

**ESCO**  
HEALTHCARE



# CelCradle<sup>®</sup> and CelCradle<sup>®</sup> +

*Cradle for Your Adherent Cells*



CelCradle<sup>®</sup>



CelCradle<sup>®</sup> +

## CelCradle®

CelCradle is a single-use, cGMP/GMP bioreactor system that can support high adherent cell density culture. Its control system is fully integrated into the bioreactor environmental module which includes temperature, humidity, and gas control.

The ready-to-use bottles, as part of single-use manufacturing, helps eliminate validation costs as compared to multiple-use system when starting on your next cell culture run. The system components come pre-sterilized, pre-packed that speed up your research and manufacturing whether for extracellular vesicles, exosomes, proteins, recombinant proteins, viruses, viral vectors, cell therapy, and other cell culture-related bioprocessing applications.



### Key Features

- Touchscreen 21 CFR Part 11 compliant Siemens HMI/PLC controls
- Culture in batch, and recirculation modes
- Culture in normal or hypoxic conditions
- Compatible with most serum-free culture medium
- Offers large surface area for cell attachment and growth
- Partnered with CelCradle X® Automated Cell Harvesting System (CCX-ACHS) for closed-system live whole cell harvest
- Option to choose as standalone or docking to virus processing workstation or virus processing isolator

*\*design and specifications  
subject to change*

## CelCradle® +

### Key Features

- Touchscreen 21 CFR Part 11 compliant Siemens HMI/PLC controls
- Culture in batch or recirculation modes
- Equipped with optional Esco integrated hydrogen peroxide H<sub>2</sub>O<sub>2</sub> biodecontamination system for internal and programmable for master biodecon including supply and exhaust filters.
- In the event that Esco integrated biodecontamination system is not ordered, optional camlocks with manual biocontainment seals can be added to connect to site biodecon system.
- Equipped triple UV-C virucidal lamps within internal chamber, re-circulatory duct and exhaust duct
- With independent controls of both top (nutrition phase) and bottom (aeration phase) holding times for each of the four CelCradle + bottles, specifically designed to optimize experimental procedures and ensure precise parameter adjustments during the design of experiments (DOEs).
- Culture in normal or hypoxic conditions
- Compatible with most serum-free culture medium
- Compatible with most serum-free cultures without macrocarrier coating. However, macrocarrier coating with vitronectin, fibronectin, or laminin may be necessary to enhance cell adhesion and growth depending on clients' protocol.
- Offers large surface area for cell attachment and growth
- Partnered with CelCradle X® Automated Cell Harvesting System (CCX-ACHS) for closed-system live whole cell harvest
- Option to choose as standalone or docking to virus processing workstation or virus processing isolator
- Containment isolation under Human and Animal Biosafety Level 3 / 4.



## CelCradle® and CelCradle® + Integration to Virus Processing Workstation or Virus Processing Isolator



*\*design and specifications subject to change*

*Class III Biological Safety Cabinet Glovebox / Virus Processing Isolator*

### Key Features

- Dockable CelCradle® / CelCradle® + unit with integrated touchscreen 21 CFR Part 11 compliant Siemens HMI/PLC controls
- Work in an ISO Class 5 environment
- Equipped with H<sub>2</sub>O<sub>2</sub> /UV-C and double-exhaust with catalytic converter
- Can be integrated with CelCradle X® Automated Cell Harvesting System (CCX-ACHS)
- Fully enclosed virus processing and harvesting system



*\*design and specifications subject to change*

*Virus Processing Workstation*

*In addition to virus processing workstations/isolators for BSL-2 applications, cell processing workstations/isolators may be used, depending on the biosafety risk assessment.*

## Product Specifications

	CelCradle®	CelCradle®+
<b>Biosafety Containment</b>	Biosafety Level (BSL) 2	<p>a. Biosafety Level (BSL) 2/3/4</p> <ul style="list-style-type: none"> <li>▪ SARS-CoV-2</li> <li>▪ Hepatitis C Virus (HCV)</li> <li>▪ West Nile Virus</li> <li>▪ Chikungunya Virus</li> <li>▪ Ebola Virus</li> <li>▪ Marburg Virus</li> <li>▪ Lassa Virus</li> </ul> <p>b. Animal Biosafety Level (ABSL) 2/3/4</p> <ul style="list-style-type: none"> <li>▪ Avian Influenza</li> <li>▪ West Nile Virus</li> <li>▪ Nipah Virus</li> <li>▪ Ebola Virus</li> <li>▪ Marburg Virus</li> <li>▪ Foot and Mouth Disease</li> </ul> <p><i>* SARS-CoV-2 can be handled/process under BSL 2 for routine diagnostic work that do not generate aerosols. However, procedures involving high-risk manipulations, or aerosol-generating processes may require BSL 3 containment.</i></p>
<b>Base Units</b>	<p>Complete system inclusive of:</p> <ul style="list-style-type: none"> <li>▪ A compression stage holding 4 CelCradle bottles and runs using the same parameters</li> <li>▪ Siemens HMI/PLC system</li> <li>▪ 4 peristaltic pumps</li> </ul>	<p>Complete system inclusive of:</p> <ul style="list-style-type: none"> <li>▪ 4 compression stages holding 4 CelCradle bottles and individually runs using different parameters</li> <li>▪ Siemens HMI/PLC system</li> <li>▪ 4 peristaltic pumps</li> <li>▪ Magnetic stirring system</li> <li>▪ pH/DO Monitoring Module</li> </ul>
<b>Bioprocessing Modes</b>	Batch, Recirculation	Batch, Recirculation
<b>Biodecontamination System</b>	Not equipped	Equipped with hydrogen peroxide/UV-C and double exhaust with catalytic converter ( <i>H<sub>2</sub>O<sub>2</sub> biodecontamination is optional</i> )
<b>Control System</b>	Integrated with x4 peristaltic pumps and systems into Esco Bioreactor and control via Siemens HMI/PLC	
<b>Stage</b>	<ul style="list-style-type: none"> <li>▪ Entire stage moves at same speed for top holding and bottom holding time</li> <li>▪ No magnetic mixer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Individually adjustable</li> <li>▪ With individually adjustable magnetic mixer in bottles</li> </ul>
<b>Flowrate / Control</b>	<ul style="list-style-type: none"> <li>▪ Faster flow rate: 85 L/min (maximum)</li> <li>▪ Can set recipe and dosing schedule after office hours or at set timed points</li> <li>▪ Independently programmable</li> </ul>	

	CelCradle®	CelCradle®+
<b>STANDARD CONSUMABLES</b>		
<b>CelCradle Bottles</b>	500A, 500AP	500A, 500AP
<b>CelCradle Inlet Filter</b>	0.22 µm	0.1 µm
<b>Outlet / Vent Filter</b>	0.22 µm	0.1 µm <i>(with option to choose dual 0.1 um filter to handle BSL3 biological agents)</i>
<b>pH and DO Sensor / Control</b>	Not equipped	Equipped with pH and DO monitoring module
<b>Matrix Vessel Coating</b>	With anti-adhesive coating on bottle wall to avoid deposition of proteins or cells/cell debris	
<b>Mixing Bottle and Connector</b>	The bottle is not equipped with a magnetic stir bar, as it is intended for BLS-2 applications. Mixing requires users to gently swirl the bottle or open the ports inside a biosafety cabinet to perform the task safely.	The bottle includes a magnetic stir bar to facilitate thorough mixing. Designed for a closed system, it is suitable for handling BSL/ABSL-3 and above viruses or viral vectors. The caps must remain sealed to maintain biosafety.
<b>Alkali Bag</b>	No alkali bag	With alkali bag



## What's In It?

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### Bioreactor

Acts as a large environmentally-controlled chamber that houses the CelCradle bottles, and media reservoir

### VOC/HEPA Filter

Used to maintain/create an optimal environment by controlling both particulates and gaseous contaminants, leading to better cell culture processes

