CelCradle™
Cradle for High Density Cells
Principle
CelCradle™ is a cost-effective, ready-to-use, benchtop bioreactor system capable of high density cell culture.

CelCradle™ is designed based on the tide motion principle, wherein the compression and decompression of bellows allow the intermittent exposure of the cells to nutrients and air. This provides a low shear, high aeration, and foam-free culture environment.

The CelCradle™ bioreactor system consists of two components: the sterile single-use CelCradle™ bottle and the bellow-compressor CelCradle™ Stage. Each standard CelCradle™ bottle holds 5.5g of BioNoc™ II carriers, to which the cells attach to and grow.

During operation, the CelCradle™ bottle is seeded with cells and partially filled with media. The media is then raised and lowered alternately to submerge and expose the cells, creating a dynamic interface between air and media on cell surface to maximize nutrient uptake and oxygen transfer.

Because of its efficient nutrient and oxygen transfer, one CelCradle™ bottle is capable of producing cells comparable to 18 to 20 roller bottles.

Since the BioNoc™ II surface is specially treated, the CelCradle™ system can grow most anchorage-dependent cells and allow easy harvest of whole cells, cell components, and secreted proteins.

Features & Advantages
- Stainless Steel 304L BA CelCradle™
- Scale-up by directly multiplying the number of bottles used or using the TideCell® system
- Disposable, ready-to-use, pre-sterilized
- Low shear stress, foam-free, no O₂ limitation
- Large surface area for high density cell culture
- Compatible with most serum-free media
- Allows the harvest of whole cells or cell components

Applications
- Mammalian and insect cell culture
- Protein and virus production
- Monoclonal antibody production
- Proteome Research
- Drug discovery
- Pharmacokinetics study
- Gene and cell therapy
Easy-to-Use, Disposable, Space and Labor-Saving Device
The CelCradle™ bioreactor is a ready-to-use and disposable bioreactor system, with virtually no start-up time and learning curve.

It is a highly scaled down product, with a single bottle providing 15,000cm² of specific surface area. This allows the growth of more than $10^{10}$ cells in four bottles in just 8.6” x 11.7” footprint and a 6 ft³ incubator.

The CelCradle™ system also allows the production of milligrams to several grams of proteins, monoclonal antibodies, 10 pfu viruses, whole cell or cell components, thus eliminating the need to maintain numerous spinner flasks, dozens of roller bottles, and hundreds of T-flasks.

Scale up with the CelCradle™ system is also easily done by directly multiplying the number of bottles used, thus eliminating the variation, uncertainty, and time spent during scale-up process development. The yield from a dozen of CelCradle™ bottles can replace 200 roller bottles, which is sufficient for most clinical trial studies.

High Yield, Special B_H Function to Boost Protein Expression
Special B_H function (increasing bottom holding time) restricts cells from over-growing and enhances protein expression over 3 folds. It also enables higher protein concentration and saves culture medium during culture.
Each CelCradle™ System accommodates up to four single-use bottles, making this an ideal screening device to test varying medium formulations or cell lines.

No steam or water lines, autoclave or utilities required, just a power outlet and CO₂ incubator.

- Simple to operate - virtually no learning curve
- Controller - adjusts nutrient and gas exchange of the bottle
- Magnetized controller enables convenient positioning by attaching on the outside surface of the incubator.
- Extremely compact system fits in most standard CO₂ incubators.
- Bright and large display is easy to read.
- Collapsible bellows
- 0.22 um ventilation filter is provided in the cap
- Cells remain entrapped in the BioNOCTM II matrix bed simplifying media replacement and product harvesting
- Sampling Port enables aseptic removal of BioNOCTM II carries for cell counting
- Retaining ring locks bottles into place in the CelCradle® Stage console
- Tubing set with peristaltic pump head enable recirculation and continuous feeding of nutrient
- CelFeeder enables 4 pumps operation with individual programming setting
- Autoclavable pump head support consistent feeding rate with calibration free
- Useful for batch and semi-batch operation where process components are easily traceable.
- Useful for continuous operation where process components are easily traceable.
Applications

**Membrane Protein or Cell Component Production**

Current methods for producing large amounts of cell mass for drug discovery and proteomics study involve the use of roller bottles or tissue culture flasks. The CelCradle™ system simplifies cell culture by replacing dozens of roller bottles or hundreds of tissue culture flask with one CelCradle™ system. Up to 20 billion cells could be harvested from a single bottle, greatly saving time, labor costs, reagents, culture medium, and space, among others.

