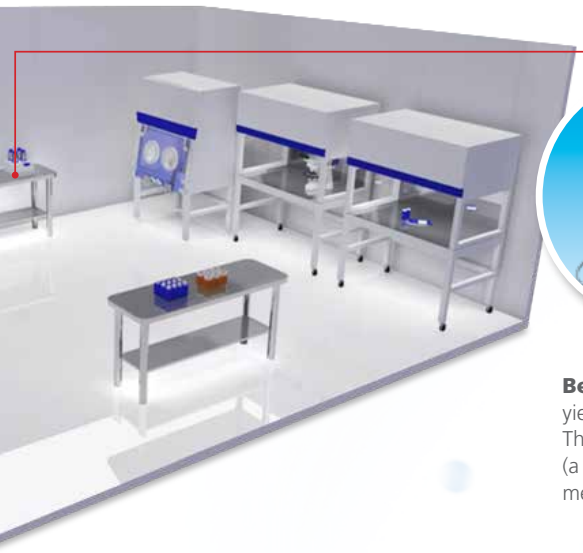




TideXcell® is a pilot or production scale bioreactor that offers an advanced process control over BelloCell™. This system has its own incubator with integrated HEPA and VOC filters and can be controlled and monitored using the 21 CFR part 11 compliant Siemens HMI/PLC.

Batch Mode in TideXcell®

Perfusion Mode in TideXcell®



Batch System

Useful for batch and semi-batch operation where process components are easily traceable

Continuous System

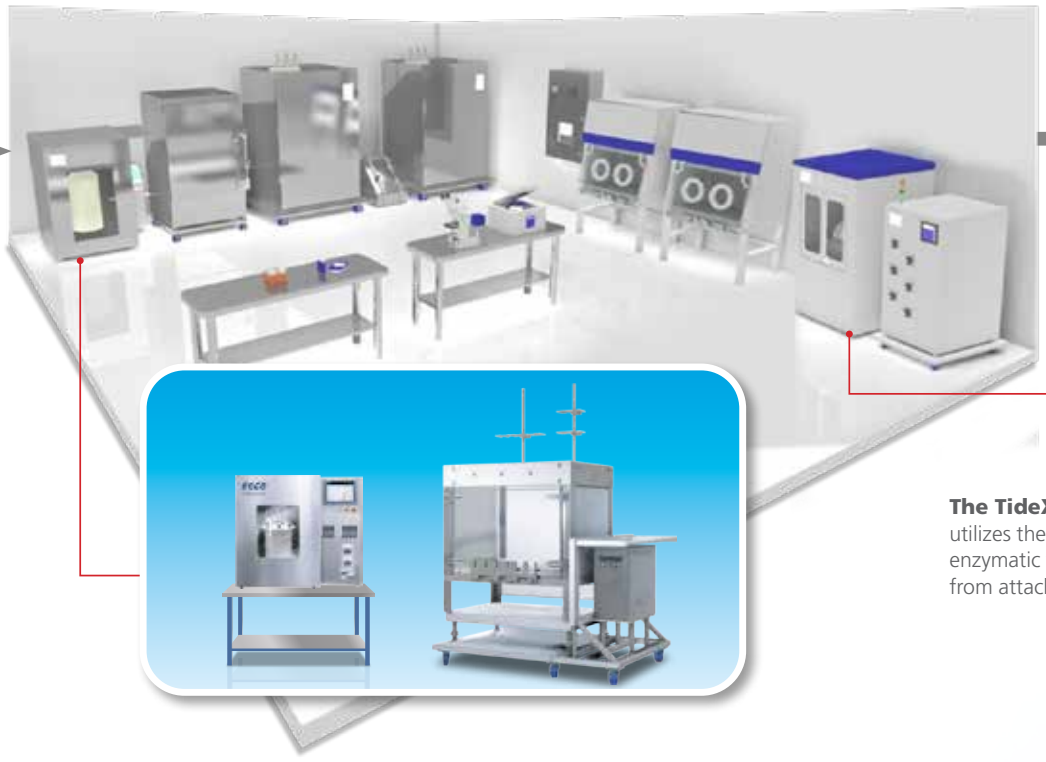
Useful for continuous operation where process components are easily traceable

BelloCell™ is a single-use benchtop bioreactor perfect for culturing high-density yield cells. It is also used as a seeding platform before scaling up to TideXcell®. This system allows the seeding of uniform concentration of cells to BioNOC II® (a macrocarrier), while controlling the physiological conditions in the cell culture medium.

Downstream Processing Formulation and Filling

Vial QC and Sterility Testing

Cold Storage



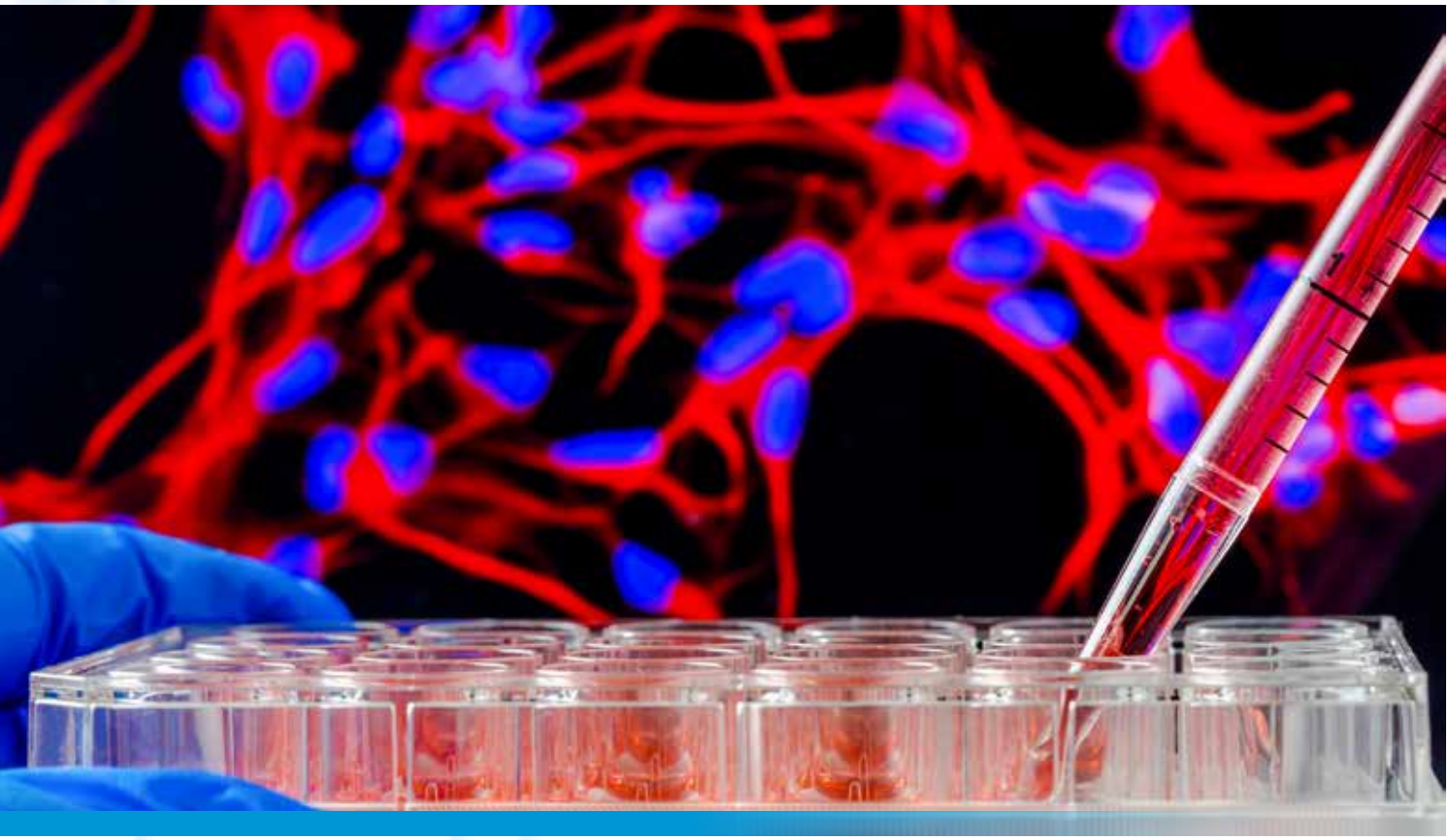
The TideXcell® Harvesting System (TXLHS) utilizes the same conventional cell harvest concept by enzymatic treatment that could digest and detach cells from attached substrates.

