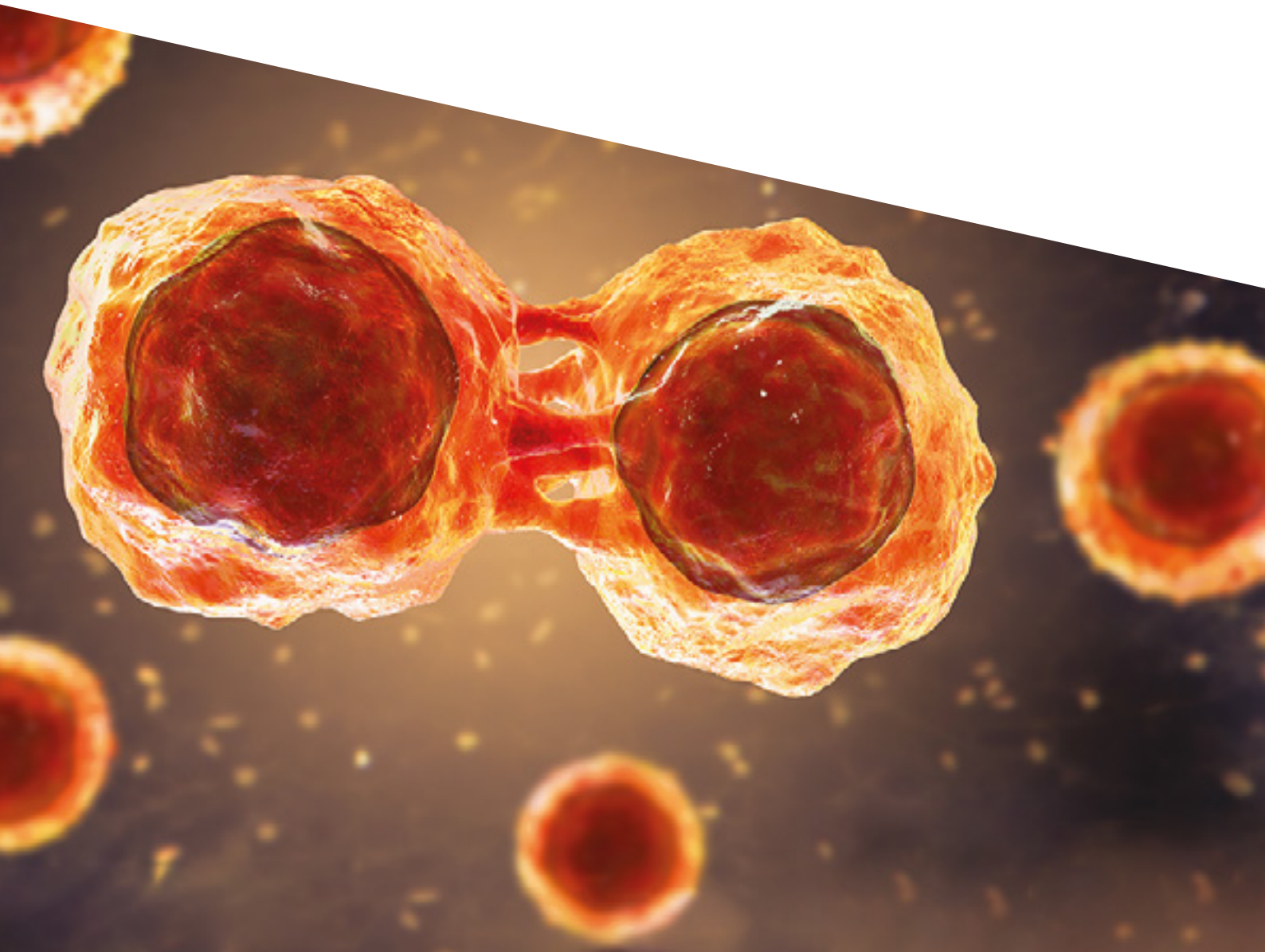
Your Partner in Cell Research

OLS
OMNI Life Science



Unraveling the Potential of Stem Cells

Opportunities for New Medical Treatments

www.ols-bio.de/stem-cell-research

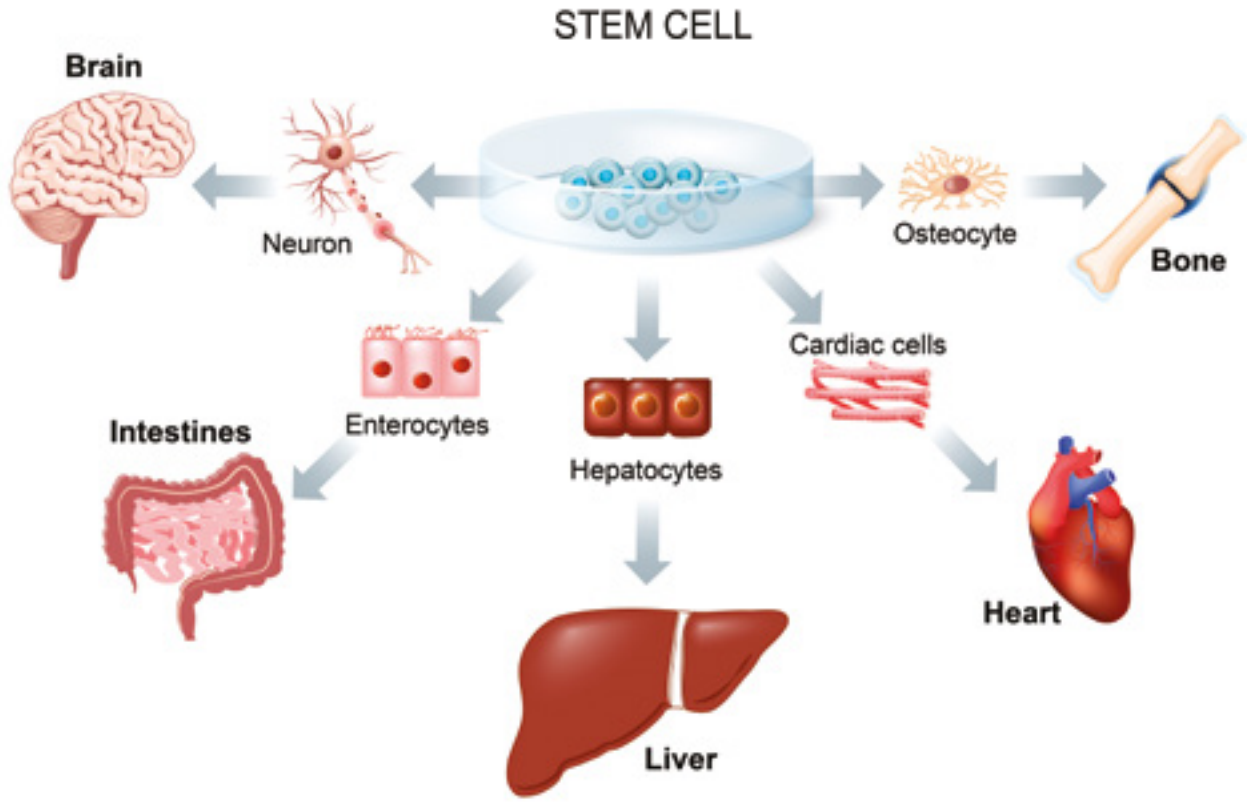
Unraveling the Potential of Stem Cells:
Opportunities for new medical treatments

Stem cells, with their unique properties and capabilities, have captured the attention of scientists, medical professionals, and researchers worldwide. Stem cell related models can help to understand how diseases occur and offer possibilities for new medical therapies.