In one study, a single CelCradle™ bottle was able to produce 300-900 mg proteins, containing 1000-1500 pmoles hERG or GPCR receptor using HEK-293 cells. This production was equivalent to that of 20-35 roller bottles.

**Protein Expression by Recombinant Viruses**

The CelCradle™ system can also be used to produce recombinant proteins through recombinant viruses such as vaccinia and baculoviruses. In one study, a single CelCradle™ system was able to produce 4 x 10⁹ transfected cells, equivalent to the production of 10-20 roller bottles.

**Virus Production**

Due to its capability to support high cell density, the CelCradle™ bottle can be used to produce viruses at a concentration one log magnitude higher than conventional culture systems. This is beneficial for virus stock preparation and combinatorial vaccine manufacturing without over dilution of the virus titer. Example of virus production results in the CelCradle™ system includes log 12-13 pfu for baculovirus, log 13-14 vp for adenovirus, log 11-12 pfu for Japanese Encephalitis virus, and log 11 pfu for WEE virus.

**In Vitro Drug Screening and Pharmacokinetic Study Model**

Normal cells in the human body experience 3D environments, wherein they are completely surrounded by other cells, membranes, fibrous layers, and adhesion proteins. Because the CelCradle™ system provides cells with a 3D environment, which mimics in vivo conditions leading to normal cell morphology and behaviour for more realistic cell culture, it can be used for drug screening and pharmacokinetic models studies.

**Literature Support**

The following are some of the available literature support online for the various applications of the CelCradle™ system.


Disposable CelCradle™ Bottles

The CelCradle™ product line meets your specific needs. Different CelCradle™ bottles cover 90% of applications in cell culture.

- Batch, semi-batch or continuous culture
- Disposable
- BioNoc™ II carriers or preferred microcarriers
- Cell harvest with or without trypsin
- Pre-sterilized bottles are time and labor saving

<table>
<thead>
<tr>
<th>Application/Bottle</th>
<th>Navision Code</th>
<th>Secreted Protein, Viruses</th>
<th>Cell Harvest (for non-secreted proteins, viruses or cells)</th>
<th>Carrier Harvest (for protein extraction or reuse of carriers)</th>
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</thead>
<tbody>
<tr>
<td>CelCradle™ 500</td>
<td>1400001</td>
<td>⬤</td>
<td>⬤</td>
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<tr>
<td>CelCradle™ 500A</td>
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<td>⬤</td>
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<tr>
<td>CelCradle™ 500AP</td>
<td>1400004</td>
<td>⬤</td>
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</table>

CelCradle™ System Complete

The CelCradle™ System Complete contains all the necessary elements for users to begin a batch type cell culture.

Features
- Includes a CelCradle™ Stage and necessary accessories for startup of the cell culture upon receipt
- Extremely compact design system fits in most standard CO₂ incubator
- Suitable for batch and semi-batch operation
- Suitable for most protein and monoclonal antibody production applications

Ordering Information

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Navision Code</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2230006</td>
<td>1 x CelCradle™ Stage</td>
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<tr>
<td></td>
<td></td>
<td>1 x GlucCell® Glucose Monitoring System</td>
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</table>

CelCradle™ Continuous System Complete

The CelCradle™ Continuous System Complete features the same equipment as the CelCradle™ Cell Culture Complete, with the addition of the CelFeeder pump and tubing sets to provide medium exchange in the CelCradle-500P bottles.

Each CelCradle™ 500P bottle is equipped with additional inlet and outlet lines for medium recirculation. Each bottle is linked to an extra medium vessel, thus providing continuous exchange of nutrient, eliminating labor for medium exchange and avoiding possible shock to cells during culture.

Features
- Each package contains a CelCradle™ Stage, a CelFeeder pump module, two tubing complete sets, and accessories for the easy startup of the cell culture.
- Each bottle connects with independent medium reservoir to eliminate cross-contamination
- Programmable and On/Off pumping control simplifies the setting of recirculation rate for each bottle
- One CelFeeder pump module enables the operation of up to 4 pump heads with individual micro-processor control
- Suitable for cell mass production, cell component production, virus production and protein expression

Ordering Information

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<th>Package</th>
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<tbody>
<tr>
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<td>1 x CelCradle™ Stage</td>
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<tr>
<td></td>
<td></td>
<td>1 x CelFeeder Pump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 x Tubing Complete Set</td>
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</tbody>
</table>
**CelCradle™ Stage**
The CelCradle™ Stage is capable of operating 4 CelCradle™ bottles simultaneously. It is compact and compatible in a CO₂ incubator.