### CelCradle Bottle

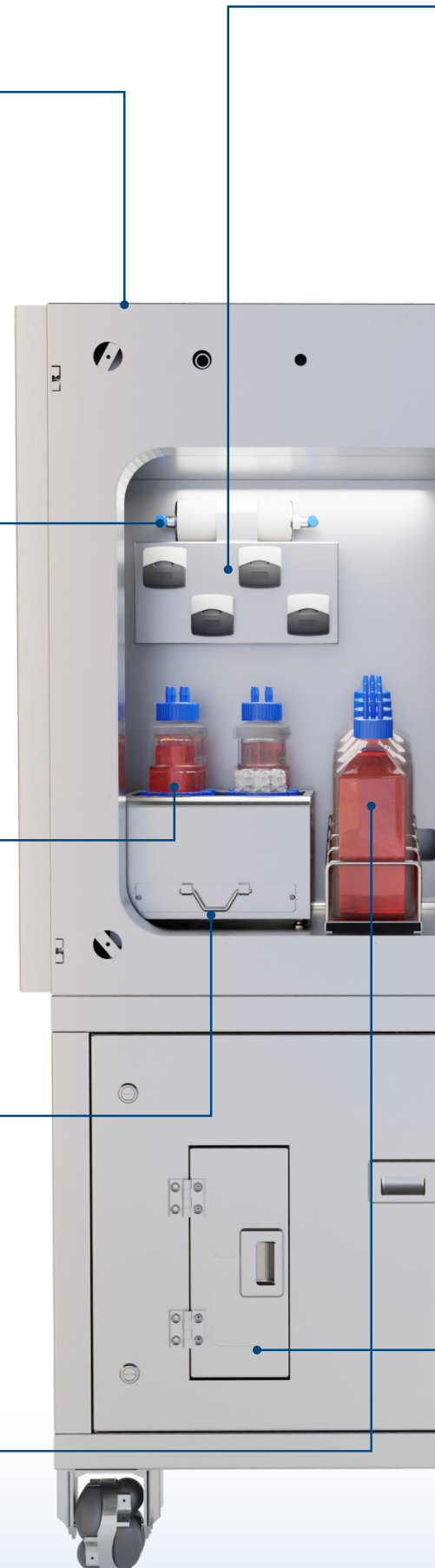
Used to house the macroporous carrier where cells reside

### Spillage Tray

Designed to catch and contain any accidental spills or leaks that may occur during the operation

### Mixing Bottle

Provide extended volume of culture media to support cell growth and eliminate the frequency to exchange culture media manually.



## Peristaltic Pump

HMI-controlled pumping tools for CelCradle® designed to simplify user's operation such that daily feeding volume and harvest are controlled for *recirculation culture* mode.

## Inflatable Seal Inner Door

A specialized sealing mechanism designed to create a tight, secure closure when inflated thereby effectively preventing contaminants from entering or exiting the area

## Touch Screen Control

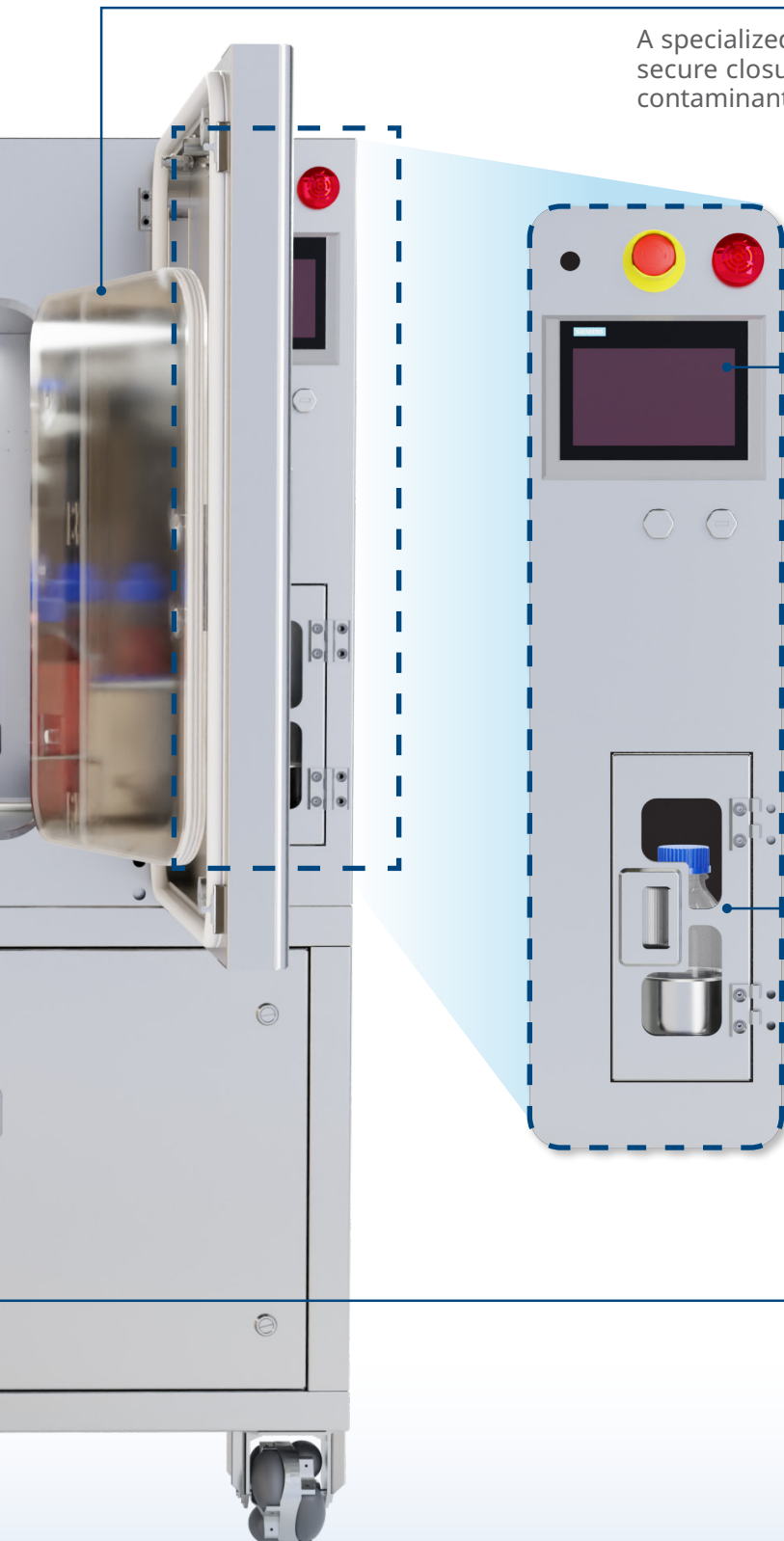
Runs in 21 CFR Part 11-compliance software via intuitive HMI. It controls the parameters needed to run the CelCradle stage and peristaltic pumps

## Water Reservoir Compartment (RH Control)

Helps maintain consistent humidity levels, ensuring a controlled and stable environment that mimics natural conditions ideal for cell growth

## Water Reservoir Compartment (Drain)

Ensures that excess water from humidity build up does not accumulate thereby maintaining consistent humidity and temperature



## What's In It? (CelCradle®+)

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**Bioreactor**

**VOC/HEPA Filter**

**Inflatable Seal Inner Door**

**Pinch Valves**

Used to control the flow of alkali solution into the mixing bottles for pH control.

