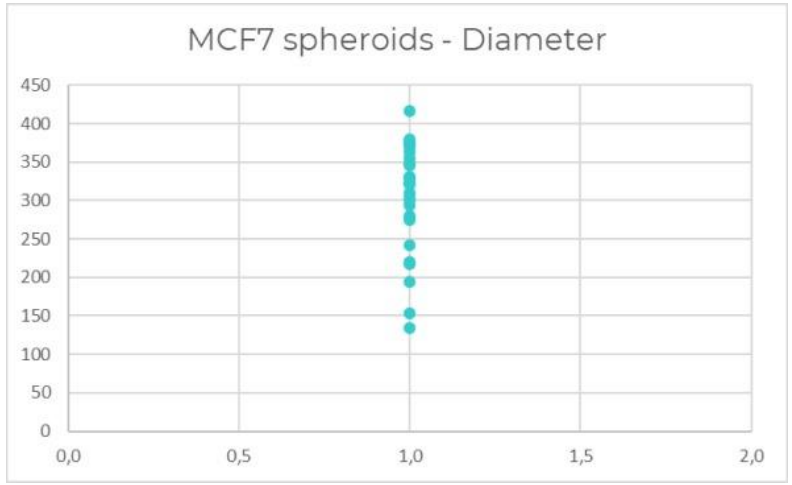
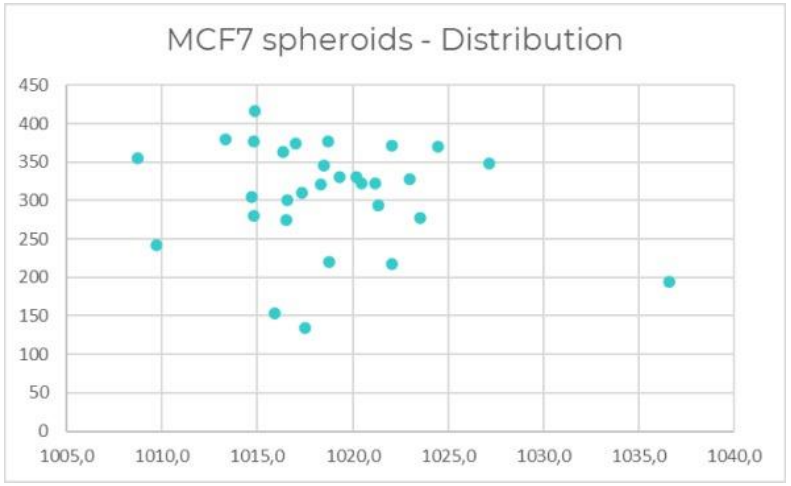
Spheroids and organoids represent a groundbreaking advancement in pharmaceutical research due to their revolutionary potential. However, their 3D structure adds a layer of intricate complexity with respect to conventional models. This leads to considerable variability and inconsistent reproducibility, which impedes the establishment of standardized procedures. Presently, the predominant approach to address such a heterogeneity rely on size-based selection. While this method provides some mitigation, it remains inadequate, particularly when based on the use of technologies designed for two-dimensional analysis and adapted for three-dimensional samples.

Shifting the Size Paradigm

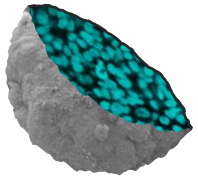




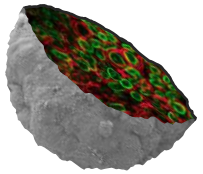
A size-based only distribution falls short in addressing the multifaceted nature of heterogeneity within 3D models. The issue lies in the misconception that uniform size alone can guarantee standardization. In reality, several other critical factors like compaction, cellular organization, ECM ratio or cavities , significantly influence variations in any treatment or test within 3D cellular models.

When assessing the same spheroids, beyond merely measuring diameters, but also incorporating their measured Mass Density values, more profound insights into the structure and organization of the examined organoid are unveiled. This result adds a second layer of information for the researcher, which strongly increases consciousness about the population under investigation.

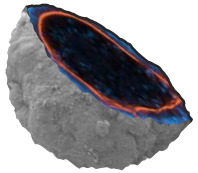
Mass Density Correlations: Impact in a nutshell



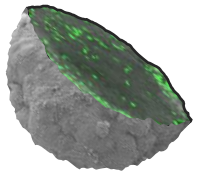
Cell Density
The mass density of an organoid is heavily contingent upon the number of cells per unit of volume. Often, an increase in cell number results in a corresponding increase in mass density.



Extracellular Matrix
Mass density variations are also influenced by extracellular matrix (ECM) components. Greater ECM concentration can lead to increased mass density, as it adds non-cellular mass to the organoid. The same can be consider for the Stroma.



Cavities
The existence of cavities or void spaces within the organoid can significantly impact mass density. Presence of cavities reduces mass density, as these regions contain less cellular and ECM material, while their absence leads to a higher mass density.



Mechanobiology
Mass density represents a compaction-related metrics that is strongly correlated to the mechanobiology involved in studies like cell-migration, permeation, activity/toxicity, co-culture distribution and so on.

Mass Density takes into consideration all the biological material present within the 3D Cell Culture volume.

