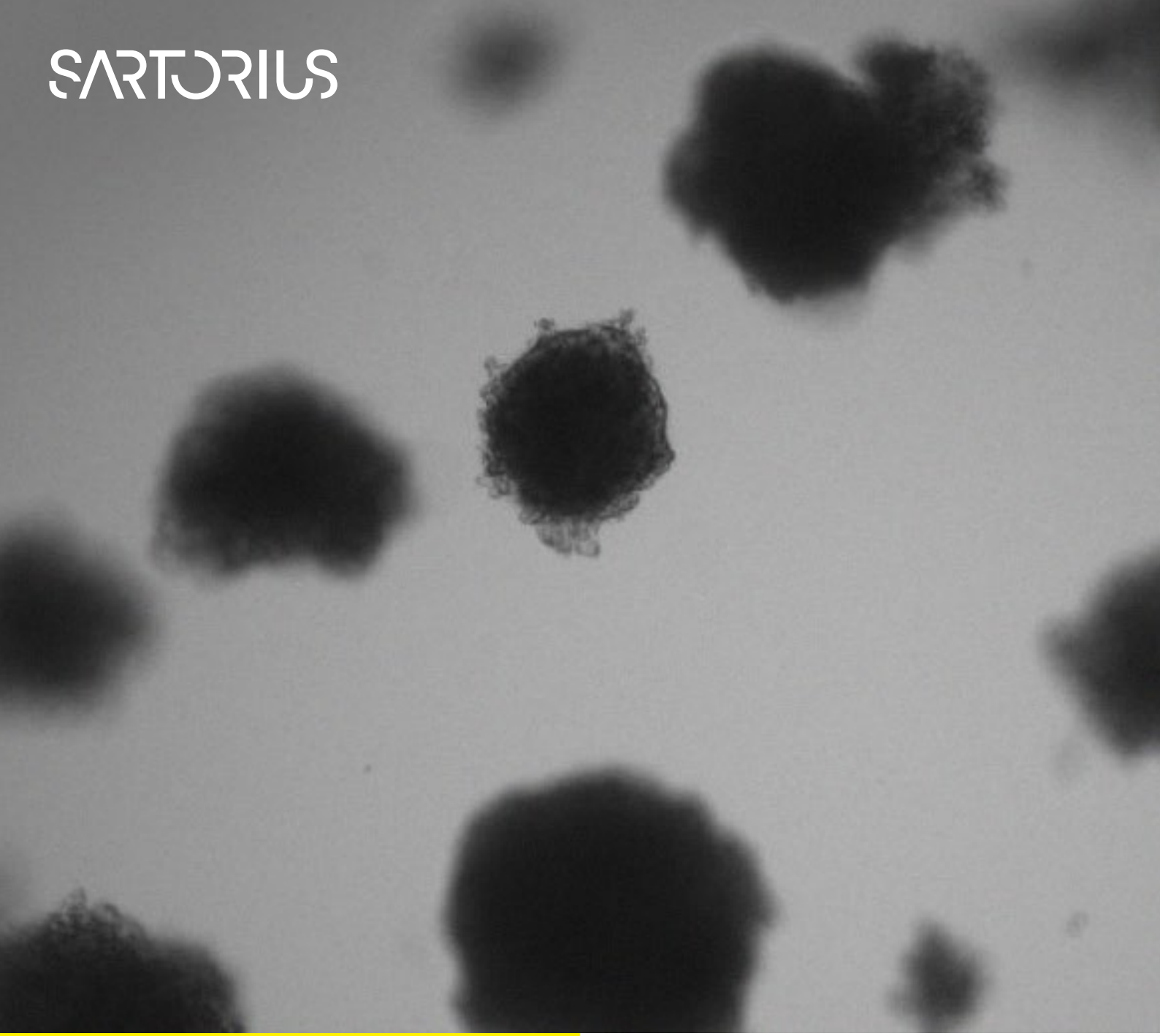


Cell Selection and Retrieval

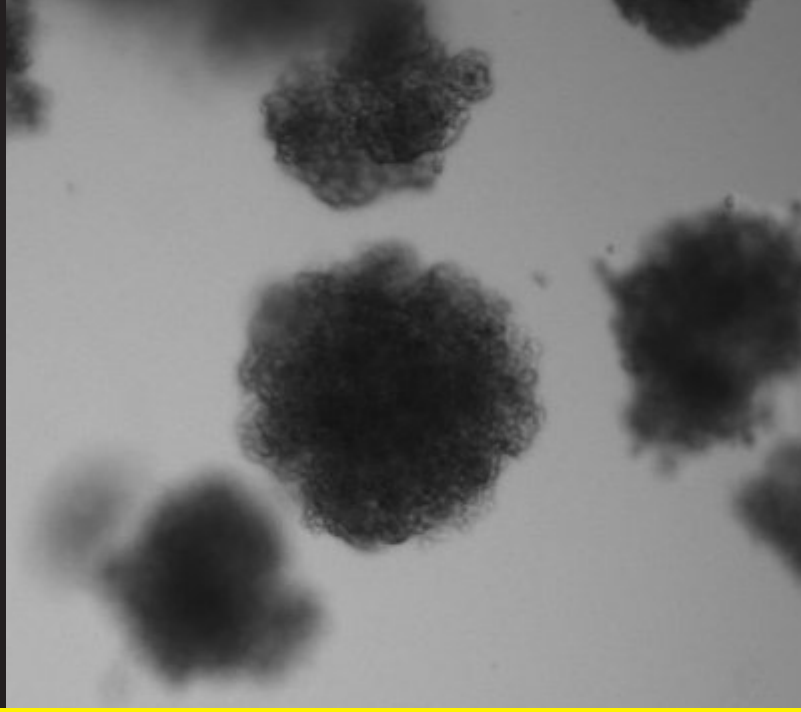
Organoids and Spheroids

Automated Workflows for the High-Throughput Selection and Picking of Complex 3D Structures

- Automated scanning, detection and gating of complex 3D structures based on a range of morphological parameters
- Organoid sizes from 80 µm to 3.5 mm
- Successful embedding of spheroids and organoids in 100% Matrigel into plates with or without cell culture membranes
- Low (1 µL) media injection volumes
- No aspiration of neighbouring clones

Organoid and Spheroid Research

Organoids are self-organizing, 3-dimensional systems which retain many physiological characteristics of the native tissue from which they are derived. Accordingly, these miniaturized models have significant advantages over the use of traditional immortalized cell lines in providing accurate information on human disease modelling and can be used in the fields of drug screening, rare disease research, personalized medicine, and many others.



Key Advantages of the CellCelector in Organoid Research

- Automated scanning, detection and gating of complex 3D structures based on morphological and fluorescence parameters
- Gentle picking of a wide range of organoid sizes, ranging from 80 µm to 3.5 mm