Stem cells are undifferentiated cells that have the remarkable ability to self-renew and differentiate into various specialized cell types. They hold the key to regenerative medicine and offer exciting possibilities for addressing a wide range of health conditions. Stem cells can be broadly categorized into several types such as embryonic stem cells (ESCs), adult stem cells and induced pluripotent stem cells (iPSCs).

ESCs are derived from early-stage embryos and possess the broadest differentiative potential. They can give rise to cells of all three primary germ layers: ectoderm, mesoderm, and endoderm. However, the use of ESCs raises ethical concerns as their derivation requires the destruction of embryos.

Adult stem cells are found in specific tissues and organs of the body even after development. They play a vital role in tissue maintenance and repair. While their differentiation potential is more limited compared to ESCs, they still offer significant therapeutic potential. Examples of adult stem cells include hematopoietic stem cells found in the bone marrow and mesenchymal stem cells located e.g. in adipose tissue. iPSCs are reprogrammed somatic cells. They are reprogrammed by introducing suitable transcription factors into the cells whose over-expression induces pluripotency in these cells. Since they are reprogrammed from cells isolated from adult tissue, such as skin, blood and diverse other tissues, they do not raise ethical concerns, because no embryos are needed to generate them. iPSCs have almost the same differentiation potential as ESCs, making them indispensable for future medicine.