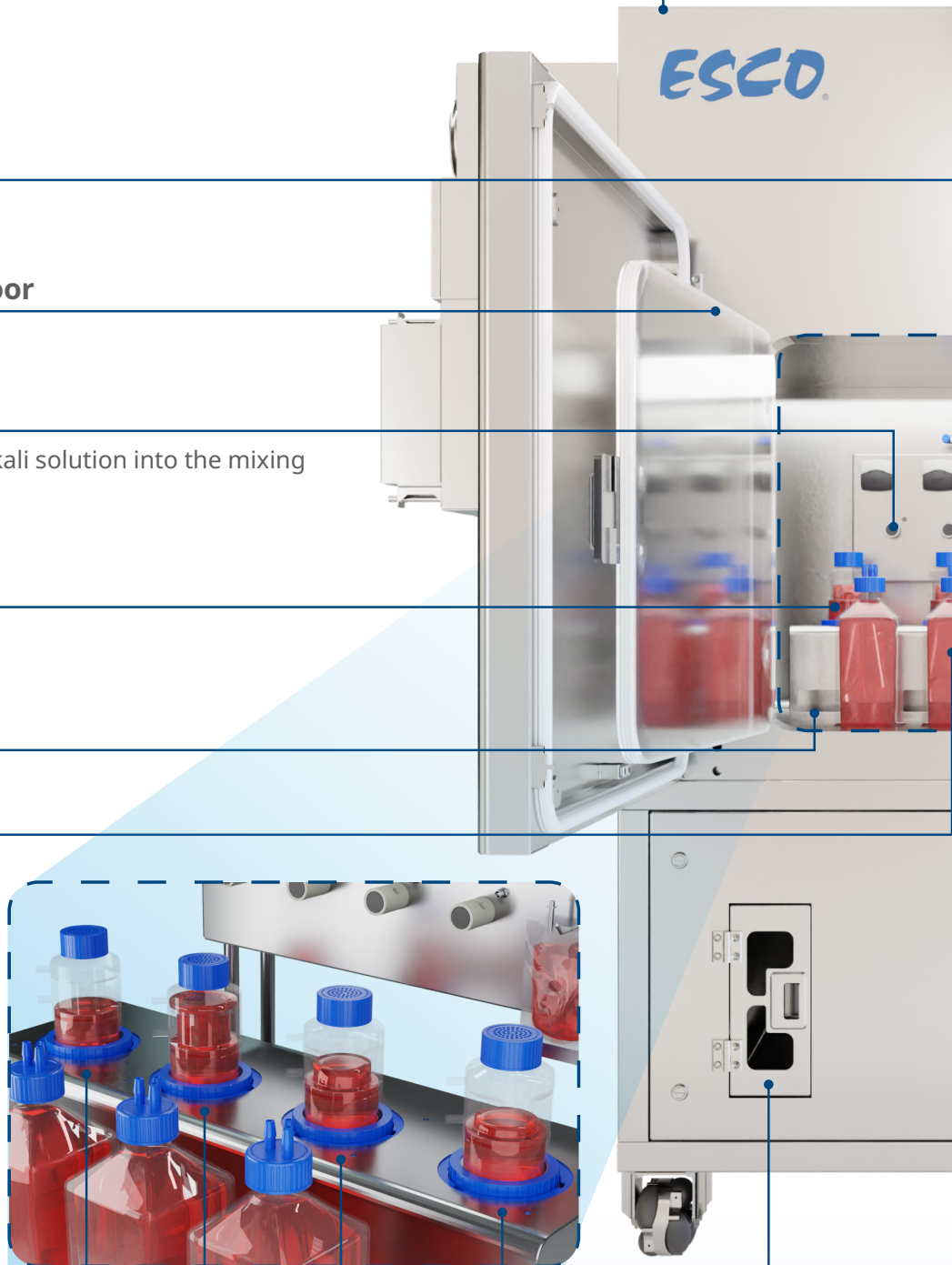
**CelCradle + Bottle**

**Spillage Trays**

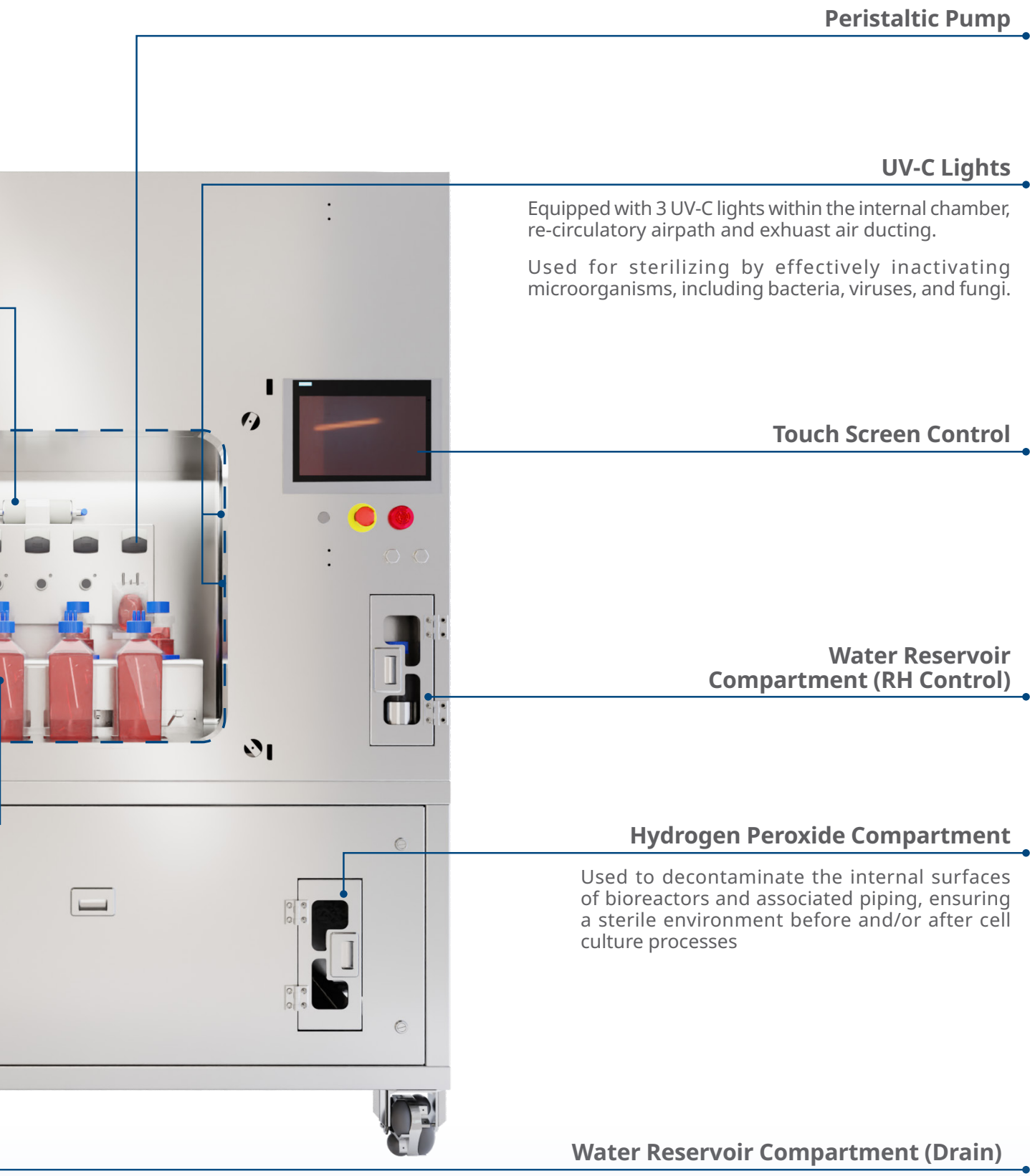
**Mixing Bottle**

**CelCradle + Stage**

Equipped with individually adjustable stage which controls both top (nutrition phase) and bottom (aeration phase) holding times for each of the four CelCradle + bottles, specifically designed to optimize experimental procedures.







