

Silica nanoparticles actively engage with mesenchymal stem cells in improving acute functional cardiac integration.

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Abstract

AIM:

To assess functional effects of silica nanoparticles (SiO₂-NPs) on human mesenchymal stem cell (hMSC) cardiac integration potential.

METHODS:

SiO₂-NPs were synthesized and their internalization effects on hMSCs analyzed with particular emphasis on interaction of hMSCs with the cardiac environment Results: SiO₂-NP internalization affected the area and maturation level of hMSC focal adhesions, accounting for increased in vitro adhesion capacity and augmented engraftment in the myocardial tissue upon cell injection in infarcted isolated rat hearts. SiO₂-NP treatment also enhanced hMSC expression of Connexin-43, favoring hMSC interaction with cocultured cardiac myoblasts in an ischemia-like environment.

CONCLUSION:

These findings provide strong evidence that SiO₂-NPs actively engage in mediating biological effects, ultimately resulting in augmented hMSC acute cardiac integration potential.