**CelFeeder Pump Module**
The CelFeeder pump module is an auxiliary peristaltic pump to achieve the recirculation and perfusion processes for CelCradle™ 500 high density continuous cell culture system.

**Tubing Complete Set**
The Tubing Complete Set includes pre-assembled tubes, reusable pump head and head plate with a sampling port to support the continuous culture in CelCradle™-500P system.

**Disposable Tubing Accessory**
The Disposable Tubing Accessory provides simple options to replace the tubes in the Tubing Complete Set, thus avoiding wear out of the tubes during operation. It is recommended to replace the tubes after 3x of use.

**GlucCell® Glucose Monitoring System**
The GlucCell® Glucose Monitoring System is a portable, light-weight, and palm-sized kit suitable for glucose measurement for both serum and serum-free culture medium in mammalian and insect cell culture, without affecting the accuracy of the results. The GlucCell® glucose monitoring system responds promptly and gives reliable result. It has an accuracy of greater than 90%, precision of 95% and linearity of 0.9997.

**Crystal Violet Dye Nucleus Count Kit**
The Crystal Violet Dye Nucleus Count Kit contains crystal violet dye, citric acid and detergent used to disrupt the cells and release cell nuclei for cell count. The CVD kit is an efficient reagent for cell count in a porous matrix.

### Ordering Information

<table>
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<tr>
<th>Product Name</th>
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<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>CelCradle™ Stage</td>
<td>2230005</td>
<td>1x Main Console&lt;br&gt;1x Control Box&lt;br&gt;1x 100-240 V power adapter&lt;br&gt;1x Signal Cable&lt;br&gt;1x Manual CD&lt;br&gt;2x Forceps&lt;br&gt;1x Crystal Violet Dye Nucleus Count Kit</td>
</tr>
<tr>
<td>CelFeeder Pump</td>
<td>1400067</td>
<td>1x CelFeeder Pump</td>
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<tr>
<td>Tubing Complete Set</td>
<td>1400011</td>
<td>1x Disposable Tubing Accessory&lt;br&gt;1x Pump Head</td>
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<tr>
<td>Disposable Tubing Set &amp; Pump Head</td>
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<td>1x Tubing Set&lt;br&gt;1x Pump Head</td>
</tr>
<tr>
<td>Disposable Tubing Accessory</td>
<td>1400013</td>
<td>5x Disposable Tubing Accessory</td>
</tr>
<tr>
<td>GlucCell® Glucose Monitoring System</td>
<td>1400009</td>
<td>1 x GlucCell® Glucose meter&lt;br&gt;2 x Glucose Test Strip bt</td>
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<tr>
<td>GlucCell® Glucose Test Strip</td>
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<td>2 x Glucose Test Strip bts (2 x 25pcs)</td>
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<td>Crystal Violet Dye Nucleus Count Kit</td>
<td>1400014</td>
<td>1 x CVD Bottle (100ml/bt)</td>
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<td>Filtered Cap</td>
<td>1400015</td>
<td>Cap for CelCradle™ Bottle</td>
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<tr>
<td>Non-Vented Cap</td>
<td>1400016</td>
<td>Cap for CelCradle™ AP/Y Bottle</td>
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<tr>
<td>Forceps</td>
<td>1400017</td>
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CelCradle™ and CO₂ Incubator Combination

The CelCradle™ System can be incorporated into an existing CO₂ incubator and can also be purchased with an Esco CO₂ incubator. Esco offers a wide range of CO₂ incubators that suit clients’ different requirements and provide superior performance and cell protection.

CelSafe® CO₂ Incubator

Esco’s CelSafe® CO₂ incubator with touch screen user interface and latest advanced technology represents safety of your precious samples, efficiency on your lab work and enhanced user experience.