- No changes in 3D structure or morphology following picking and transfer
- Organoid transfer with exceptionally low (1 µL) injection volumes of surrounding media into either 100% hydrogel, liquid media or any other medium
- Successful embedding of spheroids and organoids in 100% Matrigel into plates with or without cell culture membranes
- Full documentation of transferred organoids – from source vessel to destination plate

Organoid Research: CellCelector Advantages

The CellCelector Flex has a number of inherent hardware features which are crucial for generating successful results within within various organoid applications:

Cooled Destination Plates

The use of the optional cooled deck tray can maintain hydrogel temperature at ~0 °C, thus preventing any polymerization before the organoid structure is deposited (Fig. 1). Increasing the temperature of deck tray up to 40 °C subsequently facilitates optimal polymerization.

Further information on the cooled deck tray can be found in the "**CellCelector Sample Deposition**" technical flyer.

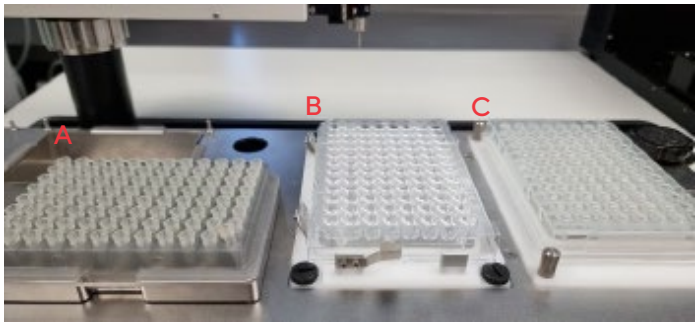


Figure 1: Cooled destination deck tray. (A) Rack containing 500 µm plastic PrecisionTips; (B) 96 well destination tray for organoid transfer; and (C) Cooled PCR plate containing 30 µl Matrigel in each well at approximately 0°C.