DISCOVERY
FROM PRECLINICAL TO CLINICAL

As a full-range services partner, we support our global clients from early-stage discovery to market approvals of clients' products.

DEVELOPMENT
FROM CLINICAL TO COMMERCIAL

As a multicultural high-performing organization with established strong credibility, we have a stable operational model that delivers optimal level of performance whilst ensuring consistent cGMP manufacturing of safe, cost-effective, and reliable products.



CELL LINE CREATION SERVICES

Producer cell lines are the key components for any scientific research and are widely utilized for vaccine manufacturing, antibody production, testing drug metabolism and cytotoxicity, genetics, synthesis of biological compounds, and many more.

Cell lines can be created from immortal cells such as CHO, HEK 293, SF-9/SF-21, with necessary vectors to transform them into high producing clones or from primary tissue (healthy and tumor) / primary source (e.g., fibroblast, blood) of human or animal origin.

Our Process

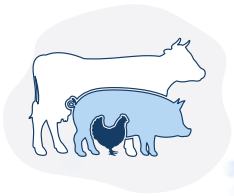
Esco Aster, internally, via our collaborator has VERO MCBs/WCBs and Avian cell line from quails with FTO except as used for poxviruses.

We will otherwise create cell lines from global cell banks such as ATCC / ECACC, clients' RCBs, industrial biotech company cell lines or from academic/research institutes

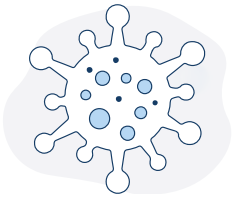
Our Services

Esco Aster provides Cell Line Creation Services to ensure the best clone(s) or stem cells can be used for your research, tissue engineering, virus, cell therapy, extracellular vesicles, and cellular agriculture. We specialize, and are best-in-class, in accelerated adherent cell line creation and development in conjunction with our adherent cell banking, characterization, testing and storage services. Our services are also employed in the following areas:

Human Donor Sourcing

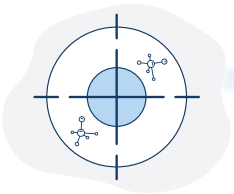


Animal Donor Sourcing

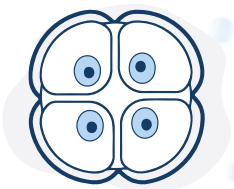


Stable Cell Lines (mAbs/Viral Vector)

Allogenic and Autologous Cell Therapy (MSCs/Fibroblasts)



Immunotherapy



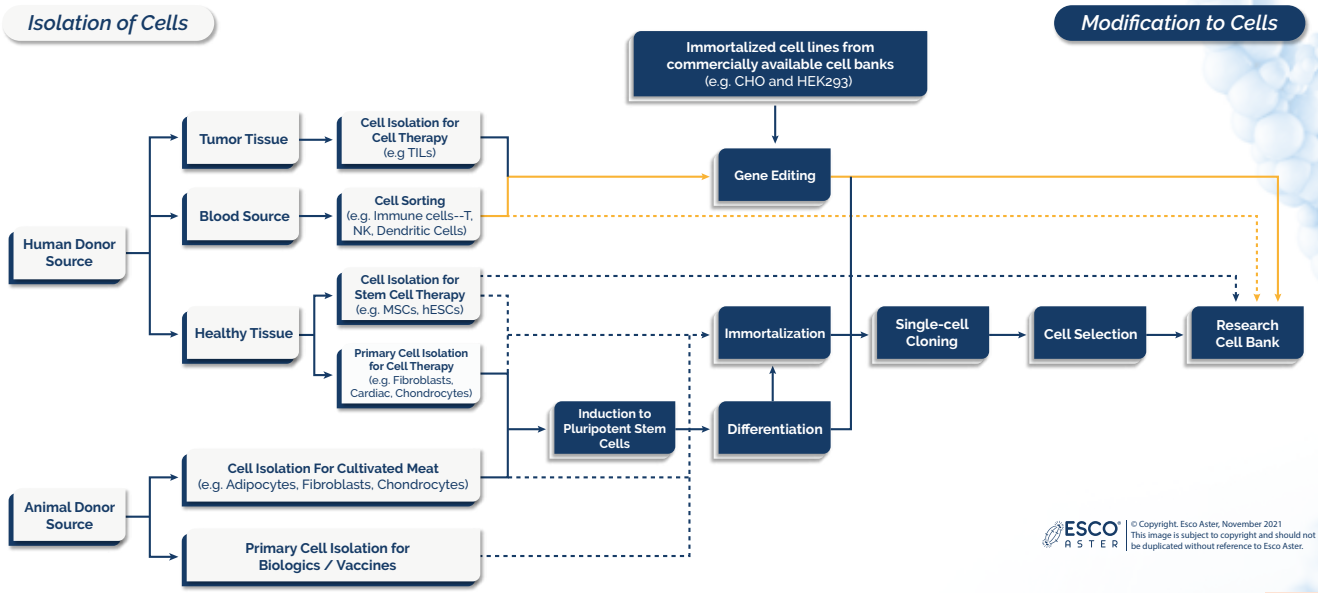
Induced Pluripotent Stem Cell (IPSCs)

