SEMICONDUCTOR NANOPARTICLES: A NEW CLASS OF FLUORESCENT BIOMARKERS

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Fluorescence provides a unique method for investigation the basic physical properties of biological structures. The high sensitivity of fluorescence, combined with advanced measurement techniques allows the detection of ultra small quantities of specific species present in a biological system. A large number of compounds have been used to generate fluorescence, such as organic molecules, fluorescent proteins, metal chelators, and chemi- and bioluminescent agents. But all of these fluorophores show one or more of the following disadvantages: lack of brightness; broad emission bands; cytotoxicity and high photobleaching rates. A new class of fluorescent materials, known as quantum dots (QDs), has attracted widespread interest in biology and medicine, and their application in these fields, constitutes nowadays one of the fastest moving interfaces of nanotechnology. The unique properties presented by QDs, especially their reduced tendency to photobleach and the dependence of their fluorescence wavelength on their size, make them suitable for fluorescent probing in *in vitro* and *in vivo* applications to a wide range of biological systems. Water soluble semiconductor QDs may be synthesized in order to target specific biomolecules, or even to interact with the whole cell/tissue, which may result in preferential localization into certain cell/tissues regions. The advances in the QD technology have unraveled a great deal of information about the cellular events with high levels of precision, such as molecular events in tumor cells and early diagnosis of cancer.
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