

# ABLE 3D Magnetic Stir and Disposable Bioreactor System for Stem Cell Culture

## Cost-Effective, Scalable, Lab-Scale iPS Spheroid Cultures



### Overview

Growth of iPS cells in spheroid suspension culture (3D) closely resemble embryoid body structures naturally formed by embryonic stem cells. This 3D growth format offers improved yield, viability and high efficiency for the expansion of human iPS stem cells and differentiation in a cost-effective format.

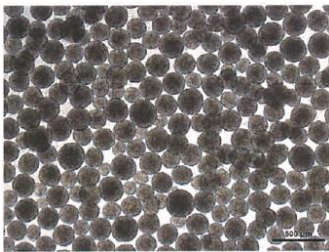
### The ABLE 30 mL Disposable Bioreactor

A delta-wing-shaped impeller with a magnet on each blade, located within the bioreactor, provides low-shear agitation by laminar flow, encouraging the formation and growth of uniform spheroid cell clusters.



The bioreactor allows for the flexibility of using seed stock from single-cell suspensions of iPS stem cells, passaged colony fragments, or mini-spheroids generated from low-adherence cell culture dishes or multi-well plates.

Bioreactor vessels of other sizes are available: 5 mL, 100 mL. The 5 mL size requires a different Stirrer Platform. A 500 mL size designed for a stand-alone bioreactor system, is also available



**Human iPS cells (cell line 1231A3) grown in StemFit™ medium** demonstrating the consistency of spheroid sizes after 4 days cultivation in the ABLE 3D Disposable Bioreactor at 40 rpm.

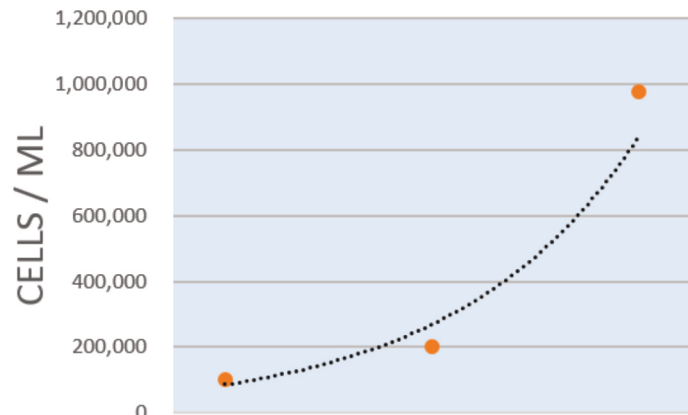
### Benefits of Spheroid Culture

The ABLE 30 mL Disposable Bioreactor provides a combination of efficiency, embryoid body formation, cell differentiation, and cost savings. The Bioreactor comes ready-to-use for non-adherent cell growth, eliminating the need for high-priced, high performance extracellular matrix (ECM) proteins for coating plasticware. One bioreactor enables expansion for up to  $5 \times 10^7$  cells; approximately equivalent to cell yield from

ten 10 cm culture dishes or ten 6-well plates. Ten dishes have approximately 550 cm<sup>2</sup> of combined surface area.

### Bioreactor Features

- Bioreactor capacity is 30 mL, enabling 5 to 10-fold cell expansion (up to  $5 \times 10^7$  cells)
- Typical growth is 200-300 μm spheroids
- Bioreactor is made of high density polycarbonate for compatibility with iPS stem cell cultivation
- Vessel interior is surface treated for bio-compatibility
- Polypropylene screw cap 0.2 μm nylon filter allows for passive gas exchange



### Single cell seeding provides for exponential growth

Human iPS cells (1231A3) were maintained on iMatrix-511 (Cat. No. NP891-011) – coated plates and grown in StemFit® medium (Cat. No. AKN02). Cells were harvested and dissociated into single cells using TrypLE Select (ThermoFisher), washed and counted. The single-cells were then seeded at  $10^5$  cells/mL in StemFit medium supplemented with 10 μM Y27632 (Cat. No. 04-0012) and transferred to the ABLE 30 mL Disposable Bioreactor with constant spinner agitation at 55 rpm. Cells were harvested at day 2 and day 4, and spheroids dispersed by TrypLE Select, stained with trypan blue and counted.