Cultivated Meat

Our Cell Line Creation Workflow

Workflow for Cell Line Creation:
Starting from Tissue Banking Activities

Workflow for Cell Line Creation:
Starting from Cell Source



STRAIN ENGINEERING/DEVELOPMENT SERVICES

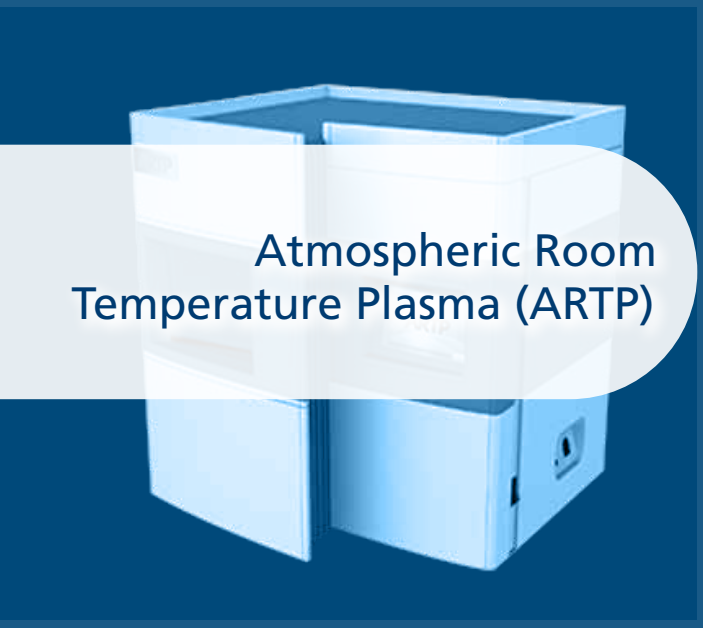
The expression of active and high-quality recombinant proteins, single-domain antibodies (nanobodies, Jotbodies) milk proteins, human milk oligosaccharides, plasmids, enzymes, and other biopharmaceuticals is a crucial step in biopharmaceutical drug development, where activity and level of expression of proteins largely depend on the characteristics of the cell factory, the microbial strains.

Therefore, there is an inherent need to screen as many variables as rapidly as feasible to find an optimal and robust microbial strain to achieve a higher level of expression or biomass yield.

Our Advantage

Utilizing **Atmospheric Room Temperature Plasma (ARTP)** technology which uses low-pressure plasma to randomly mutate the bases in DNA offers the advantage of high mutation rates, shorter processing time and environmental friendliness compared to other mutagenesis approaches like UV light, α-rays, β-rays, γ-rays, X-rays, and chemical mutagenesis.

On the other hand, the **Microbial Microdroplet Culture (MMC)** system is designed to rapidly screen thousands of strains to identify the optimal production strain with improved phenotypes.



Atmospheric Room Temperature Plasma (ARTP)

Atmospheric room-temperature plasma (ARTP) has been successfully developed as a helpful mutation tool for mutation breeding of various microbes, plants, and animals by genetic alterations. It is equipped with the traditional source of low-pressure gas discharge plasma with low-temperature plasma jet and uniform discharge and high chemical activity particle concentration characteristics.

The instrument has a high mutation rate, compact structure, easy operation, high safety and fast mutagenesis. A mutagenesis operation can obtain a large-capacity mutagenesis library that significantly increases the intensity and capacity of strain mutation. The combination of ARTP technology enables rapid and efficient evolutionary breeding of organisms.

Microbial Microdroplet Culture (MMC)

The microbial fermentation process in conventional techniques are typically labour-intensive, low throughput, and poorly parallelized. Therefore, the methods are considered inefficient for optimization. The development of automated, modular microbial cell micro-cultivation systems, mainly employing droplet microfluidics, has gained attention for their high-throughput, highly parallelized and efficient cultivation capabilities.

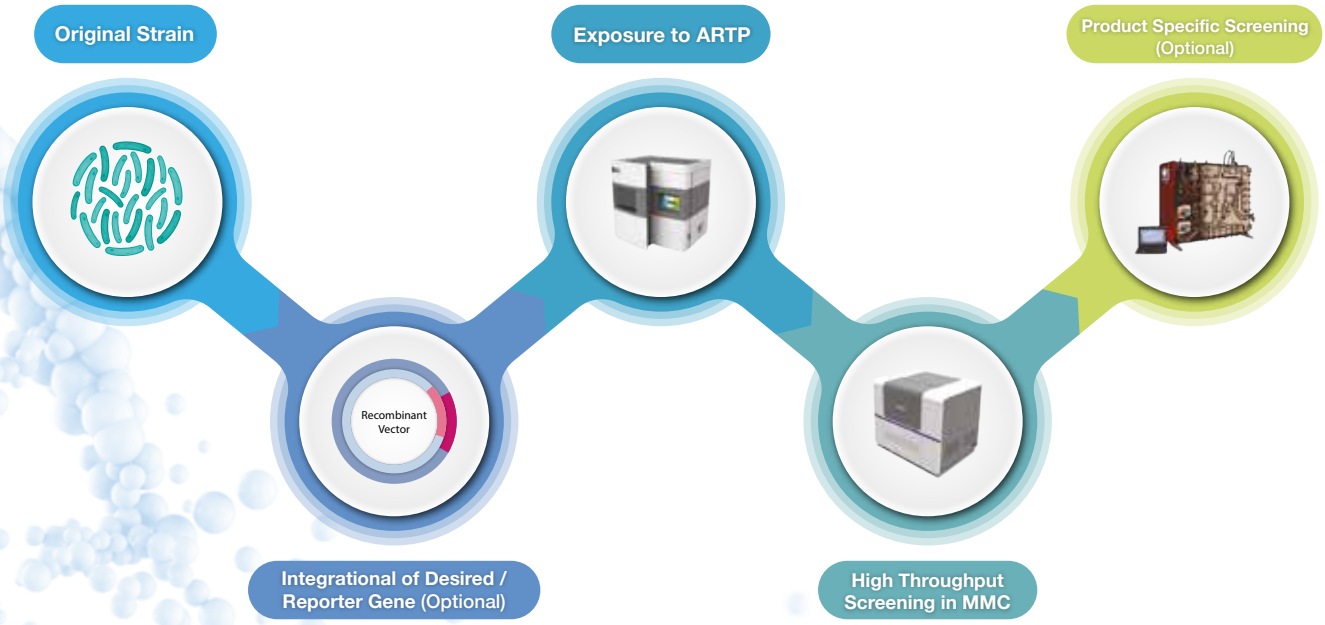
Microdroplet culture (MMC) system is an intelligent, automated, high-throughput microbial culture instrument designed based on droplet microfluidic technology. Each microfluidics chip contains up to 200 droplets which volume is only 2 µL.

