Sección temática: Biología Molecular y Biotecnología.

Quantum Dots.

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The purpose of this communication is to make a bibliographic review of Quantum Dots methods and their applications in the field of Biotechnology.

Quantum dots (QDs) are a novel class of inorganic fluorophores, which are gaining widespread recognition as a result of their exceptional photophysical properties. Typical dots are made of binary compounds such as lead sulfide, lead selenide, cadmium selenide, cadmium sulfide, indium arsenide, and indium phosphide. QDs are synthesized in organic solvents and treated later in an aqueous solution by noncovalent coatings with amphiphilic macromolecules.
In some medical treatments QDs are very important because they provide the possibility to localise biological ultrastructures that can be seen by electron microscopy. They have great potential in the area of biological imaging and diagnostic application. Combination of QD imaging with second-harmonic generation has allowed imaging of the allocation of blood vessels within the interstitium. Using QD microbeads of different sizes an assessment of tissue penetrability can be made, with infusion of these microbeads into the tumour vasculature showing differing distribution of the differently sized microbeads between intravascular and extravascular compartments.

Fluorescence resonance energy transfer (FRET) involves the transfer of fluorescence energy from a donor particle to an acceptor particle whenever the distance between the donor and the acceptor is smaller than a critical radius, known as the Förster radius. FRET is suited to measuring changes in distance, making it appropriate for measuring protein conformational changes, monitoring protein interactions and assaying of enzyme activity. QDs have been used in FRET technologies, particularly when conjugated to biological molecules, including antibodies, for being used in immunoassays but also for monitoring protein interactions.

In addition to their role in proteomic research, QDs may find use in RNA technologies, in detection of mRNA molecules and in combination with siRNA in RNA interference applications. Additional applications are the assaying of cell motility, becoming a significant alternative to gold particles. Given the above applications as immunofluorescence, QDs have superior optical properties that make it indisputable against other currently used imaging molecules, having a long way to research.

References

Jamiesona T, Bakhshia R, Petrovaa D, Pococka R, Imanib M, Seifalian AM. (2007). Biological applications of quantum dots. Biomaterial, 28: 4717-4732.

Luccardini C, Tribet C, Vial F, Marchi-Artzner V, Dahan M. (2006). Size, Charge and Interactions with Giant Lipid Vesicles of Quantum Dots Coated with an Amphiphilic Macromolecule. Langmuir 22: 2304-10.