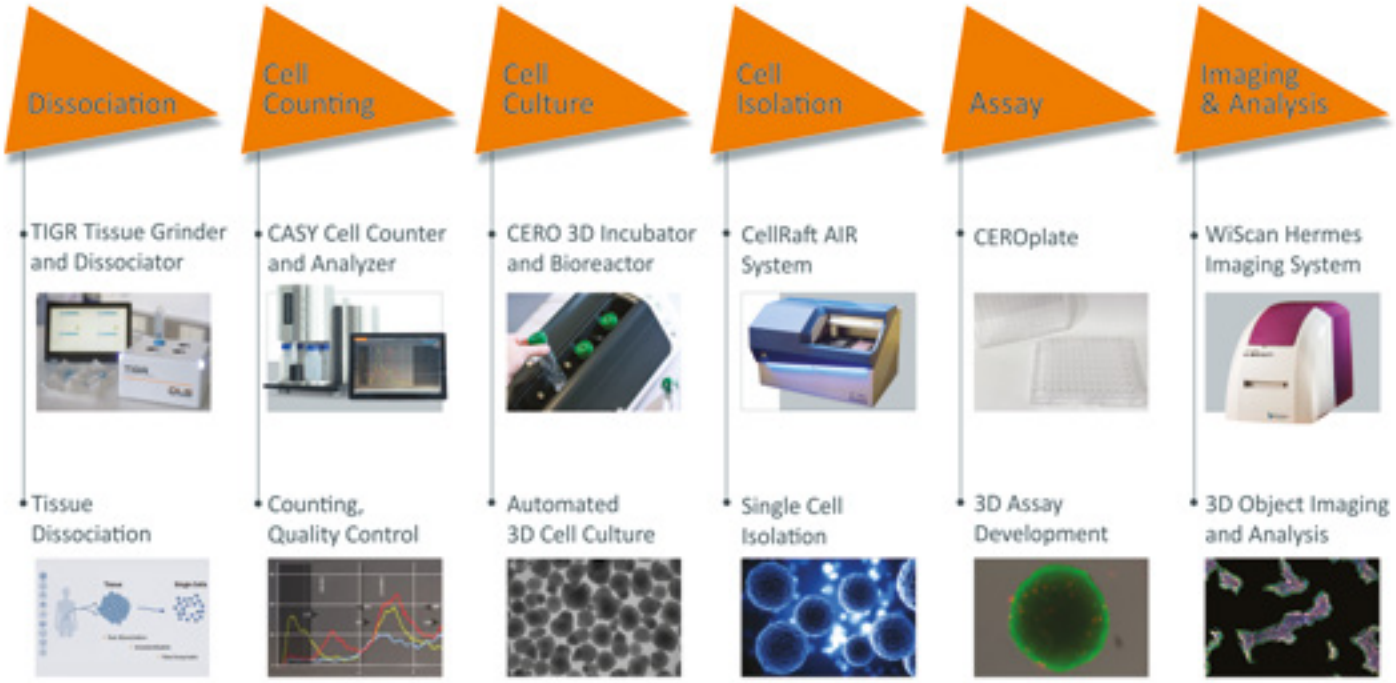


Stem cells are undifferentiated cells with the ability to differentiate into various specialized cell types.

Instruments to expedite your Stem Cell Research

Comprehensive workflow to assure your success

In this brochure, we will explore the fascinating world of stem cells and their potential applications. Find innovative devices designed to support stem cell research, clinical applications, and therapeutic interventions. Get an overview of the entire workflow starting with tissue dissociation and cell culture, following single cell isolation and ending with analysis and imaging.



Workflow comprising necessary steps from stem cell dissociation from tissues until high-content imaging.

(i) Tissue Grinder and Dissociator: Stem cells are isolated using the Tissue Grinder and Dissociator. Since stem cells are found in diverse tissues in low cell numbers, optimization steps may be necessary here. Alternatively, this step with the tissue grinder can be substituted with e.g. iPSC as a starting material.

(ii) CASY Cell Counter & Analyzer: Accurate and reproducible counting of a wide range of cells and sizes from large stem cell aggregates to small bacteria. The counter provides unmatched precision at high speed.

(iii) CERO 3D Incubator & Bioreactor: Expansion of stem cells, their differentiation or long-term culture of spheroids/organoids are conducted by their cultivation in the CERO 3D Incubator & Bioreactor.

(iv) CellRaft Air System: With the CellRaft Air System, it is possible to generate single cell clones that are isolated into a 96 well plate. Monoclonality of stem cells or organoids is confirmed by a track and trace function of images taken during the cell growth and isolation process.

(v) CEROplates: Further growth can be accomplished by cultivation of spheroids/organoids in ultralow attachment CEROplates.

(vi) WiScan Hermes High Content Imaging: Publication-quality images of spheroids/organoids can be taken at a high speed by using the WiScan Hermes High Content Screening Workstation.

TIGR Tissue Grinder and Dissociator

Single cell dissociation for tissue models

- Enzyme free
- Integrated cell strainer
- Single pack tubes

The TIGR Tissue Grinder and Dissociator provides a unique and effective concept to generate single cells. Enzyme-free and purely mechanical, it avoids cleavage and abrasion of membrane proteins, thus improving cell viability. The dissociation needs less than 5 min. 4 slots, which can be operated, allow high-throughput tissue dissociation.

CASY Cell Counter and Analyzer

Accurate counting of different cells and sizes

- Accurate and reproducible
- Simple and fast
- Cell number and volume

Accurate determination of cell concentration, cell volume, and viability is crucial for a wide array of cell types. Whether you are working with cell lines, primary cells, PBMCs, yeast, or even more specialized cells, CASY has you covered.

Say goodbye to tedious sample preparations. CASY's advanced technology allows for immediate measurements, even with challenging samples like induced Pluripotent Stem Cells (iPSCs), which often have a high level of aggregation. Utilizing a unique blend of Pulse Field Analysis and Electronic Current Exclusion (ECE), CASY can accurately determine the volume of all cellular aggregates. This eliminates the need for prior singularization, providing you with the total cell number in one straightforward step.

Passaging iPSCs as cell clumps (aggregates) is recommended because single iPSCs are more prone to die than cells that have direct contact to adjacent cells. To avoid single cells (for thawing and clump passaging), users usually do not want to disrupt cell aggregates.

Ideal partner for counting a wide range of cells.