Microorganism can be cultured and transferred as the process as follows:

- Formation of microdroplet containing cells, reagents, and soluble growth factors
- Cycling microdroplets for cell incubation and OD_{600} monitoring
- Splitting and fusing microdroplets to renew the medium for subculture and add a chemical agent

Microorganisms can be continuously cultured for as long as 15 days or 100 generations with MMC. Good performance strains can be screened according to the production status.

Workflow for Strain Improvement and High-throughput Screening (HTS)

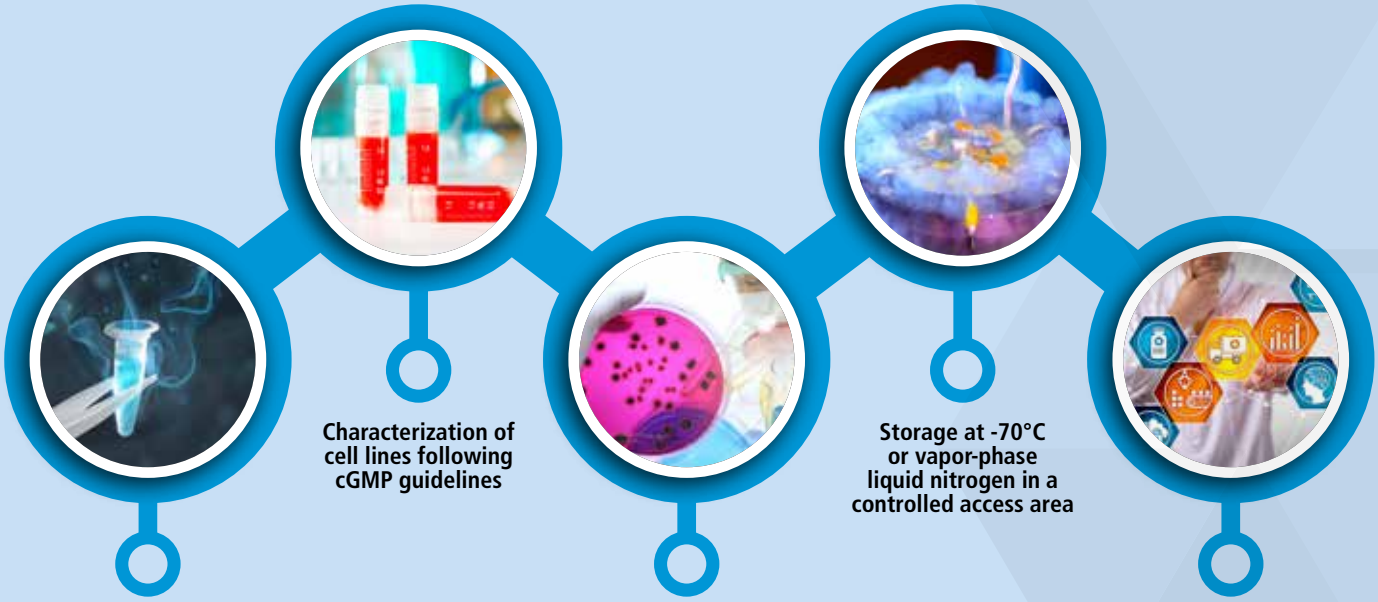


MASTER CELL / **MICROBIAL** BANKING

Cell banking provides a common starting source for each manufactured lot of product which is well-characterized and assures that an adequate supply of equivalent cells exist for use during the entire lifespan of the product. Several kinds of cell banking such as master cell bank (MCB), working cell bank (WCB), and end of production cell bank (EoPCB) service are provided following cGMP regulatory standards and guidelines (ICH, U.S. FDA, EMA, and NMPA).

Our cGMP-compliant cell bank can preserve a large volume of cell lines, microbial cells, and other biologics for the manufacture of commercially available therapeutics. We ensure that all samples collected either on the field or on our biobank are carefully processed and transported using the best techniques for preservation.

Our Capabilities



Manufacturing of MCB and WCB for mammalian cell line and microbial cell line

Characterization of cell lines following cGMP guidelines

Quality Assurance

Storage at -70°C or vapor-phase liquid nitrogen in a controlled access area

Shipment

VIRAL VECTOR PRODUCTION SERVICES

We work with you to produce large-scale viral stocks using serum-free media in a closed system, such as an isolator for your project. Our macrocarriers in our Tide Motion bioreactors provides a high surface area 3D cell culture. This enables a cost-effective, labor-reducing, and time saving production of viral vectors in producer cell lines. Cell lines such as HEK293T adapts well in Tide Motion bioreactors, reaching a higher cell density for sustained cell growth to allow high titer vector stocks harvested.

- Efficient, large-scale production of lentivirus, retrovirus, adenovirus-associated, adenovirus stocks compared to cell factories and other 2D culture systems.

* *Actual results may vary, depending on viral vectors used and transfection reagents/ techniques adopted. We advise client to seek our advice and recommendations whereas appropriate.*

RECOMBINANT PROTEIN EXPRESSION AND PRODUCTION SERVICES

Recombinant protein is a form of protein that is artificially made using recombinant DNA technology. It is made to be produced in large quantities, to be used throughout biomedical science, and to be manufactured for useful industrial applications.

Eukaryotic systems, specifically mammalian and insect cells, are very viable culture expression systems for the production of both monoclonal antibodies and recombinant proteins. Our laboratory uses highly productive cell lines such as Chinese hamster ovary cells (CHO) and SF-9 cells which stably express antibodies/ recombinant proteins which have been subjected to process optimization techniques for more improved expression and consistent high yield protein production.

Our capabilities ensure a seamless workflow that inludes

- Engineering of Expression Vectors
- Host Cell Transfection
- Clone Selection
- Single Cell Clone Isolation and Expansion
- Cell Banking
- Evaluation of Growth Characteristics and Process Optimization

The advantages of the CHO cell culture system are:

- High cell density achievable in our Tide Motion Bioreactors
- Survival in serum-free media during the production phase
- Rapid and high protein yields – up to several hundred mgs/L

Besides CHO lines, we also use HEK 293 lines which are grown to high densities and in turn, offer:

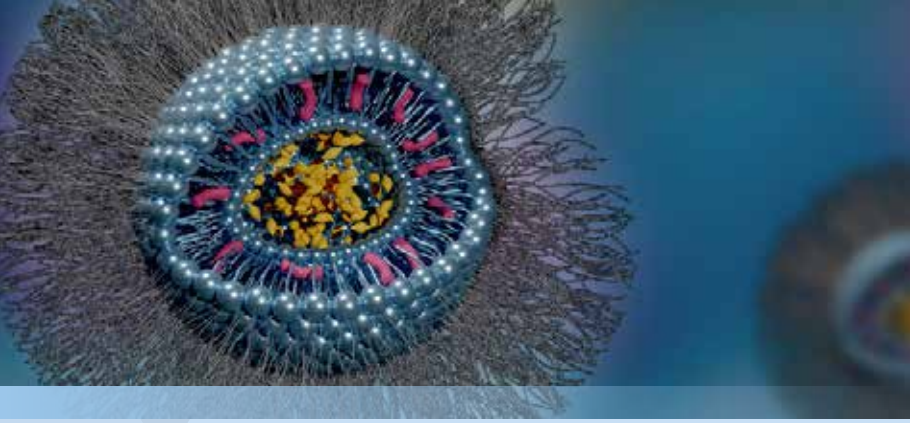
- Small-scale construct screening
- Transient transfection or stably integrated genes
- Rapid and high protein yields – up to several hundred mgs/L

