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

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

Overview

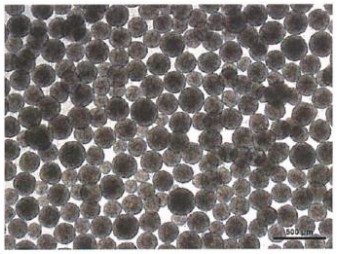
Growth of iPS cells in spheroid suspension culture (3D) closely resemble embryoid body structures naturally formed by embryonic stem cells. This 3D growth format offers improved yield, viability and high efficiency for the expansion of human iPS stem cells and differentiation in a cost-effective format.

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 usi 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



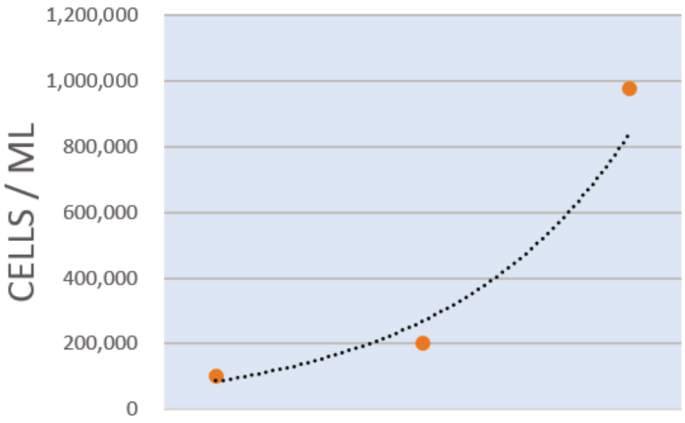
Human iPS cells (cell line 1231A3) grown in StemFit™ medium demonstrating the consistency of spheroid sizes after 4 days cultivation in the ABLE 3D Disposable Bioreactor at 40 rpm.

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 5×10^7 cells; approximately equivalent to cell yield from ten 10 cm culture dishes or ten 6-well plates. Ten dishes have approximately 550 cm^2 of combined surface area.

Bioreactor Features

- Bioreactor capacity is 30 mL, enabling 5 to 10-fold cell expansion (up to 5×10^7 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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Able Bioreactor Sizes

Vessel Size:	**5 mL**	**30 mL**	**100 mL**	**500 mL**
Typical cell density:	**10^6 cells**	**10^7 cells**	**10^8 cells**	**10^9 cells**
Cat. No.:	**ABBWVS05A**	**ABBWVS03A**	**ABBWVS10B**	**ABBWVS50B**

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_2 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**
ABBWVS10B	BWV-S10B	**ABLE 100 mL Disposable Bioreactor**	**Pack of 4**
ABBWVS50B	BWV-S50D	**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 Biophy Res Commun* 425: 321-327 (2012).