Features:

• 20°C High Heat Sterilization System
• Advanced Sensor Technology
• Optimized Chamber Design
• CelTouch Screen User Interface
  - Big, clear and easy-to-read parameter display
  - Easy to follow, on-screen icon menus
• Complete Data Collection and Graph Functions
• Green Product: Double Insulation System
• Optional Active Humidification System
• Complete Security System
• Available in 170 L and 240 L sizes
• Magnetic Door Lock
  - Manual and Automatic lock functions
  - Water Reservoir (Active Humidification Model)
  - User can precisely set %RH required for specialized application
• Water Pan (Standard Model)
  - Precisely heated by base heater to provide humidity
• USB Interface
  - For exporting of data log parameters
  - Entering set up parameters
  - Easy software updates
• Ribbed Type Chamber Design
  - Seamless design
  - Facilitates faster cleaning
  - More chamber space

GUIDE TO MODELS, CelSafe® CO₂ Incubators

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS-170-B-8</td>
<td>CelSafe® Incubator, 170 L, IR Sensor, CO₂ Control, High Heat Sterilization</td>
</tr>
<tr>
<td>CLS-170-B-8-RH</td>
<td>CelSafe® Incubator, 170 L, IR Sensor, CO₂ Control, High Heat Sterilization, Active Humidification</td>
</tr>
<tr>
<td>CLS-170-T-8</td>
<td>CelSafe® Incubator, 170 L, IR Sensor, CO₂ &amp; O₂ Control, High Heat Sterilization</td>
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<tr>
<td>CLS-170-T-8-RH</td>
<td>CelSafe® Incubator, 170 L, IR Sensor, CO₂ &amp; O₂ Control, High Heat Sterilization, Active Humidification</td>
</tr>
</tbody>
</table>

CelCulture® CO₂ Incubator

Sleek, reliable and intuitive, Esco CelCulture CO₂ incubators provide all-rounded sample protection that brings your scientific dreams one step closer to reality.

Features:

• HPA-validated 90°C Overnight Moist Heat Decontamination Cycle
• ISO Class 5 cleanliness via ULPA Filter System
• Direct heat, air jacketed system for fast and uniform heating and rapid recovery without overshoot
• Rounded corners and seamless design for easy cleaning
• Constructed using electrogalvanized with ISOCIDE™ powder-coating to eliminate 99.9% of surface bacteria within 24 hours of exposure
• With optional copper interiors for added antimicrobial protection
• Available in 50 L, 170 L and 240 L sizes
• ULPA Filter
  - 99.999% efficient, superior to conventional HEPA filters
  - Filters air continuously
  - Chamber returns to ISO Class 5 cleanliness in 13 minutes upon door closing to prevent contamination
**Guide to Models, CelCulture® CO₂ Incubators**

**IR Sensor Models with Stainless Steel Chamber**

<table>
<thead>
<tr>
<th>Models</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CCL-050A-8</td>
<td>CelCulture® Incubator, 50 L, IR Sensor, CO₂ Control, Moist Heat Decon</td>
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<tr>
<td>CCL-170A-8</td>
<td>CelCulture® Incubator, 170 L, IR Sensor, CO₂ Control, ULPA, Moist Heat Decon</td>
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<tr>
<td>CCL-170A-8-NF</td>
<td>CelCulture® Incubator, 170 L, IR Sensor, CO₂ Control, Moist Heat Decon, No ULPA Filter</td>
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**Suppressed O₂ Models with Stainless Steel Chamber**

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCL-050T-8</td>
<td>CelCulture® Incubator, 50 L, IR Sensor, CO₂ &amp; O₂ Control, Moist Heat Decon, 230 VAC, 50/60 Hz</td>
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<tr>
<td>CCL-170T-8</td>
<td>CelCulture® Incubator, 170 L, IR Sensor, CO₂ &amp; O₂ Control, ULPA, Moist Heat Decon, 230 VAC, 50/60 Hz</td>
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<tr>
<td>CCL-170T-8-NF</td>
<td>CelCulture® Incubator, 170 L, IR Sensor, CO₂ &amp; O₂ Control, Moist Heat Decon, 230 VAC, 50/60 Hz, (No ULPA Filter)</td>
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<tr>
<td>CCL-240T-8</td>
<td>CelCulture® Incubator, 240 L, IR Sensor, CO₂ &amp; O₂ Control, ULPA, Moist Heat Decon, 230 VAC, 50/60 Hz</td>
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<tr>
<td>CCL-240T-8-NF</td>
<td>CelCulture® Incubator, 240 L, IR Sensor, CO₂ &amp; O₂ Control, Moist Heat Decon, 230 VAC, 50/60 Hz, (No ULPA Filter)</td>
</tr>
</tbody>
</table>

**CelCulture® Stainless Steel CO₂ Incubator**

The Esco CelCulture® CO₂ incubator is also available with stainless steel exterior with the same superior features.