For Baculovirus expression system using SF-9 cells, we employ consistent and high protein yield with post-translational modification (PTMs). They are as follows:

- Cloning of transfer vectors
- Generating a recombinant bacmid
- Production of P1 virus stocks
- Virus amplification
- Virus Titer Determination - Plaque Assay
- Cell expansion and infection with baculovirus
- Protein purification

Our services include enhancing the maximum yield process through optimization of:

- Time of Infection
- Multiplicity of Infection (MOI)
- Cell Density at the Time of Infection
- Cell Density at the Time of Harvest
- Insertion of Kozak sequences, signaling peptides (to enhance production and secretion of protein) and fusion tags for ease of purification in the transfer vector



LIPID NANOPARTICLE DEVELOPMENT AND FORMULATION SERVICES

Liposomes, which were discovered in 1960, have become increasingly recognized as a viable and effective drug delivery system. Aside from therapeutics, liposomes and lipid nanoparticles (LNPs) have been studied in a variety of fields, including but not limited to medical imaging, cosmetics, and agriculture.

LNPs, which are very small lipophilic substances that have been extensively researched and clinically proven to be capable of safely and effectively delivering nucleic acid therapeutics, present themselves as a promising delivery system capable of improving drug selectivity and biodistribution. It has successfully entered clinical use for the delivery of mRNA; specifically, LNP–mRNA vaccines are now being used to combat coronavirus disease 2019.

At Esco Aster, we can help develop your LNP formulations with our expert team of formulation scientists and provide contract manufacturing service with our fill-and-finish systems in an advanced facility to produce your product at large-scale quantities for clinical trials. We have the speed, reliability and expertise to collaborate with you through a turnkey solution from development to manufacturing .

UPSTREAM PROCESSING DEVELOPMENT SERVICE

With our in-depth understanding of the Asian market, we adopt a customisable approach in delivering sustainable risk-adjusted returns to our clients.

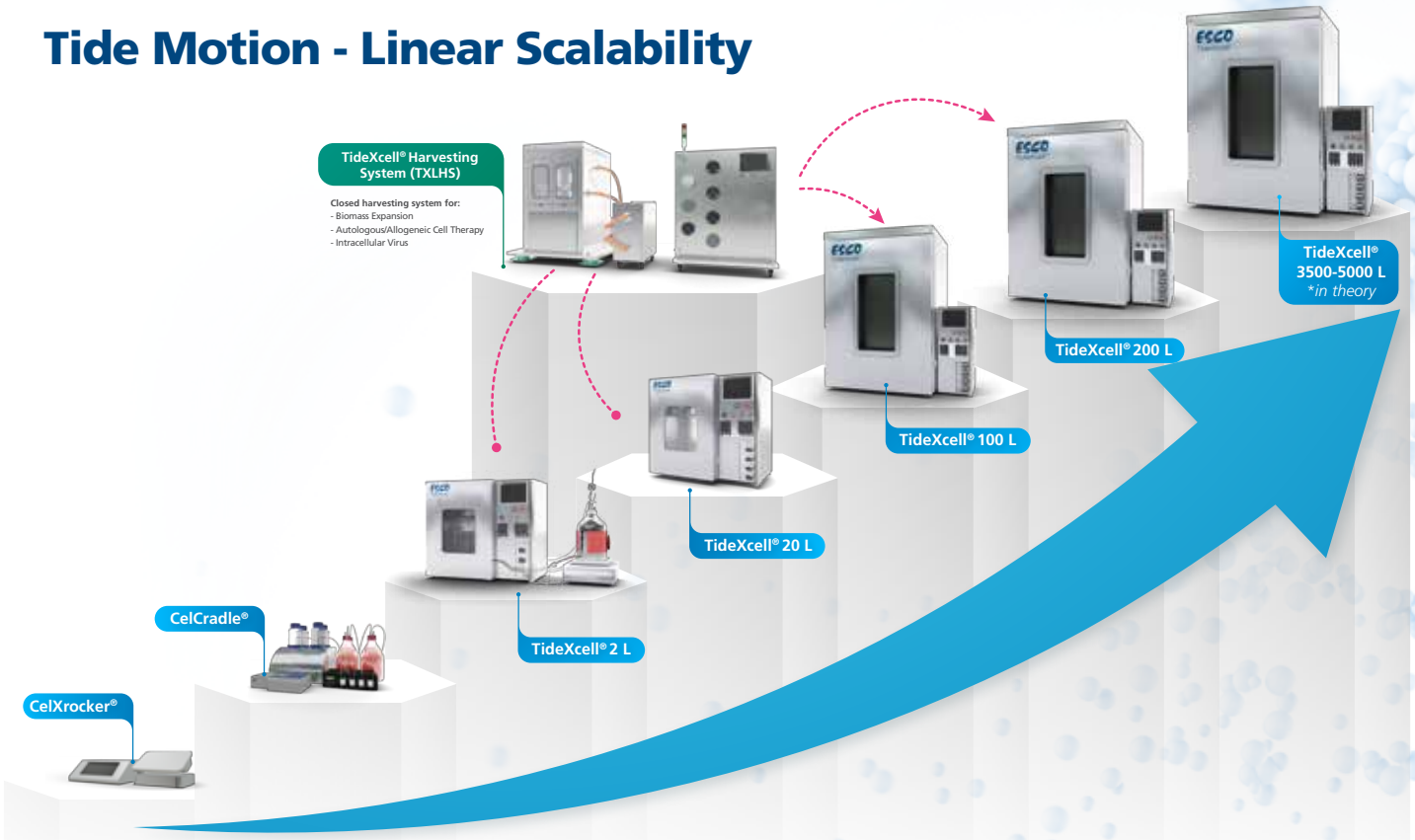
We support an integrated approach to service delivery to increase viral expression titer, multiplicity of infection (MOI), and increase cell viability at high-density cultures. On the average, we have obtained up to $5x10^9$ (for mammalian cell lines) and $2x10^8$ for stem cell lines.

We are the industry's leaders and expert in Upstream Processing (USP) development using our Tide Motion™ bioreactors.