## What's In It? (CelCradle®+)

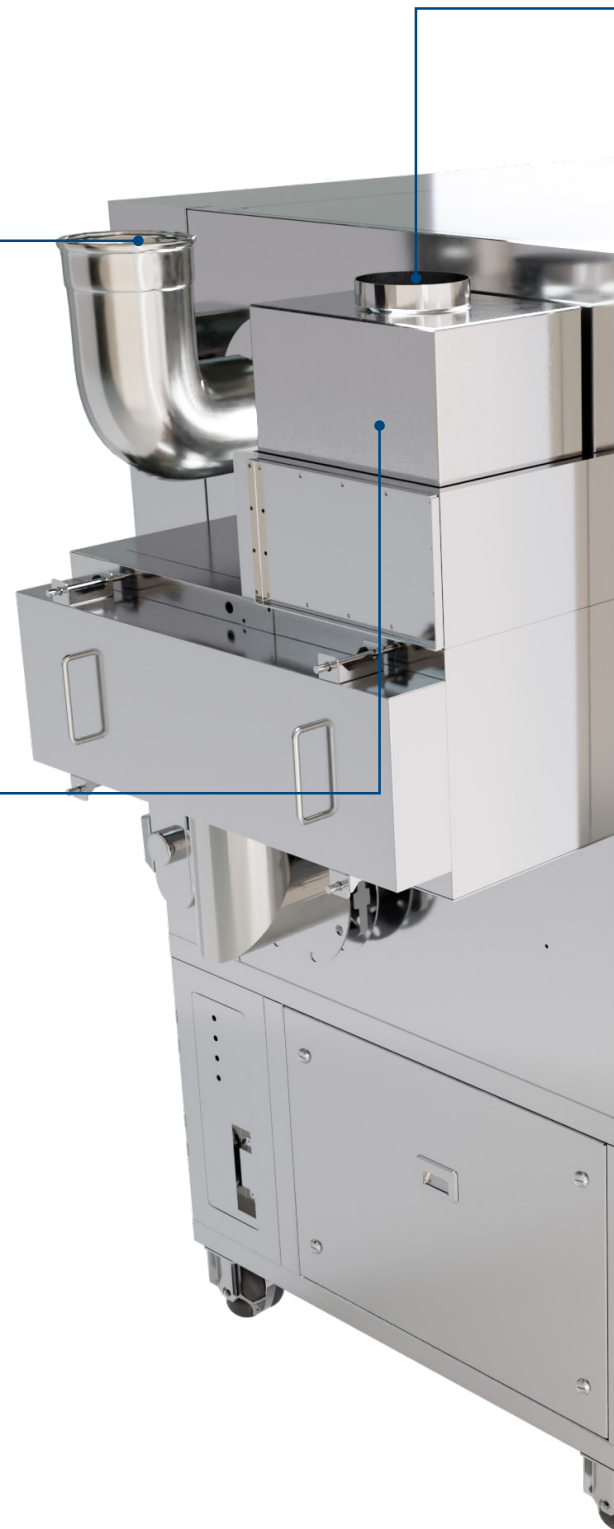
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### Inlet Air Connection

- Ensures that fresh air enters the lab without introducing external contaminants, creating a positive airflow from clean zones to controlled zones.
- The exhaust system can be configured for either top or side discharge into the room or connected to an exhaust ducting system. The connection can utilize either hard ducting or thimble ducting, depending on biosafety risk assessment.

### Catalytic Converter

Used to neutralize any remaining H<sub>2</sub>O<sub>2</sub> vapor and other potential by-products from the decontamination process



## Exhaust Air Connection

- Designed for biocontainment, ensuring that air sterilized by virucidal UV-C technology is securely directed into an external exhaust system. This setup maintains biosafety by preventing the backflow of air into the general laboratory or production environment. It effectively mitigates occupational exposure and cross-contamination by ensuring the containment of airborne infectious agents within controlled areas



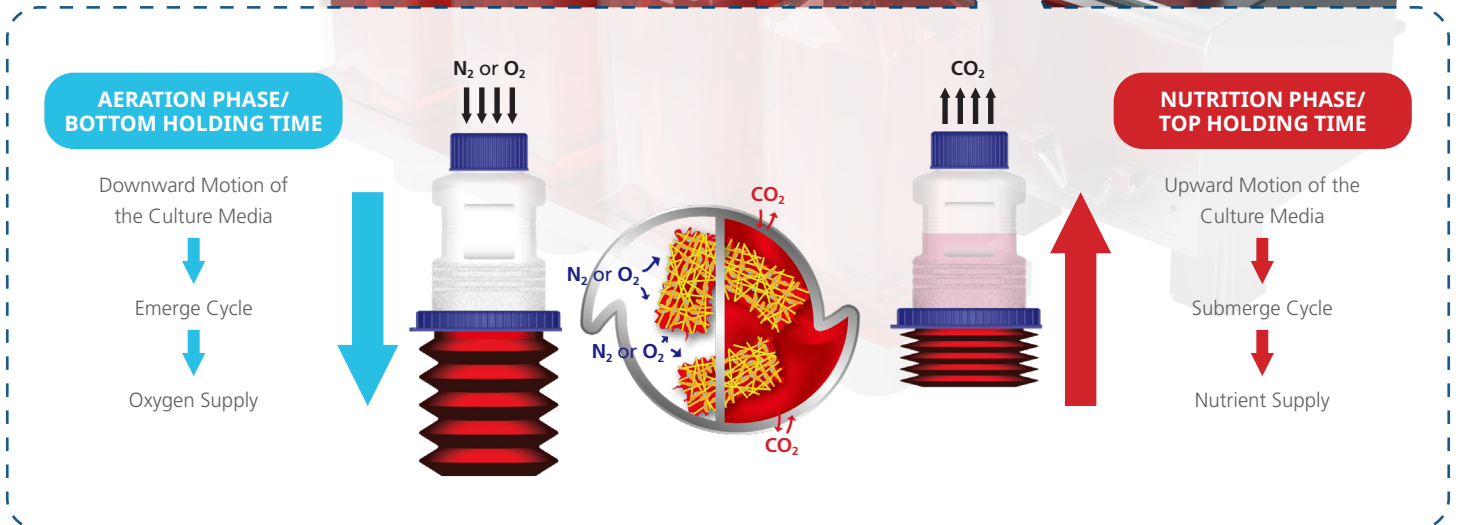
*Option for side exhaust system*



## The Tide Motion Principle

CelCradle® and CelCradle® + operate through the Tide Motion principle wherein cells, attached to macroporous carriers, are alternately exposed to aeration and nutrition via the decompression and compression of the bellows holding the culture medium. The gentle vertical oscillation of the culture medium creates a dynamic interface between air and culture medium on the surface of the cells, providing the cells with an environment that is of extremely low shear stress, high aeration and nutrition levels, zero foaming, and no O<sub>2</sub> limitation. This efficient nutrient and oxygen transfer allow both systems to produce high cell density and yield.