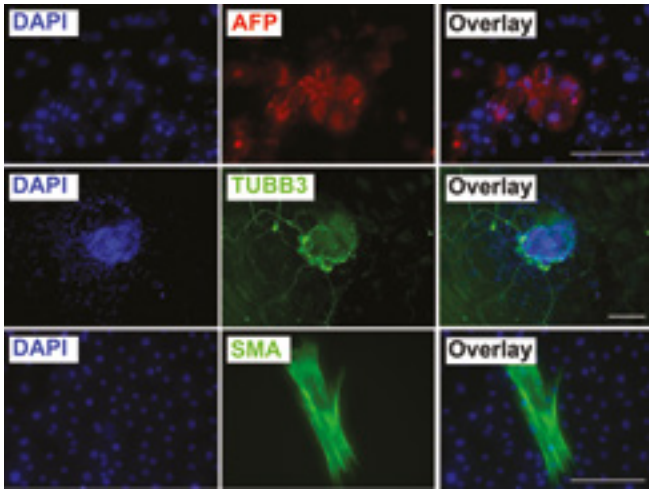
Instead, they are thawed and passaged as clumps, which improves cell viability. The downside is that many cell counters cannot determine the cell number correctly when the cells are aggregated, because they require singularized cells. In contrast to this, the CASY is able to count iPSCs even if the cells are highly aggregated. So, with the CASY there is no need to singularize the cells. The CASY also determines the cell number correctly after treating iPSC aggregates with different dissociation reagents: Treating iPSC aggregates with e.g., EDTA or Gentle Cell Dissociation Reagent, usually results in different clump sizes. The CASY automatically recognizes the extent of aggregation and carries out an aggregation correction, resulting in reliable and precise cell numbers.

CERO 3D Incubator and Bioreactor

Simplify your 3D cell culture

- Intuitive
- Standardized
- Flexible

The CERO 3D Incubator & Bioreactor is a new, revolutionary instrument creating an optimal cell culture environment. It offers a special 3D cell culture technology that monitors and controls temperature, pH and carbon dioxide levels. Indeed, this is an ever-evolving state-of-the-art dynamic culture system that accelerates your process , reduces costs and hands-on time and allows multiplexing (four 50 ml tubes enable four different experimental setups in one run). The CERO 3D offers dynamic cell culture conditions. In contrast to static cultures, it provides optimal nutrition, gas diffusion thus increasing size and lifespan of your cultures.

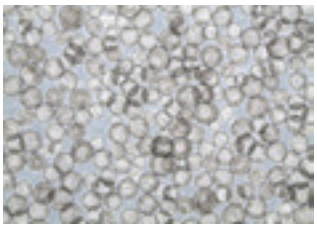


iPSC differntiation into all three germ layers
„A reproducible and versatile system for the dynamic expansion of human pluripotent stem cells in suspension; Biotechnol. J. 2015, 10, 1589–1599"

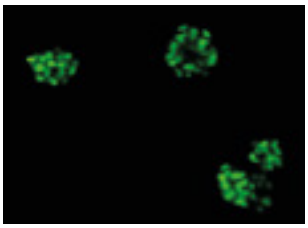
Stem cells and organoids: The CERO 3D Incubator & Bioreactor offers a comprehensive solution for stem cell expansion projects in biobanks, drug discovery, toxicity testing and regenerative medicine. By leveraging the CERO 3D´s ability for scale up (straight forward expansion of cells, spheroids and organoids), it simplifies the process while reducing costs significantly. This makes it an ideal choice for those looking to make their research more efficient without sacrificing quality or results.

Applications:

- Organoids
- Spheroids
- Suspension Cells
- Punch Biopsies
- Tissue explants



Semi-automated iPSC spheroid culture grown in CEROtubes in the CERO 3D. Bright field of uniform spheroids.



OCT4 positive iPSC derived embryoid bodies (EB).