1

CHO library suits the expression of recombinant proteins, monoclonal antibodies, and biosimilars implemented with our proprietary bioreactors in a small footprint

Tide Motion - Linear Scalability



2 Bioprocess optimization using Design-of-Experiments methodology in optimizing cultivations and unit operations

3 Animal component free media adapted to USP processes and lowering impurities

4 Robust proprietary technology platform that is scalable up to 5,000 liters packed-bed volume capacity

5 Customizable and reprogrammable fed-batch, continuous, and perfusion mode(s) in hypoxia and/or anaerobic conditions

SUSPENSION CULTURE SERVICES

Our suspension services can be used for various cell culture applications such as bacteria, insect cells, and mammalian cells in batch, fed-batch, and perfusion modes. We utilize single-use cell bags of up to 50 L capacity allowing an easy set-up with no cleaning required and less susceptible to issues such as cross-contamination. The various advantages of the system include convenience, reliability, flexibility, and versatility.

Key Applications

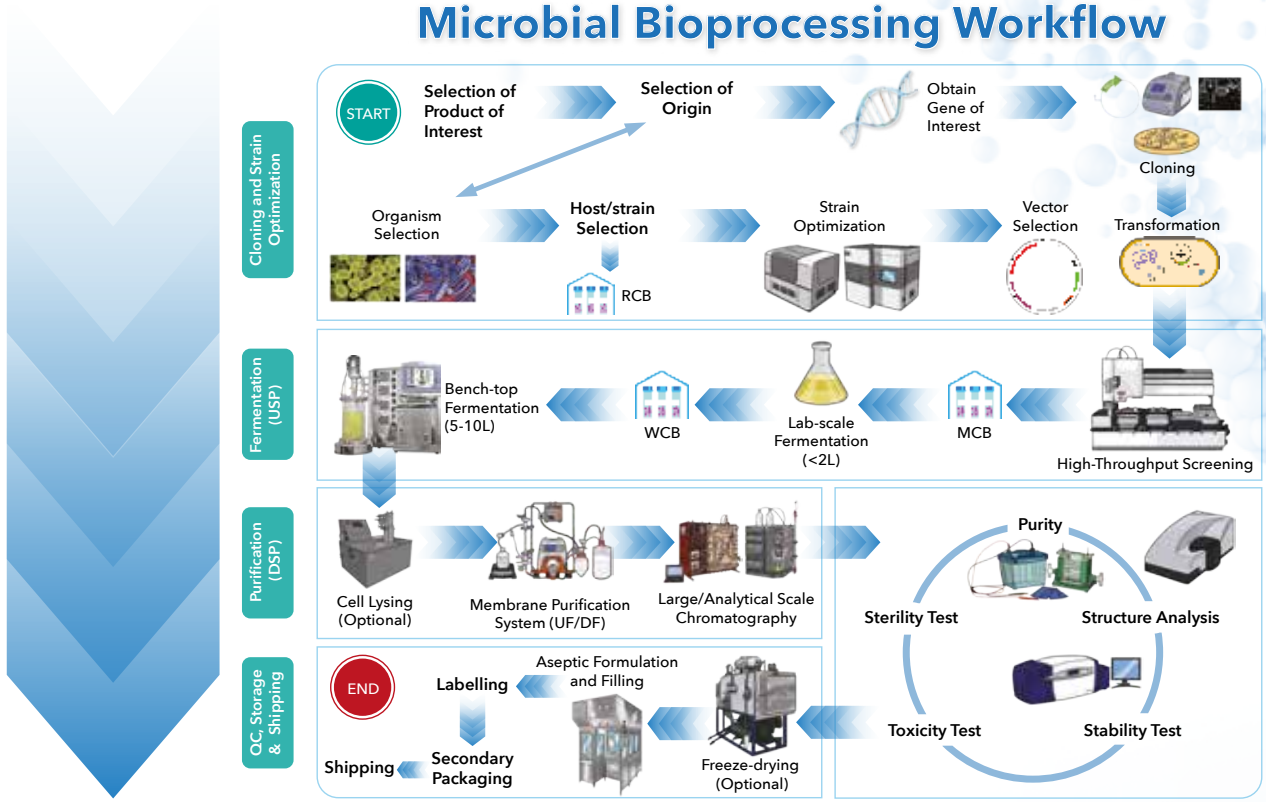
- Monoclonal Antibody (mAbs) Production
- Hybridoma Cell Culture
- Insect Cell Culture
- Cellular Agriculture

FERMENTATION SERVICES

Esco has vast experience in bioreactor designing and offering fermentation service to the clients for different cell lines. A series of bioreactors and bioprocessing equipment of laboratory (5-10 L) to manufacturing scale are utilized for the following services:

- Strain Development and Optimization
- Recombinant DNA Technology
- Microbial Fermentation (e.g. Bacteria, Yeast)
- Large-scale Contract Fermentation (50 L)
- Fermentation Process Optimization for Expression/Production of:
  - Recombinant Proteins
  - Peptides
  - Enzymes
  - Active Pharmaceutical Ingredients (APIs)
  - Biomass Generation
  - Cellular Agriculture
  - Alternative Proteins
- Fermentation Process Validation

Overview of the Esco Aster's Microbial Bioprocessing Workflow:



DOWNSTREAM PROCESSING
DEVELOPMENT SERVICE

We have a modular setup to optimise efficiency in obtaining a pure and high concentration of your product whilst recovering as much as 80% product of interest (POI) with minimal waste. Our bioengineers propose the most feasible downstream processing systems (DSP)* tailored for your project development.

A. FILTRATION SERVICES

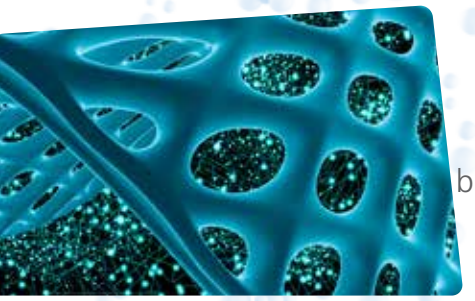
We incorporated tangential flow filtration systems (TFF) as a first downstream concentration/ purification step in different pipelines:

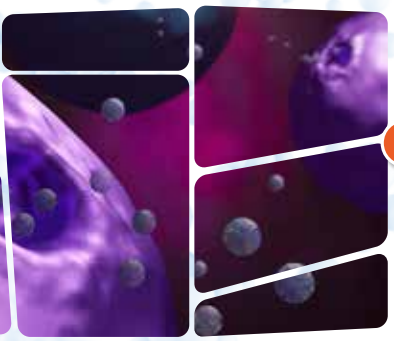
Microfiltration: Applications where the harvested cells are the final product, TFF combined with a clarification step will consolidate the final downstream platform.