\* inside view of CelCradle® + System

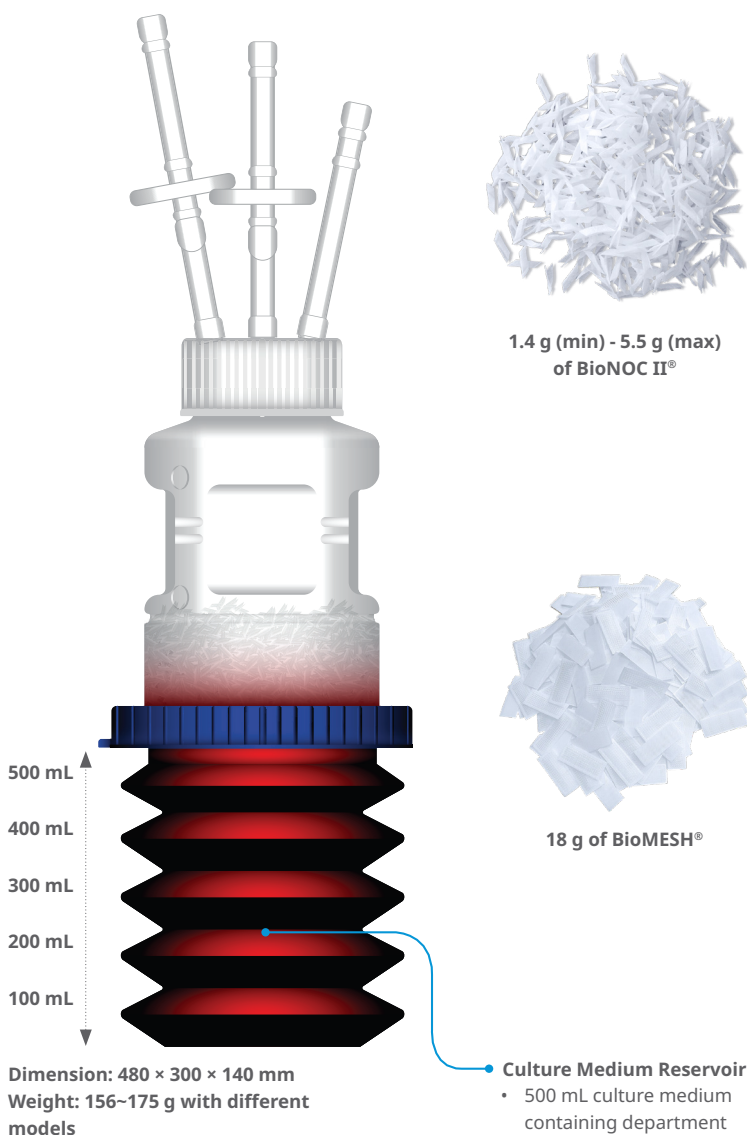


## General Applications

- Culture of anchorage-dependent or adherent cells
- Conversion from roller bottles to single-use, closed system
- Overcome limitations of microcarrier-stirred tank bioreactor technology
- Virus Seed Stock
- Live Virus Culture
- Vaccine Research and Development
- Vaccine Production
- Replication-Competent Viral Vectors
- Biosafety / Animal Biosafety Level 2/3/4 Containment
- Autologous and Allogeneic Cell Therapy
- Cell Banking
- Monoclonal Antibody Production
- Phase III Clinical Trial
- Protein, Extracellular Vesicles, Exosomes, and Stem Cell Production

## Macroporous Carriers

Macroporous carriers are matrices that support the attachment, growth, and proliferation of adherent cell lines, including those of animal, mammalian, and insect cells.



### BioNOC II®

BioNOC II® is a macroporous carrier that supports the growth of anchorage-dependent cell lines including animal, mammalian, and insect cells in either serum-containing or serum-free culture media.

#### Features

- Made of 100% PET
- Complies to <85>, <87>, <881>, ISO 10993-5: 2009
- High porosity (>95% porosity)
- High surface area up to 15,000 cm<sup>2</sup> per 0.1 L packed bed volume
- Enhanced hydrophilicity, coating factors can be added

### BioMESH®

BioMESH® is a low lint microcarrier designed specifically for cell therapy applications. BioMESH® is often used when harvesting cells as the end product, such as skin fibroblasts, cardiac fibroblasts, MSCs, pluripotent stem cells, epithelial cells, and chondrocytes.

#### Features

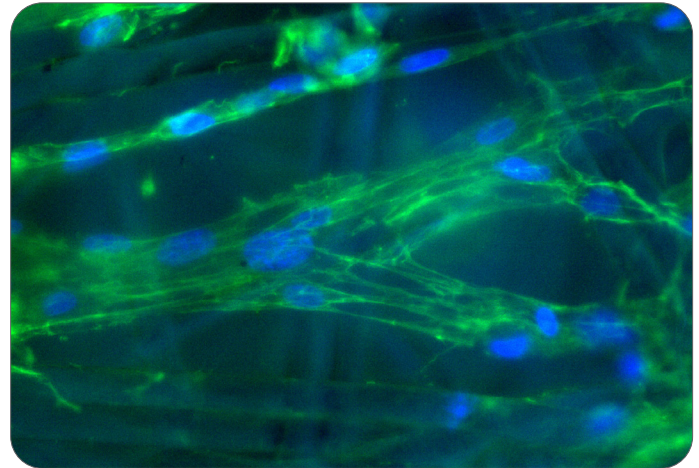
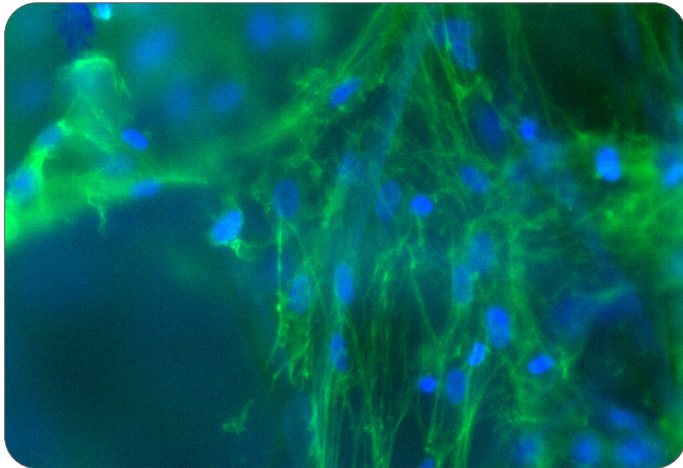
- Made of a combination of polypropylene (PP) netting and PET mesh
- Complies to USP <83> <87> <788>, USP Class VI, ISO 10993-5:2009
- High porosity (>90% porosity)
- High surface area for cell growth: up to 10,000 cm<sup>2</sup> per 0.1 L packed bed volume for hMSCs
- Enhanced hydrophilicity, coating factors can be added

Application /Macrocarriers	EV/Exosomes	Cell Therapy (when harvesting the cells as final product)	Intracellular Virus (when harvesting the cells containing the virus)	Secreted Bioproducts (Virus, Viral Vectors, Proteins)
BioNOC II®	+++	++	++	+++
BioMESH®	+++	+++	+++	++

## Anchorage-dependent Cell Culture

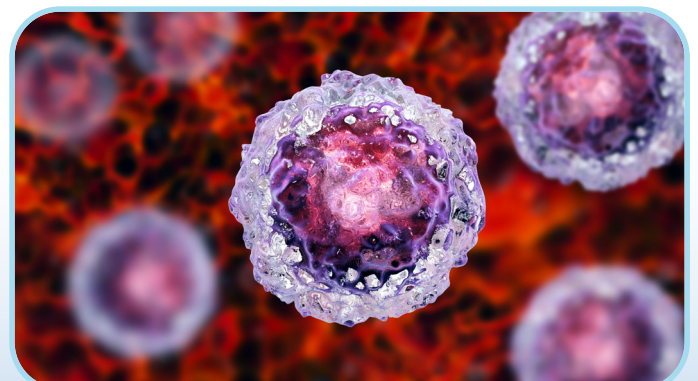
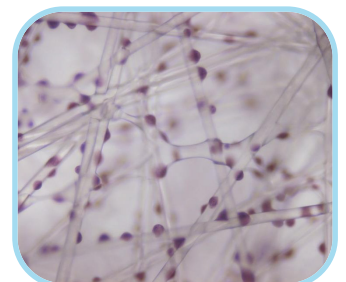
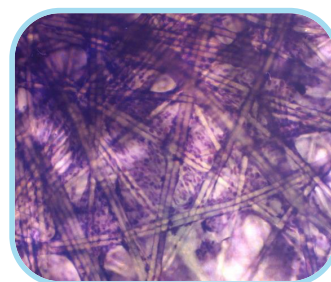
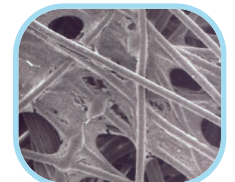
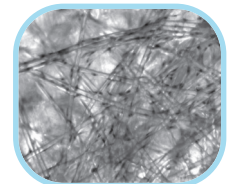
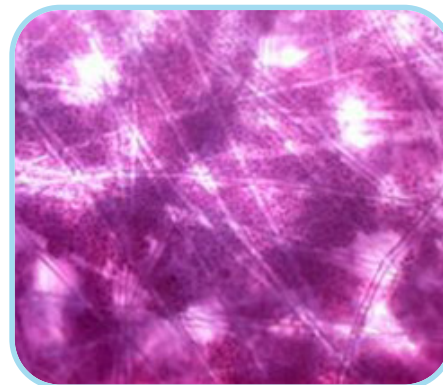
A single CelCradle® bottle, pre-filled with 5.5 grams of BioNOC II®, offers up to 15,000 cm<sup>2</sup> of surface area per bottle to support cell attachment and growth. The carriers are proven to have enhanced biocompatibility, long-lasting hydrophilicity, extremely low lint waste, and excellent mechanical strength.