Automatic Morphology Measurements and Gating

Automatically identify desirable organoids based on a range of morphological parameters, including area, diameter, sphericity, and the presence of neighbouring organoids (Fig. 2).

Further information on object measurements and gating can be found in the "**CellCelector Image and Image Analysis**" technical flyer.

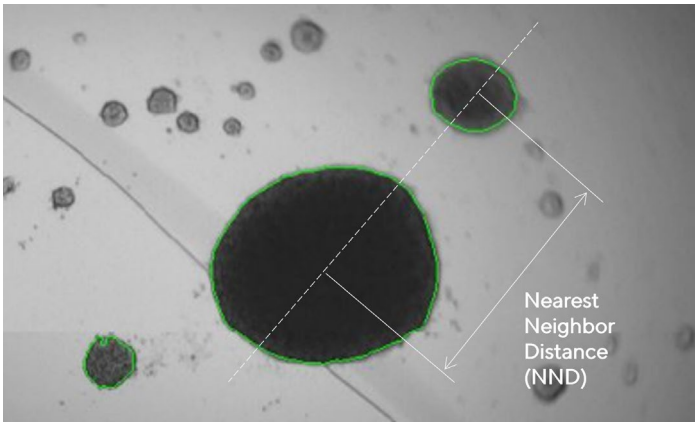


Figure 2: Nearest Neighbour Distance between a large heart organoid and its satellite organoid

Automated Picking Correction for Organoids in Suspension

Non-adherent organoids may move between scanning and picking. By using the automated correction pick-up functionality, organoids which might have moved can be easily picked within a pre-defined detection area (Fig. 3).

Further information on the automatic picking correction functionality can be found in the "**CellCelector Picking and Transfer**" technical flyer.

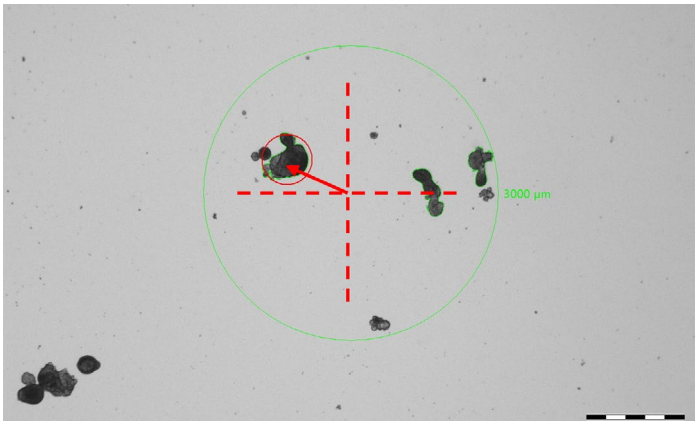


Figure 3: Automated picking correction for lung organoids in suspension

Picking From and Deposition Into 100% Hydrogel

Picking From Different Hydrogels

Organoids can be easily picked from a variety of hydrogels or liquid media without disturbing surrounding structures. In this example, organoids were efficiently picked from Matrigel® despite high organoid density across different planes (Fig. 4).

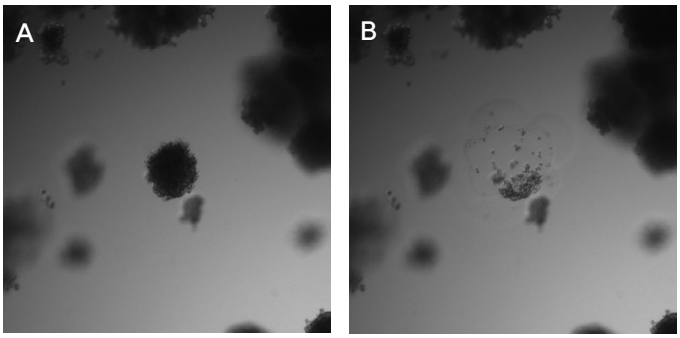


Figure 4: Accurate organoid selection and transfer from areas of high organoid density, (A) before and (B) after selection and transfer