**Features:**
- Corrosion Resistant Surface
- Meets Pharmaceutical and Clinical Laboratory Requirements
- HPA-validated 90°C Overnight Moist Heat Decontamination Cycle
- ISO Class 5 cleanliness via ULPA Filter System
- Available in 50 L, 170 L and 240 L sizes
**CelCulture® Water-Jacketed CO₂ Incubator**

Esco CelCulture® Water-Jacketed CO₂ Incubator provides a very stable environment to grow and maintain cell cultures.

Water-Jacketed CO₂ Incubator can maintain temperature by surrounding the chamber by hot walls generated from the heated water. The heated water circulates and radiates heat around the inner chamber which maintains constant temperature.

Water-Jacketed CO₂ Incubator can hold the chamber temperature much longer when power is lost. The CO₂ incubator will also be able to recover temperature much faster after power failure as it also gets back more quickly as temperature settings change due to frequent opening of the door.

**Features:**
- More stable temperature control with faster recovery and better uniformity
- Increased temperature security during power failures
- HPA-validated 90°C Overnight Moist Heat Decontamination Cycle
- ISO Class 5 cleanliness via ULPA Filter System
- Constructed using electrogalvanized with ISOCIDE™ powder-coating to eliminate 99.9% of surface bacteria within 24 hours of exposure
- Available in 50 L, 170 L and 240 L sizes

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### GUIDE TO MODELS, CelCulture® Water-Jacketed CO₂ Incubators

#### IR Sensor Models with Stainless Steel Chamber

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
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<tbody>
<tr>
<td>230 V / 50-60 Hz</td>
<td>115 V / 50-60 Hz</td>
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<tr>
<td>CCL-050B-8-WJ</td>
<td>CCL-050B-9-WJ</td>
</tr>
<tr>
<td>CCL-170B-8-WJ</td>
<td>CCL-170B-9-WJ</td>
</tr>
<tr>
<td>CCL-240B-8-WJ</td>
<td>CCL-240B-9-WJ</td>
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#### Suppressed O₂ Models with Stainless Steel Chamber

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<td>CCL-050T-9-WJ</td>
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<tr>
<td>CCL-170T-8-WJ</td>
<td>CCL-170T-9-WJ</td>
</tr>
<tr>
<td>CCL-240T-8-WJ</td>
<td>CCL-240T-9-WJ</td>
</tr>
</tbody>
</table>
**CelCulture® CO₂ Incubator with Cooling System**

Esco CelCulture® CO₂ Incubator with Integrated Cooling System provides solution for highly specialized application. The integrated cooling system allows studies of samples that requires temperature at/or below ambient temperature.

**Features:**
- Wider temperature range of 12°C below ambient to 60°C above ambient
- Highly efficient, environmentally friendly Peltier Cooling System
- Constructed using electrogalvanized with ISOCIDE™ powder-coating to eliminate 99.9% of surface bacteria within 24 hours of exposure
- Complete contamination control methods
  - 90°C Validated Moist Heat Decontamination Cycle
  - ULPA Filter
  - 0.2 micron in-line filter
- Available in 170 L and 240 L sizes

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**GUIDE TO MODELS, CelCulture® CO₂ Incubators with Cooling System**

<table>
<thead>
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<tbody>
<tr>
<td>IR Sensor Models with Integrated Cooling System</td>
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<tr>
<td>230 V / 50-60 Hz</td>
<td>115 V / 50-60 Hz</td>
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<tr>
<td>CCL-170B-8-P</td>
<td>CCL-170B-9-P</td>
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<tr>
<td>CCL-240B-8-P</td>
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**Suppressed O₂ Models with Integrated Cooling System**

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<td>CCL-170T-9-P</td>
</tr>
<tr>
<td>CCL-240T-8-P</td>
<td>CCL-240T-9-P</td>
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</tbody>
</table>
How can 1 > 2?!
A single CelCradle™ bottle replaces hundreds of Petri dishes, tissue culture flasks, and dozens of spinner flasks, roller bottles, etc.

Real Scale-Down! Maximum Production! Ultimate Result!

1 CelCradle™ Stage accommodates 4 CelCradle™ bottles

Roller Bottles 850 cm²

x80

Spinner Flask 500 ml x16

Petri Dish 180 cm² x400

Plates 6320 cm² x8

Flask 150 cm² x500

VacciXCell
BIOPROCESSING SPECIALISTS

21 Changi South Street 1 • Singapore 486 777
Tel +65 6542 0833 • Fax +65 6542 6920
mail@vacciXcell.com • www.vacciXcell.com