*Note: Surface area may vary depending on the cell line to be cultured. 15,000 cm<sup>2</sup> is based on the culture data from VERO cells.*



FDA and Hoechst 33342-stained cells attached to the BioNOC II® carriers

Established Cell Lines	Estimated Cell Density (per Bottle)
<b>Mammalian Cells</b>	
BHK-21	$5.5 \times 10^9$
HEK293	$3.2 \times 10^9$
HeLa	$1.5 \times 10^9$
MSCs	$2.0 \times 10^8 - 1.0 \times 10^9$
Huh-7	$2.4 \times 10^9$
Hybridoma OKT 3	$3.6 - 8.9 \times 10^9$
Marc 145	$8.9 \times 10^5$
MDBK	$1.5 - 2.0 \times 10^9$
MDCK	$1.2 \times 10^9$
MRC5	$2.5 \times 10^8$
rCHO	$4.5 \times 10^9$
Vero	$5.4 \times 10^9$
<b>Insect Cells</b>	
Hi-5	$4.0 \times 10^9$
SF-9	$6.3 \times 10^9$
SF-21	$4.3 \times 10^9$



## Single-Use and Ready-to-Use CelCradle® Bottles

CelCradle® bottles are sterilized through gamma irradiation and come pre-packed with 5.5 grams of carriers as standard. Different models of bottles cover a specific application in cell culture.

### CelCradle® -500A Series



Suitable for cell harvest, transient transfection, slow adhering cells; batch/semi-batch culture

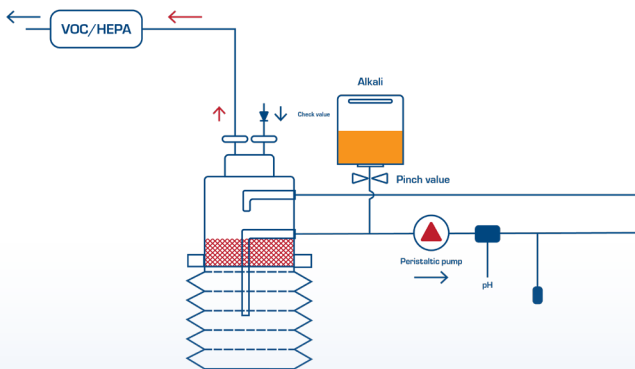
### CelCradle® -500AP Series



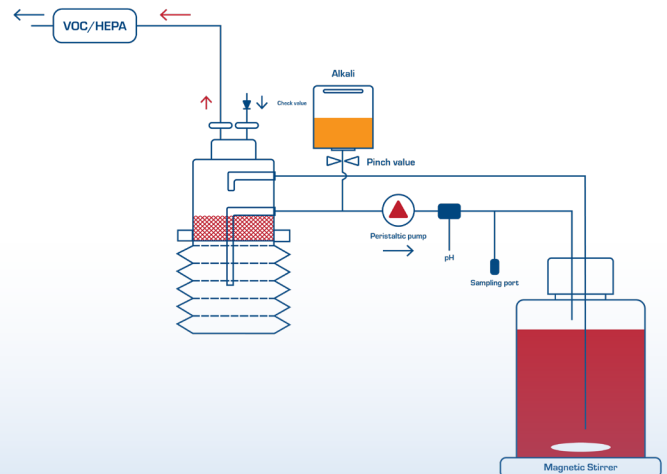
Suitable for cell harvest, transient transfection, slow adhering cells, recirculation culture in either BSL 2 and/or 3/4 environment.

- CelCradle® (BSL 2): 0.22 µm inlet and outlet filters
- CelCradle® Plus (BSL 3/4): 0.1 µm inlet and outlet filters, with an option for dual 0.1 µm filters

## Schematic Diagrams (CelCradle + Bottles With and Without Mixing Vessel)



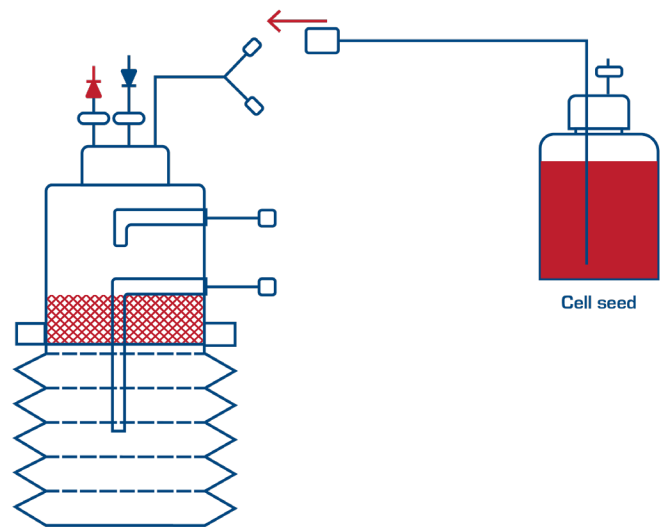
CelCradle Plus-500A



CelCradle Plus-500AP

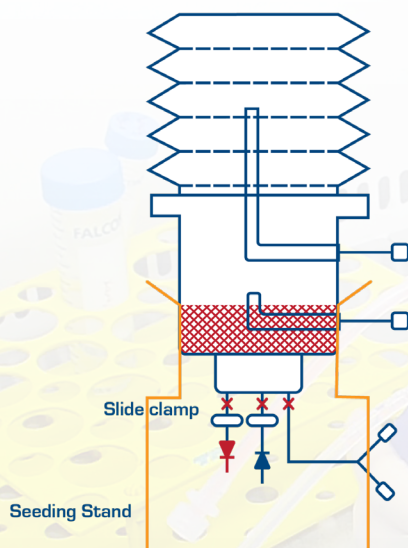
## Closed Cell/Virus Seeding using CelCradle® 500AP (Upright)

- Take out one (1) CelCradle® 500AP Bottle from the package (gamma-irradiated). Place the CelCradle® 500AP Bottle in a biological safety cabinet (BSC). Fill in 450 ml culture media first.
- Dispense 50 ml of cell suspension containing a total of  $2 \times 10^8$  -  $3.0 \times 10^8$  cells. Swirl the bottle when dispensing cell seeds so that cells will be evenly distributed on the matrix bed. (*Cell seeding density may differ depending on the cell line*). Place the bottle on the bioreactor immediately. Do not shake the bottle to avoid cell detachment.
- Set up inoculation parameters: Up: 2.0 mm/s, T\_H: 20 s; Down: 2.0 mm/s; B\_H: 0 s and then press "Start" to initiate the immobilization process.
- After 3-5 hours, directly set up the moving rate and holding time parameters for cell growing phase without stopping machine.
- Connect with tubing set with 2 L culture media in the reservoir. Culture until cell density reach the target for virus infection. Cell density needs to be determined from the glucose consumption rate by sampling the culture media during culture. It is recommended to establish a correlation curve between cell density and glucose consumption rate by periodically opening the cap and sampling the carriers before initiating the virus production process.
- Withdraw spent culture media and exchange to a fresh one. Make to sure leave 10-50 ml void volume for virus seeds.
- Add virus seed based on the multiplicity of infection (MOI) calculation.
- Culture until the end and harvest the virus.



