Morphometric analysis of cell spheroids: volume and cell migration by high-throughput (HT) image analysis

PF.04-CHEC

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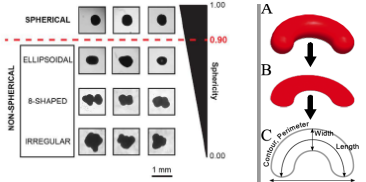
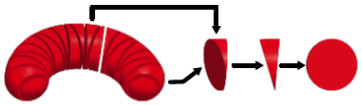
The spheroid model: biology and utility

- a standardized biologically relevant 3D cell assay to study cell proliferation, cell death, cell migration, cell-matrix, and cell-cell interactions
- HT molecular screening tests involving ***100s or 1000s of spheroids*** impose the need for HT microscopy and HT image analysis techniques

Spheroid volumes from 2D projections independent from spheroid shape

- contour subdivision into ▲ perpendicular to the central axis and volume reconstruction as a sum of half cylinders under assumed symmetry rules

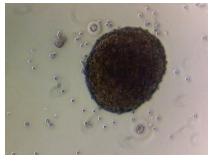


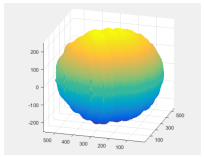


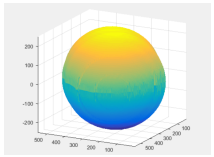
Zanoni et al. Scientific Reports 2016; 6:19103

Zeder et al. Microscopy&Microanalysis 2011; 17:799-809

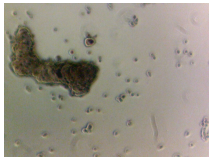
28 356 453 µm^3

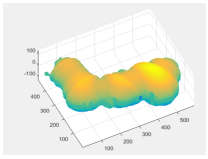


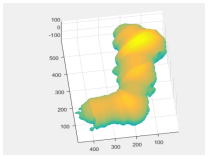


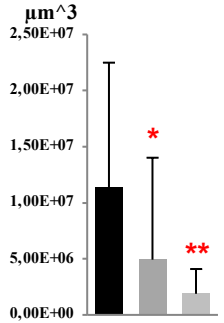


6 210 840 µm^3









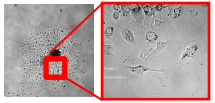
n = 242

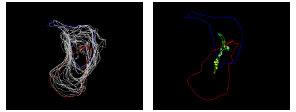
Quéré et al. 2021, in preparation

Volume measurements are a useful adjunct to molecular studies

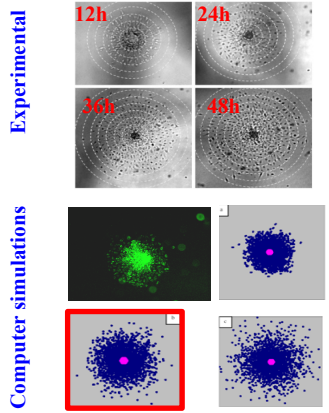
The cell automaton model of out-of-spheroid glioma cell migration (48h time-lapse)

- cells have limited choices between cases of preferential (white), permitted (grey), or prohibited (black) sites to which they may (or may not) potentially move

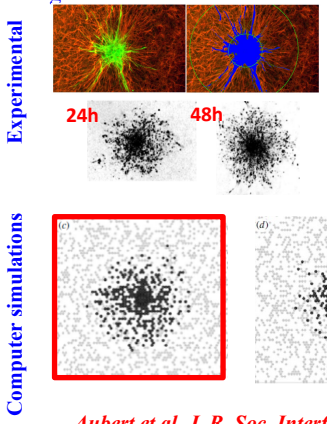




Migration of glioma cells on collagen IV



Migration on a sheet of confluent astrocytes



Aubert et al. Phys. Biol. 2006; 3: 93–100

Aubert et al. J. R. Soc. Interface 2008; 5: 75–83

Interactions between migrating glioma cells slow down migration

Interactions between migrating glioma cells and surrounding astrocytes speed up migration