Ultrafiltration (UF)/Diafiltration (DF):

a. Applications where the final product are biological, such as:
- Extracellular Vesicles (EVs)/Exosomes
- Viruses as Intermediate Products (CAR-T)
- Protein Purification

b. Applications where the final product are synthetic nanoparticles such as:
- Biocompatible Polymer Particles
- Liposomes
- Polysaccharides





We provide an upstream to downstream bioprocessing and end-to-end modular approach that are able to achieve suitable concentration/purification factors to meet your final product specifications.

- **Number cells/ml:** Recovery yields of as much as 87% depending on the product of interest
- **Nanoparticles/ml:** Recovery yields that enable the production of nanoparticles in concentrations required to meet biological outcomes in clinical studies
- **Identity, Potency, Morphology:** Cell viability and proliferation as much as 98%
- **Purity:** Removal of protein impurities and microcarriers to meet quality attributes for final product

Note: *DSP development is not limiting to single-use concentrators or chromatography or microfluidics-size exclusion methods. We advise clients to seek our advice and value-added services in conjunction to USP development.*

B. PREPARATIVE CHROMATOGRAPHY

Esco has capabilities in the downstream purification of wide range of biologics like recombinant proteins, viruses, virus-like particles (VLPs), and monoclonal antibodies (mAbs) using different chromatographic techniques based on the requirement of the product of interest.

These techniques include:

- Affinity Chromatography (e.g. antibody, specific group, tagged group)
- Ion Exchange Chromatography
- Multimodal Column Chromatography
- Hydrophobic Interaction Chromatography
- Reverse Phase Chromatography
- Size Exclusion Chromatography

With these, we offer specific services in downstream bioprocessing such as:

- Optimization of process variables using Design of Experiment (DoE) analysis
- Process development for the production of biologics (e.g. viral vaccines, recombinant proteins, viruses, VLPs, antibodies)
- Scale-up and scale down of the bioprocessing platform from laboratory to industrial scale
- Access to bioprocess expertise with dedicated scientist(s)

ANALYTICAL TESTING
AND VALIDATION SERVICES

Nowadays, the biopharmaceutical industry relies on analytical service providers to come up with an excellent platform for core testing needs so they can back up their internal resources at their best.

At Esco Aster, we understand the importance of providing a robust platform to support our clients during process development and product manufacturing. To meet industry needs for high-quality, rapid, cost-effective, and top-of-the-line services, we are now offering extensive analytical expertise, including:

- Analytical Method Development, Validation and Transfer Bioassay
- Product Characterization and Biochemical Comparability Reference Standard Characterization
- Pre-formulation Studies
- Final Product Stability Studies
- Forced Degradation Studies

- Sterility Testing
- Product-related Impurity Testing
- Microbiology Testing
- Particulate Matter Testing
- Nanoparticle Characterization
- Process Characterization/Validation:
  - Characterization of Cells
  - Cell Bank Characterization
  - Process Limit Studies
  - Product-specific Assay Validations
  - Process Performance Consistency Studies
  - Evaluation of DNA Reduction
  - Stability of Process Intermediates
  - Cleaning Validation
  - Sterile Process Validation

(BIO)POLYMER
ENCAPSULATION SERVICES

For those customers that require enhancing the half-life and stability of their final drugs or bioactives, Esco Aster offers a cutting edge encapsulation technology based on biocompatible polymers, polysaccharides, and other macromolecular or lipid-based carriers.

Our scientific and bioengineering teams have the knowledge and years of experience to support our clients with different encapsulation approaches during R&D, drug development and manufacturing for several applications, namely:

- Encapsulation of Fat-Soluble Compounds
- cGMP- compliant Nanoparticle Purification using Tangential Flow Filtration Systems
- Research and Development: Plain and Encapsulated Liposomes, Polymersomes, Polymer Nanoparticles and other Formulations
- Customized Surface Modification of Nanocarriers
- Custom Formulations
- Encapsulation of Small Molecules, Therapeutic Agents, Bio-actives and Nucleic Acids
- Encapsulation of Vitamins and Supplements
- Nanoparticles Production Process Control
- Analytical and Characterization Services: Analysis and Reporting

OTHER
CUSTOMIZED SERVICES

Our manufacturing facilities are built in accordance to PIC/s and upcoming HSA CTGTP guidelines. Our facilities are ready for batch, recirculation, and perfusion in single-use bioreactors or stainless steel fermenters. Our USP and DSP platforms, when used in conjunction with an integrated quality control system, total quality management and Supervisory Control and Data Acquisition (SCADA) deliver the best-in-class manufactured products. All this, combined with our talented bioprocessing scientists, we develop the full process validations, product characterization and production for all clinical trial phases.

- Formulation development studies, including conditioned media for cosmetics or wound healing purposes
- Transdermal and topical emulsion-based formulation development
- Micro-/ Nano-encapsulation technologies for tasting or smelling masking, increase bioavailability
- Shelf-life and stability testing under accelerated conditions for pharmaceutical or skin products
- 3D *in vitro* technologies for cosmetic products testing
- 3D *in vitro* lung efficacy studies for compounds/ ingredients testing
- 3D organoids using miniaturized bioreactors for diseases modelling
- Technology transfer and process validation
- Compilation of regulatory dossier and documentation to a regulatory body of interest

PROCESS TRANSFER SERVICES

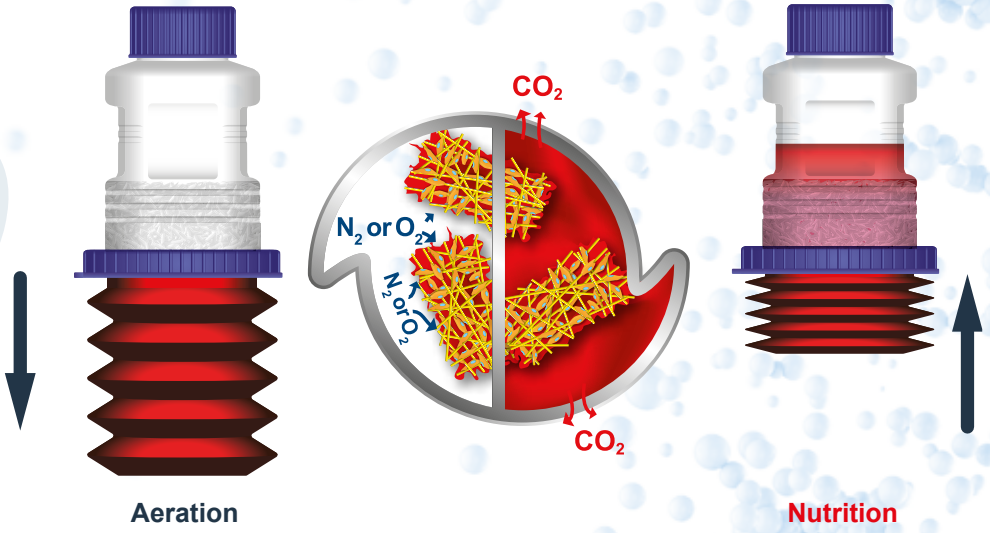
Esco Aster is the global leader in providing process transfer services to meet scale up needs of the industry. The Tide Motion® Bioreactor platform is a viable and robust solution to replace adherent cell culture systems such as 2D planar cultures, roller bottles and 3D microcarriers that are widely used to produce Phase III and commercial drug products.