## Closed Cell/Virus Seeding using CelCradle® 500AP (Reverse)

- Take out one (1) CelCradle® 500AP Bottle from the package (gamma-irradiated). Place the CelCradle® 500AP Bottle in a biological safety cabinet (BSC).
- Dispense 110-120 ml of cell suspension containing a total of  $2 \times 10^8$  -  $3.0 \times 10^8$  cells directly. (*Cell seeding density may differ depending on the cell line*).
- Fill in 110-120 ml cell seeds ( $2-3 \times 10^8$  cells) unto the CelCradle® 500AP bottle.
- Clamps all ports on the cap. Reverse the bottles and put on the seed stand for 3-4 hours. Gentle swirl the bottles manually every 15 mins for the first hour and 30 mins for the rest. Take note that the bottle is kept inside the CelCradle bioreactor during the seeding the process.
- Fill in 380-390 ml of culture media after when cells have been reached attachment rate of over 90%.
- Culture until cell density reaches the target for virus infection.
- Withdraw spent culture media and exchange with a fresh one.
- Fill in 500 ml of culture media with virus seeds.





## Cell Monitoring



**GlucCell™**

A portable, easy-to-use, calibration-free glucose monitoring system for cell culture. Get results in just 15 seconds. Sample with just 1.5 uL culture medium with measurement range from 30-500 mg/dL.



**Crystal Violet Dye**

A simple tool for the quantification of cells based on the number of nuclei dyed. The CVD kit contains reagents that disrupt the cells, thereby releasing the nuclei, which are subsequently dyed.

*Note: CVD is not recommended for counting stem cells. Use fluorescence dyes to achieve better cell observation.*

## Sampling

### CelCradle-500A

Adherent cells attached to the macroporous carriers can be monitored through carrier sampling. The bottle is opened inside a biosafety cabinet and using a sterile forceps, carriers can be taken out for cell count, cell staining and monitoring.

### CelCradle-500AP

Adherent cells attached to the macroporous carriers can be monitored through carrier sampling. The bottle is opened inside a biosafety cabinet and using a sterile forceps, carriers can be taken out for cell count, cell staining and monitoring.

500-AP bottles are equipped with specialised sampling port on the tubings for culture media sampling.



## Ordering Information (CelCradle® using BioNOC II®)

Item Code	Product Name	Package	Remarks
2231120	CelCradle Bioreactor with Environmental Control	1 × CelCradle Bioreactor with Environmental Control	
1400315	CelCradle-500A	1 Carton = 4 Boxes, each box contains: 2 × CelCradle-500A BioNOC II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle-500A bottle is pre-filled with 0.1 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400316	CelCradle-500AH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle-500AH BioNOC II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle-500AH bottle is pre-filled with 0.05 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400317	CelCradle-500AQ	1 Carton = 4 Boxes, each box contains: 2 × CelCradle-500AQ BioNOC II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle 500-AQC bottle is pre-filled with 0.025L BioNOC II® *double wrapping
1400318	CelCradle-500AP2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500AP bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500AP bottle is pre-filled with 0.1 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400340	CelCradle 500-APD2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APD bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APD bottle is pre-filled with 0.2 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400341	CelCradle 500-APT2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APT bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APT bottle is pre-filled with 0.3 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400319	CelCradle-500APH2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APH bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APH bottle is pre-filled with 0.05 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400320	CelCradle-500APQ2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APQ bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APQ bottle is pre-filled with 0.05 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400321	CelCradle-500AP1L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500AP bottle 1 × 1 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500AP bottle is pre-filled with 0.1 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400322	CelCradle-500APH1L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APH bottle 1 × 1 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APH bottle is pre-filled with 0.05 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400324	CelCradle-500APQ1L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APQ bottle 1 × 1 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APQ bottle is pre-filled with 0.025 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400325	CelCradle-500AP0.5L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500AP bottle 1 × 0.5 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500AP bottle is pre-filled with 0.1 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400326	CelCradle-500APH0.5L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APH bottle 1 × 0.5 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APH bottle is pre-filled with 0.05 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping
1400327	CelCradle-500APQ0.5L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APQ bottle 1 × 0.5 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APQ bottle is pre-filled with 0.025 L BioNOC II® *0.22 µm inlet and outlet filters *double wrapping

0.1 L BioNOC II® equals to 850 pieces  
0.05 L BioNOC II® equals to 425 pieces  
0.025 L BioNOC II® equals to 212 pieces

+/- 1%

## Ordering Information (CelCradle® + using BioNOC II®)

Item Code	Product Name	Package	Remarks
2231121	CelCradle Plus with Environmental Control	1 × CelCradle Plus Bioreactor with Environmental Control	
1400328	CelCradle Plus-500A	1 Carton = 4 Boxes, each box contains: 2 × CelCradle Plus-500A BioNOC II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500A bottle is pre-filled with 0.1 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400329	CelCradle Plus-500AH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle Plus-500AH BioNOC II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AH bottle is pre-filled with 0.05 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400330	CelCradle Plus-500AQ	1 Carton = 4 Boxes, each box contains: 2 × CelCradle Plus-500AQ BioNOC II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AQ bottle is pre-filled with 0.25 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400331	CelCradle Plus-500AP2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500AP bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AP bottle is pre-filled with 0.1 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400342	CelCradle Plus-500APD2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APD bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APD bottle is pre-filled with 0.2 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400343	CelCradle Plus-500APT2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APT bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APT bottle is pre-filled with 0.3 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400332	CelCradle Plus-500APH2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APH bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APH bottle is pre-filled with 0.05 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400333	CelCradle Plus-500APQ2L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APQ bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APQ bottle is pre-filled with 0.025 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400334	CelCradle Plus-500AP1L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500AP bottle 1 × 1 L Mixing Vessel with Magnetic Stir Bar Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AP bottle is pre-filled with 0.1 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400335	CelCradle Plus-500APH1L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APH bottle 1 × 1 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APH bottle is pre-filled with 0.05 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400336	CelCradle Plus-500APQ1L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APQ bottle 1 × 1 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APQ bottle is pre-filled with 0.025 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400337	CelCradle Plus-500AP0.5L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500AP bottle 1 × 0.5 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AP bottle is pre-filled with 0.1 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400338	CelCradle Plus-500APH0.5L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APH bottle 1 × 0.5 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APH bottle is pre-filled with 0.05 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping
1400339	CelCradle Plus-500APQ0.5L	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APQ bottle 1 × 0.5 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APQ bottle is pre-filled with 0.025 L BioNOC II® *0.1 µm inlet and outlet filters *triple wrapping

0.1 L BioNOC II® equals to 850 pieces  
0.05 L BioNOC II® equals to 425 pieces  
0.025 L BioNOC II® equals to 212 pieces

+/- 1%

## Ordering Information (CelCradle® using BioMESH®)

Item Code	Product Name	Package	Remarks
1400344	CelCradle 500-A BioMESH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle-500A BioMESH II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle-500A bottle is pre-filled with 0.1 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400345	CelCradle 500-AH BioMESH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle-500AH BioMESH II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle-500AH bottle is pre-filled with 0.05 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400346	CelCradle 500-AQ BioMESH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle-500AQ BioMESH II® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle-500AQ bottle is pre-filled with 0.025 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400347	CelCradle 500-AP2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500AP BioMESH® bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500AP bottle is pre-filled with 0.1 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400348	CelCradle 500-APD2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APD BioMESH® bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APD bottle is pre-filled with 0.2 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400349	CelCradle 500-APT2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APT BioMESH® bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APT bottle is pre-filled with 0.3 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400350	CelCradle 500-APH2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APH BioMESH® bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APH bottle is pre-filled with 0.05 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400351	CelCradle 500-APQ2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APQ BioMESH® bottle 1 × 2 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APQ bottle is pre-filled with 0.025 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400352	CelCradle 500-AP1L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500AP BioMESH® bottle 1 × 1 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500AP bottle is pre-filled with 0.1 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400353	CelCradle 500-APH1L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APH BioMESH® bottle 1 × 1 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APH bottle is pre-filled with 0.05 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400354	CelCradle 500-APQ1L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APQ BioMESH® bottle 1 × 1 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APQ bottle is pre-filled with 0.025 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400355	CelCradle 500-AP0.5L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500AP BioMESH® bottle 1 × 0.5 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500AP bottle is pre-filled with 0.1 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400356	CelCradle 500-APH0.5L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APH BioMESH® bottle 1 × 0.5 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APH bottle is pre-filled with 0.05 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping
1400357	CelCradle 500-APQ0.5L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle-500APQ BioMESH® bottle 1 × 0.5 L Mixing Vessel 1 × Tubing Manifolds w/ CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle-500APQ bottle is pre-filled with 0.025 L BioMESH® *0.22 µm inlet and outlet filters *double wrapping