The advent of long-term three dimensional cell culture holds a great promise in disease modeling and drug discovery. The cells kept in a 3D environment have the ability to mimic tissue-like structures more efficiently than in traditional 2D monolayer cultures. However, many scientist are struggling with numerous technical limitations when working with spheroids in long-term cultures.

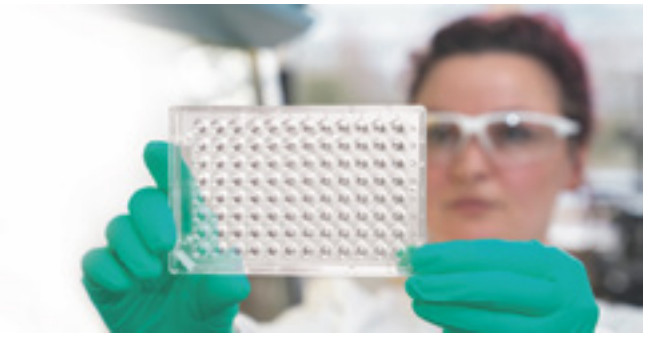
CERO 3D Incubator and Bioreactor ensures up to 100.000 organoids in one CEROtube under optimal cell culture conditions

CEROplates

Simple process for 3D aggregates

- Uniform spheroids
- High-throughput applications
- Organoid formation

The ultra-low attachment CEROplates, simplify the process for growing 3D aggregates. It features clear wells with U-bottom to make sample monitoring simple. The unique well geometry of the microplate aids in the formation of an unattached, round-shaped, single spheroid or organoid in the center of each well. This allows you to assay and analyze your 3D aggregates in the same plate without transfer. The CEROplates are compatible with existing readers, imaging systems, liquid handling and automated workstations.



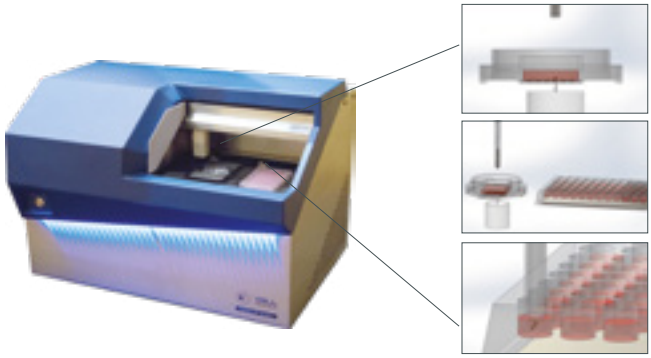
CellRaft AIR System

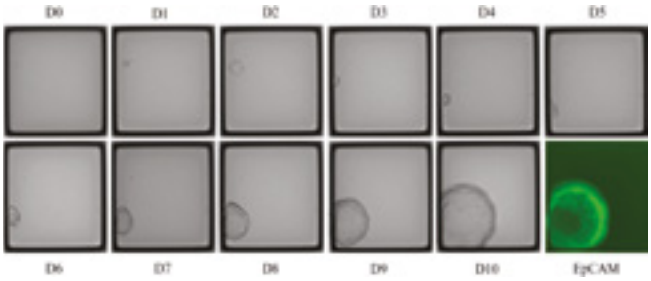
Generate hundreds of healthy monoclonal iPSCs or hESCs

- Improved cell viability
- High vitality of single cells
- Powerful analysis software

The CellRaft Technology with 3D capabilities offers a solution with fully automated imaging, analysis, and isolation workflow for monolayer single cells (e.g. isolation of single iPSC) and 3D organoid culture. Stem cells plated on the CellRaft Array show improved viability due to shared media (paracrine effect of secreted growth factors), low culture volumes, and isolation of intact clonal colonies from single iPSCs. With the CellRaft technology, the volume of expensive media, extracellular matrix, and viability enhancers are significantly reduced, leading to cost and consumable savings as well.

