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The influence of carbon-encapsulated iron nanoparticles on elastic modulus of living human mesenchymal stem cells examined by atomic force microscopy

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HIGHLIGHTS

- Three types of carbon-encapsulated iron nanoparticles (CEINs) were synthesized and investigated their impact on cellular changes by atomic force microscopy (AFM).
- A significant difference of Young's modulus of the cells was revealed, even at low concentration of nanoparticles.
- The AFM measurement proved to be a useful tool not only for visualization, but also for identification of local cellular changes at the nanoscale after exposure to carbon-encapsulated iron nanoparticles.

Abstract

Nanomaterials and nanoparticles are regarded as promising candidates for various biomedical applications due to their unique physicochemical properties. In this study, three types of carbon-encapsulated iron nanoparticles (CEINs) were synthesized and their impact on cellular changes was investigated by atomic force microscopy (AFM). The AFM experiment was additionally compared with conventional methods, such as colorimetric assay and other microscopic techniques. A significant difference of reduced Young's modulus of the cells was revealed, even at low concentration of nanoparticles in the culture medium. The AFM measurement proved to be a useful tool not only for visualization, but also for identification

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