0.1 L BioMESH® equals to 360 pieces  
0.05 L BioMESH® equals to 180 pieces  
0.025 L BioMESH® equals to 90 pieces

+/- 1%

## Ordering Information (CelCradle® + using BioMESH®)

Item Code	Product Name	Package	Remarks
1400358	CelCradle Plus-500A BioMESH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle Plus-500A BioMESH® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500A bottle is pre-filled with 0.1 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400359	CelCradle Plus-500AH BioMESH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle Plus-500AH BioMESH® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AH bottle is pre-filled with 0.05 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400360	CelCradle Plus-500AQ BioMESH	1 Carton = 4 Boxes, each box contains: 2 × CelCradle Plus-500AQ BioMESH® 1 × Strainer	*Batch type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AQ bottle is pre-filled with 0.025 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400361	CelCradle Plus-500AP2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500AP BioMESH® bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AP bottle is pre-filled with 0.1 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400362	CelCradle Plus-500APD2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APD BioMESH® bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APD bottle is pre-filled with 0.2 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400363	CelCradle Plus-500APT2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APT BioMESH® bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APT bottle is pre-filled with 0.3 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400364	CelCradle Plus-500APH2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APH BioMESH® bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APH bottle is pre-filled with 0.05 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400365	CelCradle Plus-500APQ2L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APQ BioMESH® bottle 1 × 2 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APQ bottle is pre-filled with 0.025 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400366	CelCradle Plus-500AP1L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500AP BioMESH® bottle 1 × 1 L Mixing Vessel with Magnetic Stir Bar Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AP bottle is pre-filled with 0.1 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400367	CelCradle Plus-500APH1L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APH BioMESH® bottle 1 × 1 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APH bottle is pre-filled with 0.05 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400368	CelCradle Plus-500APQ1L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APQ BioMESH® bottle 1 × 1 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APQ bottle is pre-filled with 0.025 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400369	CelCradle Plus-500AP0.5L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500AP BioMESH® bottle 1 × 0.5 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500AP bottle is pre-filled with 0.1 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400370	CelCradle Plus-500APH0.5L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APH BioMESH® bottle 1 × 0.5 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APH bottle is pre-filled with 0.05 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping
1400371	CelCradle Plus-500APQ0.5L BioMESH	1 Carton = 4 Boxes, each box contains: 1 × CelCradle Plus-500APQ BioMESH® bottle 1 × 0.5 L Mixing Vessel with Magnetic Stir Bar 1 × Tubing manifolds w/ pH/DO single-use sensors and alkali bag CPC or luer lock connectors	*Recirculation type cell culture *Upright/reverse seeding *1 CelCradle Plus-500APQ bottle is pre-filled with 0.025 L BioMESH® *0.1 µm inlet and outlet filters *triple wrapping

0.1 L BioMESH® equals to 360 pieces  
0.05 L BioMESH® equals to 180 pieces  
0.025 L BioMESH® equals to 90 pieces

+/- 1%

## Equipment Footprint

**CelCradle®**

The diagram shows a person in a white protective suit standing next to the CelCradle® incubator for scale. The person's height is 1750mm. The incubator's height is 1719mm and its width is 986mm. The incubator door is open, revealing four red bottles inside. The incubator is mounted on a base with wheels.

Parameters

Incubator Volume	: 220L
External Dimensions	: 986 × 956 × 1719mm
Internal Dimensions	: 534 × 548 × 650mm

**CelCradle® +**

The diagram shows a person in a white protective suit standing next to the CelCradle® + incubator for scale. The person's height is 1750mm. The incubator's height is 1977mm and its width is 2069mm. The incubator door is open, revealing four red bottles inside. The incubator is mounted on a base with wheels.

Parameters

External Dimensions	: 1977 × 1178 × 2069mm
Internal Dimensions	: 946 × 696 × 650mm

## cGMP Scale Out Strategy

Esco Healthcare facilitates seamless technology transfer, scaling out from research-use-only applications to GLP toxicology studies and cGMP/GMP production, transitioning efficiently from BelloStage®/BelloCell® platforms to CelCradle® and CelCradle®+ systems.

For innovators seeking a capex light, Esco Aster leverages its CelCradle bioreactors to provide cGMP CRDMO services. These services enable technology transfer, transitioning processes from Research Use Only (RUO) laboratory bench applications to GLP and the production of clinical trial materials cGMP bedside.



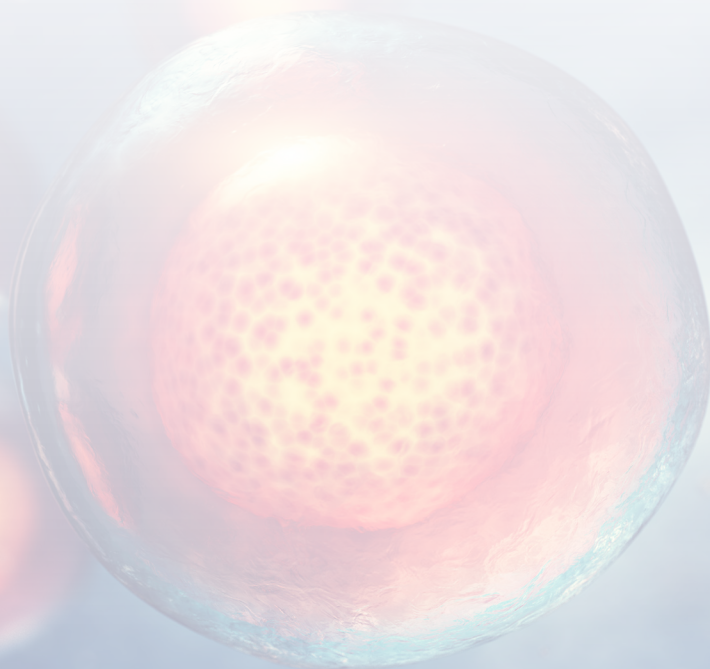
**BelloStage® / BelloCell®**  
\* BelloStage® / BelloCell® uses independent CO<sub>2</sub> incubator.

**CelCradle®**

**CelCradle®+**

**Research-use Only/ For Further Manufacturing**

**cGMP/GMP Manufacturing**



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- Containment Barrier Isolator (CBI)
- Downflow Booth (DFB)
- Dynamic Floor Laminar Hatch
- Dynamic Pass Box
- Evidence Drying Cabinet
- Garment Storage Cabinet
- General Processing Platform Isolator (GPPI)
- Laminar Flow Horizontal Trolley
- Laminar Flow Straddle Units, Single and Double
- Laminar Flow Vertical Trolley
- Pass Box
- Soft Wall Cleanroom
- Sputum Booth
- Ventilated Balance Enclosure (VBE)
- Weighing and Dispensing Containment Isolator (WDCI)

Since 1978, Esco has emerged as a leader in the development of controlled environment, laboratory and pharmaceutical equipment solutions. Products sold in more than 100 countries include biological safety cabinets, fume hoods, ductless fume hoods, laminar flow clean benches, animal containment workstations, cytotoxic cabinets, hospital pharmacy isolators, and PCR cabinets and instrumentation. With the most extensive product line in the industry, Esco has passed more tests, in more languages, for more certifications, throughout more countries than any biosafety cabinet manufacturer in the world. Esco remains dedicated to delivering innovative solutions for the clinical, life science, research and industrial laboratory community.



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