Recent trends in the use of nanotechnology for the control of tumor markers

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Cancer diagnosis and therapy have experienced notable advances as a consequence of using Nanotechnology. In one hand, nanostructures are useful tools in cell proliferation and tumor marker assays to detect the presence and/or activity of tumor cells at relatively low percentages in biological fluids and/or tissues. On the second, modern therapies are based on drug delivery systems involving the use of nano-carriers, which decrease the side effects to patients and provide a higher effectiveness in the treatment of the disease.

Cancer diagnostics combines the use of imaging techniques and the detection of tumor markers in fluids and/or tissues. These markers are characterized by a glycoprotein structure and are mainly determined by using immunological mehods, which have traditionally involved the use of enzymes or fluorophores as labels. Nanoparticles (NPs) can be used in tumor marker assays as labels, nanoscaffolds and separation media. Carbon nanotubes, quantum dots, and noble metal, organic polymer, silica and magnetic NPs are the main nanomaterials that have shown their usefulness for these purposes up to date. Generally, the use of nanotechnology in tumor marker assays has provided them with shorter analysis times and higher sensitivity compared to the conventional methods. These assays can be miniaturized using microarray or microfluidic systems and allow the individual or multiplexed determination of tumor markers using direct, competitive or sandwich schemes.

It can be concluded that innovations in this field should be directed towards the development of multiplexed assays with application to real samples, which has been very scarcely reported up to date.