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AMSBIO | [www.amsbio.com](http://www.amsbio.com) | [info@amsbio.com](mailto:info@amsbio.com)

**AMSBIO LLC**  
USA & Canada   
1035 Cambridge Street,  
Cambridge, MA 02141  
T: +1 (617) 945-5033 or  
T: +1 (800) 987-0985  
F: +1 (617) 945-8218

**AMSBIO Europe BV**  
EU   
Berenkoog 41,  
1822 BH Alkmaar,  
Netherlands  
T: +31 (0) 72 8080244  
F: +31 (0) 72 8080142

**AMS Biotechnology (Europe) Ltd**  
UK & Rest of the World   
184 Park Drive, Milton Park  
Abingdon OX14 4SE  
T: +44 (0) 1235 828 200  
F: +44 (0) 1235 820 482

**AMS Biotechnology (Europe) Ltd**  
Switzerland   
Via Lisano 3,  
(CP.683)  
CH-6900 Massagno  
T: +41 (0) 91 604 55 22  
F: +41 (0) 91 605 17 85

**AMSBIO Europe BV**  
Deutschland   
T: +49 (0) 69 779099  
F: +49 (0) 69 13376880

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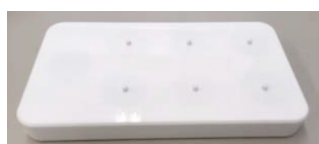
## Able Bioreactor Sizes



<b>Vessel Size:</b>	<b>5 mL</b>	<b>30 mL</b>	<b>100 mL</b>	<b>500 mL</b>
<b>Typical cell density:</b>	<b>10<sup>6</sup> cells</b>	<b>10<sup>7</sup> cells</b>	<b>10<sup>8</sup> cells</b>	<b>10<sup>9</sup> cells</b>
<b>Cat. No.:</b>	<b>ABBWVS05A</b>	<b>ABBWVS03A</b>	<b>ABBWVS10A</b>	<b>ABBWVS50A</b>



**Controller and Motor**



**Stirrer Platform**

### ABLE System Configuration

The ABLE 3D System has only two components: a six-channel magnetic stirrer platform (bottom, 30 mL size shown), and an electrical controller and motor unit (top). The Stirrer Platform is placed inside a CO<sub>2</sub> cell culture incubator allowing the temperature, humidity and gas controls to be passively managed. The controller unit attaches magnetically to the outside of the incubator, and the motor is connected to the Stirrer Platform by a cable.

REPROCELL Cat. No.	Able Product Code	Description	Size
ABBWDW-1013	DW-1013	ABLE Bioreactor Magnetic Stir System Controller and Motor	1 each
ABBWBP05N0S-6	BWS-S005N0S-6B	ABLE Bioreactor Magnetic Stir System Base 5 mL	1 each
ABBWBP03N0S-6	BWS-S03N0S-6B	ABLE Bioreactor Magnetic Stir System Base 30 mL and 100 mL	1 each
ABBWVS05A	BWV-S005A	ABLE 5mL Disposable Bioreactor	Pack of 6
ABBWVS03A-6	BWV-S03A	ABLE 30mL Disposable Bioreactor	Pack of 6
ABBWVS10A	BWV-S10A	ABLE 100 mL Disposable Bioreactor	Pack of 4
ABBWVS50A	BWV-S50	ABLE 500 mL Disposable Bioreactor	1 unit

## References

1. Matsuura K. Fabrication of mouse embryonic stem cell-derived layered cardiac cell sheets using a bioreactor culture system. *PLoS One* 7: e52176 (2012).
2. Matsuura K. Creation of human cardiac cell sheets using pluripotent stem cells. *Biochem Biophys Res Commun* 425: 321-327 (2012).

AMSBIO | [www.amsbio.com](http://www.amsbio.com) | [info@amsbio.com](mailto:info@amsbio.com)

**AMSBIO LLC**  
USA & Canada

1035 Cambridge Street,  
Cambridge, MA 02141  
T: +1 (617) 945-5033 or  
T: +1 (800) 987-0985  
F: +1 (617) 945-8218

**AMSBIO Europe BV**  
EU

Berenkoog 41,  
1822 BH Alkmaar,  
Netherlands  
T: +31 (0) 72 8080244  
F: +31 (0) 72 8080142

**AMS Biotechnology (Europe) Ltd**  
UK & Rest of the World

184 Park Drive, Milton Park  
Abingdon OX14 4SE  
T: +44 (0) 1235 828 200  
F: +44 (0) 1235 820 482

**AMS Biotechnology (Europe) Ltd**  
Switzerland

Via Lisano 3,  
(CP.683)  
CH-6900 Massagno  
T: +41 (0) 91 604 55 22  
F: +41 (0) 91 605 17 85

**AMSBIO Europe BV**  
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T: +49 (0) 69 779099  
F: +49 (0) 69 13376880