Bubble-Free Deposition Into Hydrogel

Controlling aspiration speed, volume and destination temperature parameters allows 100% bubble-free organoid deposition into small volumes of hydrogel (<10 µL) or liquid media. Different approaches can be taken to achieve this. Destination plates can be kept at a continuously low temperature by the cooled deck tray allowing small hydrogel volumes to be aspirated and deposited without any polymerization, before the organoid is deposited directly into the hydrogel (Fig. 5). Conversely, both the hydrogel and the organoid can be aspirated in a single movement, before bubble-free deposition into the destination plate of choice (Fig. 6).

A key feature of both approaches are the low media volumes (<1 µL) aspirated with the organoid before deposition, therefore ensuring the organoids are surrounded by the optimal environment required for further growth and development.

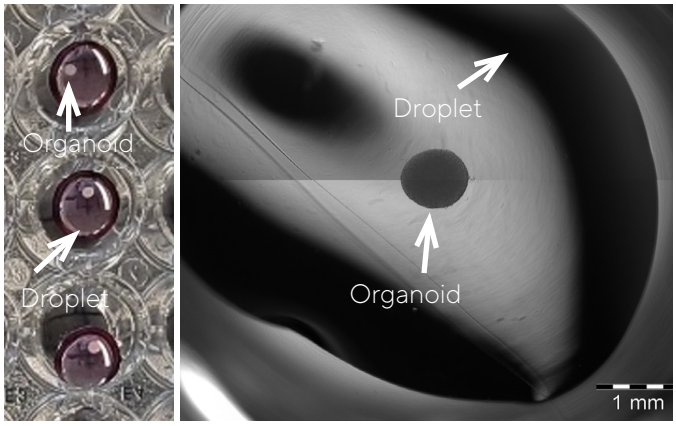


Figure 5: Photograph and scanning of the destination plate to verify deposits and the absence of air bubbles

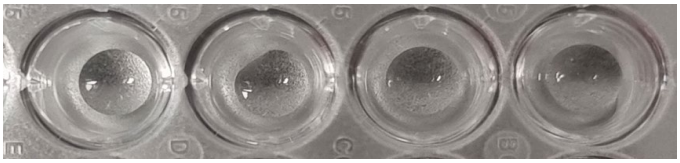


Figure 6: Photograph of bubble-free 10 µL and 20 µL Geltrex® droplets in U-bottom 96 well plates 90 mins after initial deposition

Morphology Preservation Following Transfer

Comparison of organoid images before (from the source plates) and after (from the destination plate) transfer shows that the organoids retain their morphology and structure due to the very gentle transfer. Additional downstream analysis confirmed internal structure preservation (Fig. 7).

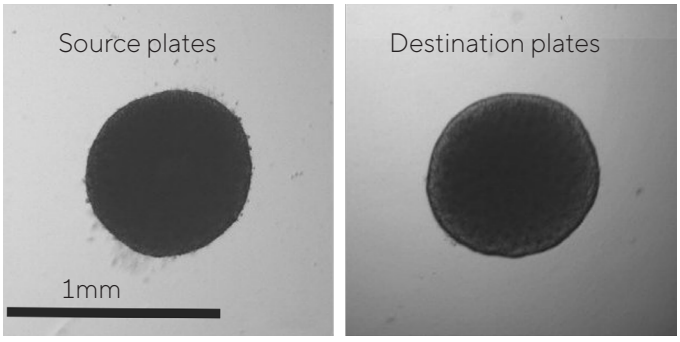


Figure 7: 700 µm heart organoids maintained their structure following gentle transfer

Germany
Sartorius Lab Instruments GmbH & Co. KG
Otto-Brenner-Strasse 20
37079 Goettingen
Phone +49 551 308 0

USA
Sartorius Corporation
565 Johnson Avenue
Bohemia, NY 11716
Phone +1 631 254 4249
Toll-free +1 800 635 2906

For further information, visit
www.sartorius.com

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