Grow and isolate iPSC-derived organoids: Utilize CellRaft Technology to grow and maintain hundreds of individual organoids that can be mono- or polyclonal. Serial imaging allows for longitudinal monitoring, while phenotypic characterization helps identify organoids of interest. Identified organoids can be further evaluated and selected for phenotypic characteristics, such as organoid diameter, circularity, and fluorescence intensity. The CellRaft AIR System offers a solution with a fully automated imaging and isolation workflow for organoid culture.





Organoid grown from a single cell (D0, Day 0) on a CellRaft for ten days and serially imaged.

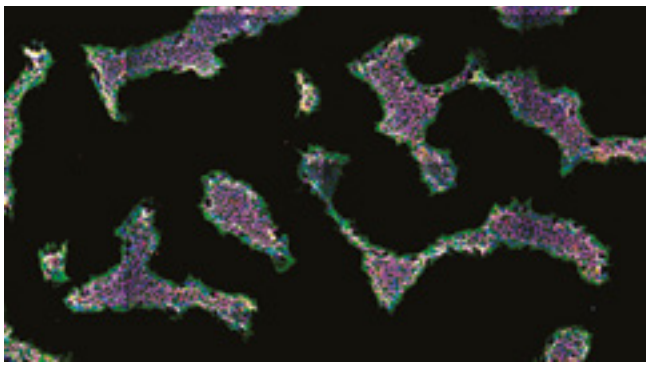
WiScan Hermes High-Content Imaging System

Ideal solution for high-content and high-throughput screening

- High-throughput
- High quality images
- Flexible and versatile

Dedicated to high-content imaging and analysis for image-based assays in cell biology studies and drug discovery processes, the High-Content Imaging System brings publication quality images at high-throughput speed to the research lab. Its built-in applications are extremely easy to use, and are operated at the push-of-a-button. Hermes is a sophisticated and flexible system, offering fluorescence colors, bright field option, laser based photo bleaching and a large range of air objectives and oil objectives. The system is ideal for a large variety of applications, including phenotypic screening, zebrafish models, spheroids and 3D models.

WiScan Hermes System-easily generate publication-quality images



Human induced pluripotent stem cell colonies labeled for pluripotency markers, which facilitate quantification of the population of cells.
Red= Oct4 pluripotency marker
Blue= DAPI
Green= SSEA-4 protein

Spheroids and 3D imaging

- Capture properly focused images of spheroids in an ideal growth environment in U-shape bottom plates
- Easily spot spheroids using unique methodology of rapid scanning for spheroid localization
- Simple and labour reducing automated analysis of spheroid relevant features
- Monitor spheroid growth over the entire plate using plate view
- Classify spheroids of specific, desired features using sub-population tool
- Apply live/dead spheroid assay to monitor viability of 3D stem cell and tumour spheroids
- Visualize spheroid morphology over a range of depths using flexible multi-plane definitions

Fast, automated imaging with oil immersion objectives, shorter exposure, brighter image, higher resolution

- Super-resolution radial fluctuations (SRRF) live-cell imaging
- Fluorescence in-situ hybridization (FISH)
- Microbiology, virology & yeast studies
- Spot / foci / granule visualization
- Mitochondria, and focal adhesion imaging
- Unique hardware automatically adds immersion oil to objectives
- No user intervention; no oil spilling
- Autonomous, rapid image acquisition for:
  - Full-plate scanning
  - Time-lapse imaging of live cells
- Optimized autofocus, X, Y, Z motion and long-duration oil capsules for easy maintenance

OMNI Life Science GmbH & Co. KG
Bremen, Germany

info@ols-bio.de
+49 421 27 61 69 0

OMNI Life Science GmbH
Basel, Switzerland

info@ols-bio.ch
+41 800 666 454

OMNI Life Science Nordics APS
Aabenraa, Denmark

hholm@ols-bio.com
+45 2679 4521

Find out more:

www.ols-bio.de