W8 at a glance

OUTPUTS

SIZE (µm)

WEIGHT (ng)

MASS DENSITY (fg/µm³)

RECOVERY

Live

Sterile

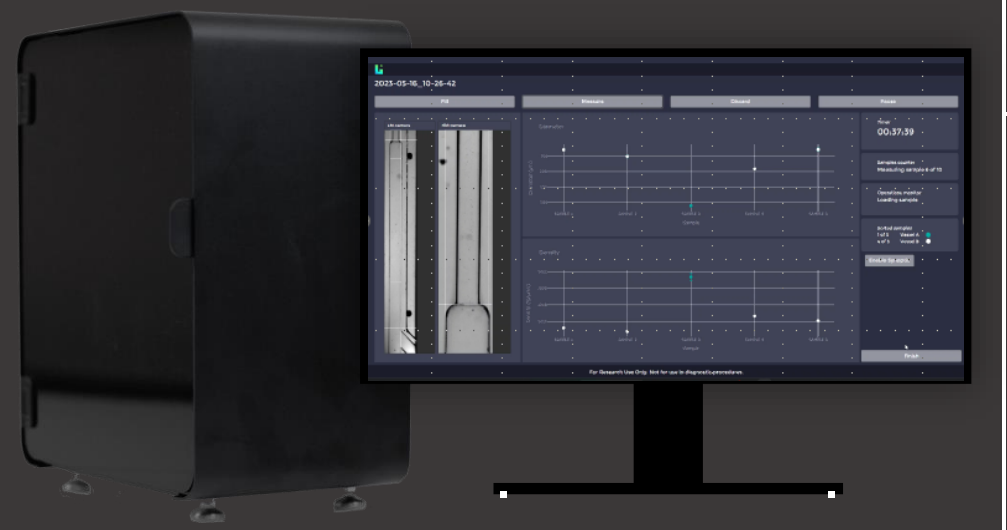
Lable Free

TROUGHPUT

Up to

15

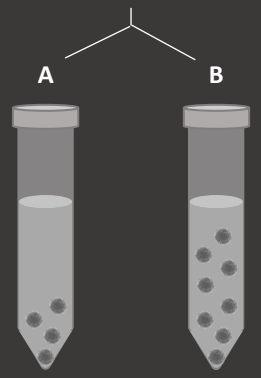
S / h



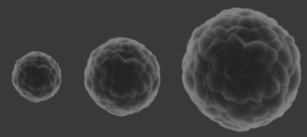
GENTLE SAMPLING

By MASS DENSITY

By SIZE



WORKING REGION



100 - 600 µm in diameter

High Content

Plug & Play

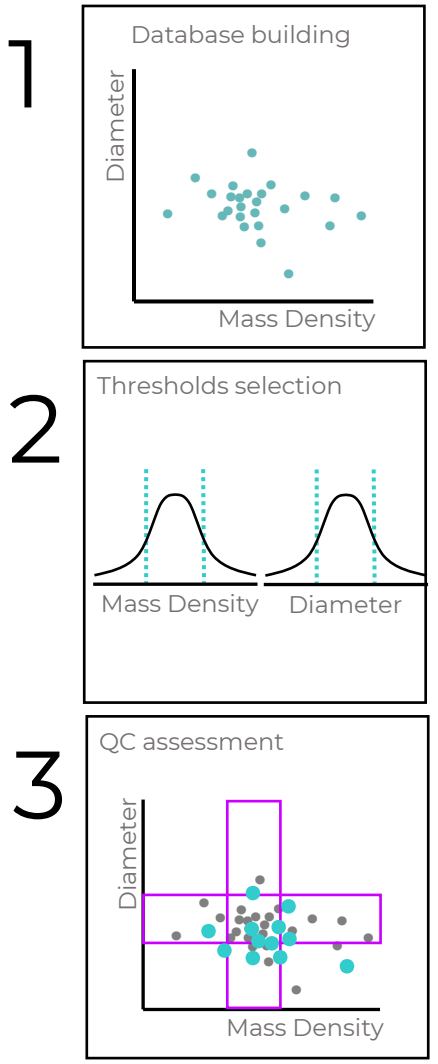
Easy to use

Reliable

Simple data Interpretation

A Quality Control approach for daily routine

3D cell culture heterogeneity stems from two sources: variability due to issues related to external factors (medium variations, unprecise cell-seeding, etc), and intrinsic cell line heterogeneity, linked to the nature of the culture. It is easy to understand how difficult can be to compare data between different batches, production days or even laboratories and operators, even when performing identical protocols, with heavy impact on data reliability at the end of the workflow. The new Mass Density vs Size distribution permits a unique and simple approach to strongly mitigate such a problem *via* the customizable three-step **database-related W8 QC Scoring Method**.



Redefining 3D Cell Culture characterization in Daily Routine

1 WEEK

Confocal microscopy setup

D1

PREPARATION
- Fixation 1h
- Clarification 1h

D2

PREPARATION
- Clarification 1h
- Labeling 1h

D3

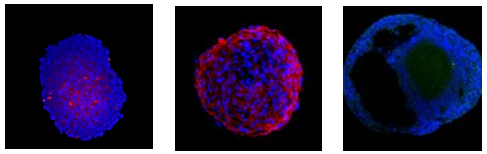
PREPARATION
- Labeling 1h

D4

ACQUISITION 2h
DATA ELAB. 1h

D5

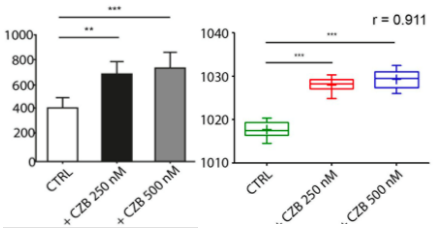
RESULT



CELL DENSITY | ECM | CAVITIES

H1,5

PREPARATION 15 MIN
ACQUISITION 60 MIN
DATA ELAB. 15 MIN
RESULT.



The W8 plays a pivotal role in the daily routine to quantify structural characteristics, as demonstrated by the perfect fit of mass density values with confocal investigations. This biomarker, provides a comprehensive overview that correlates with key structural metrics, including cellular density, extracellular matrix composition, and the presence or absence of cavities. Furthermore, the W8 facilitates the selection of the most suitable samples for in-depth confocal analysis.

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