

Is NanoShuttle™ biocompatible?

YES!

We get asked this question all the time, and the answer is always yes. NanoShuttle™ is a nanoparticle assembly (~50 nm) consisting of gold, iron oxide, and poly-L-lysine (PLL)¹ that attaches to the plasma membrane electrostatically (50 pg/cell).

NanoShuttle™:

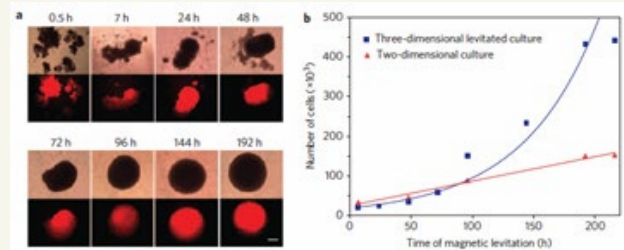
- Consists of biocompatible components: iron oxide and PLL are recognized as safe by the FDA^{2,3} and gold nanoparticles are in clinical trials for therapeutic use, with no indications for system toxicity⁴
- Does not bind any specific receptors, works with all cell types
- Will release off the cell over 7-8 days into the surrounding extracellular matrix, as shown by transmission electron microscopy (TEM)
- Requires magnetic forces (30 pN) only strong enough to aggregate but not harm cells
- Will not affect proliferation^{5,6}, viability⁶, metabolism^{5,7}, inflammatory⁵ or oxidative stress⁸, phenotype^{5,7,8}, and other macro cell functions
- does not cause any chromosomal abnormalities in cells, as shown by comparative genomic hybridization (CGH)

Overall, NanoShuttle™ is biocompatible and facilitates rapid 3D culture formation.

REFERENCES

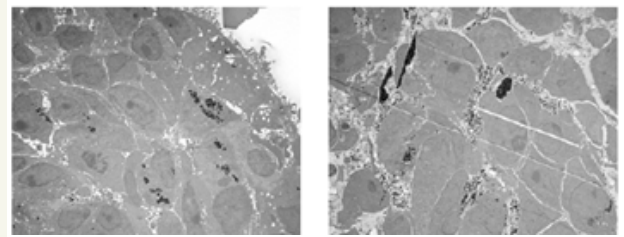
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5. Tseng et al. Tissue Eng. C. (2013)
6. Daquinag et al. Tissue Eng. C. (2013)
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Spheroid Growth



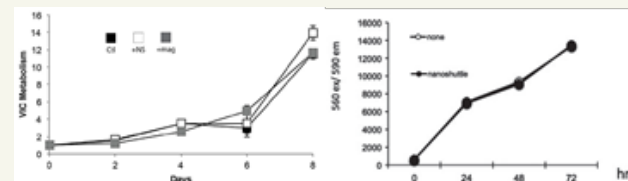
Over 8 d, mCherry-tagged glioblastoma grow faster in 3D vs. 2D¹

Transmission Electron Microscopy



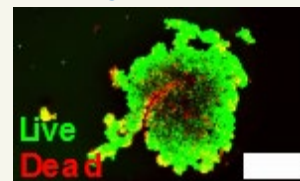
After 24 h (left), NanoShuttle™ is localized with the cells, but by 8 d (right) move out of the cell and into the extracellular space¹

Proliferation, Metabolism



Neither NanoShuttle™ nor magnetic forces have any effect on the proliferation of valvular interstitial cells (VIC, left)⁷ and 3T3 fibroblasts⁶ (right)

Viability



NanoShuttle™ has no effect on viability, as demonstrated by live/dead staining (live = green, red = dead) on magnetically 3D bioprinted spheroids of 10,000 HepG2 hepatocellular carcinoma cells in a 384-well plate. Scale bar = 500 μm