From Roller Bottles to Tide Motion® Bioreactors

Many commercial biologics utilize cells such as adherent CHO for production of Erythropoietin (EPO), Ipilimumab, Interferon beta-1a and others; human and animal vaccines as well are produced using roller bottles. Tide Motion® bioreactors mimic the rolling motion of roller bottles which is an alternate emerging and submerging of cells for oxygenation and nutrient exchange.

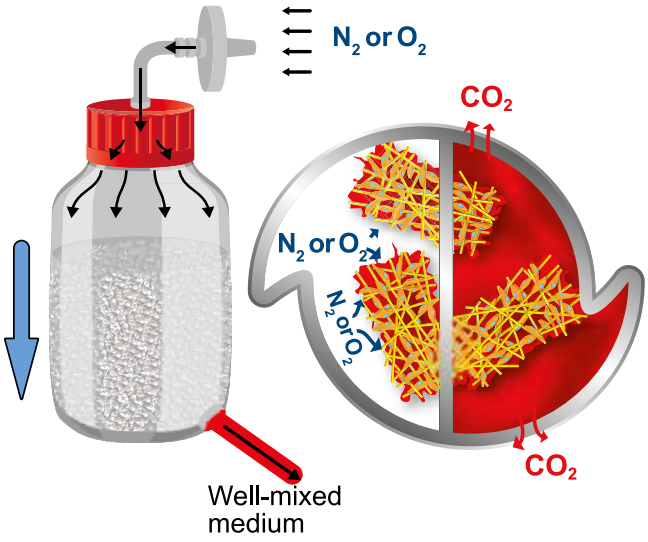
By virtue of this, we offer a viable alternative to roller bottle culture. This could be a less expensive and time-saving as opposed to bioengineering adherent cell lines to suspension cells which may entail redoing of large-scale clinical trials and subsequent issues from a regulatory standpoint.

BelloCell™ - R&D Scale (500 mL)

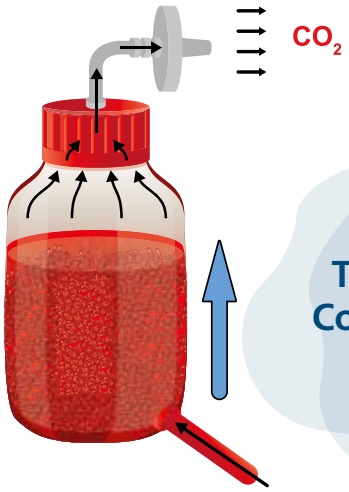


Aeration

Nutrition



Total Aeration



Total Nutrition

TideXcell® Pilot Commercial Scale (2 L - 100 L)

FILL AND FINISH SERVICE

Our fill and finish services cater to preparations in which the end product is in liquid, cell, or vial form. This production of clinical trial ready product can be done in a ready-to-use vial filling line with integrated freeze drier integrated in an isolator. The same cGMP-compliant process can be applied to client's dosage, formulation and filling requirements defined in the dossier submission package.

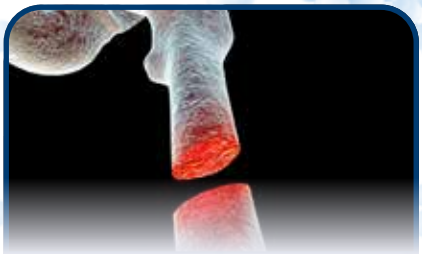
- Automatic sterile aseptic filling of liquid vials and cells cryopreserved vials ready for clinical trial or biobanking
- Various customized filling lines depending on product types
- Complete QA/QC release
- Labelling, packing, and shipping of clinical samples

STRATEGIC ALLIANCES

We adopt an innovative R&D model that encourages external industry and academia collaborations to accelerate open innovation, advance science and technology and expand market growth opportunities. We collaborate, on a global basis, to complement our CRDMO value-added services. Most importantly, we encourage the building of new relationships to build new application notes using our tools and technologies.

Water Treatment

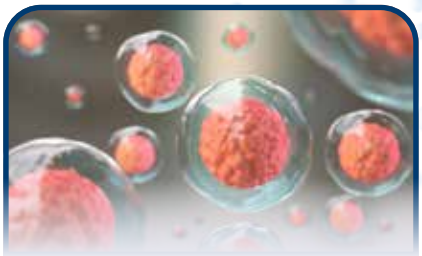
Vaccine Production



Bone Regeneration

Cellular Agriculture

- Acellular Products
- Cellular Products



Cell Lines

- Adherent Cell Lines
- Suspension Cell Lines

Biosimilars/Biobetters

Gene Therapy

- Integrative Viral Vectors
- Nonintegrative Viral Vectors
- Organic and Inorganic Vectors

Diagnostics

- mAbs for Diagnostics
- Disease Diagnostics

Cosmeceuticals

1978

Esco was founded in Singapore and began to pioneer cleanroom technology in Southeast Asia

1990

Esco expanded distribution to pharmaceutical life science biotech and medical research markets

2001

Esco earned first EN 12469 cert. for BSC

2006

Esco earned onsite UL accreditation

2007

Expansion of Esco life science and medical products

2015

Esco VacciXcell was introduced

2017

Esco Aster was introduced (first CRDMO company in Asia utilizing its own proprietary Tide Motion technology)

Esco Aster and Instittute of Molecular Cell Biology announce a collaboration to accelerate pre-clinical development of a hand foot and mouth vaccine

Esco Aster and Bioprocessing Institute sign a Memorandum of Understanding to innovate on continuous manufacturing platform

2018

Esco Aster and National University of Singapore announced a development of single-use bioreactor-based stem cells for bone regeneration.

2019

Esco Aster continued to grow with the outfitting of a cGMP-compliant PD, GLP, Phase 1 and 2 clinical trial facility.

2021

Esco Aster received a food processing license to manufacture cell-based cultivated meat from Singapore Food Authority (SFA).

2022

1. Esco Aster fully carved out as independent affiliate of Esco Lifesciences Group.

2. Esco Aster was awarded the stringent **FSSC 22000** food safety certification, clinching another **"world's first"** in the cultivated meat scene.

2023

Facility Expansion for Cultivated Meat Production

YOUR PARTNER IN EVERY STEP

FREE

ENQUIRY

FREE

PRE-CONSULTATION

FREE

PROJECT SCOPE PRESENTATION

SERVICE AGREEMENT SIGNING

PROJECT COMMENCEMENT

PROJECT DELIVERY

PROJECT COMPLETION

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