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# Nanoparticles for DNA and protein analysis

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**Abstract** – The talk will be an overview on the use of nanoparticles for DNA and protein analysis. The main objective is to design low cost, user-friendly and efficient electrochemical based sensors and biosensors that can be used even by non professional people for fast diagnostic at home or doctor's office, control of food quality, security as well as other applications where either an emergency exists or an alternative method toward the sophisticated and expensive laboratory instrumentation is being required. Some results obtained for DNA, protein and even cell detections will be shown

The DNA and protein sensors are playing a growing role in various fields where an accurate, low cost, fast and on-line measuring system is required. To improve the electrochemical assay sensitivity and to achieve a better and more reliable analysis there is a great demand for biomolecule labels with higher specific activity. The most used labels for electrochemical sensors up to date have been enzymes as well as small molecules like electroactive indicators (dyes, etc.). In principle nanoparticles provide a novel platform for improving specific activity of a label as well as affinity to the tracer molecules (DNA probes or other biomolecules). Nanosized particles have a chemical behavior similar to small molecules and can be used as specific electrochemical labels. Nanoparticles in general and quantum dots (QDs) particularly, may be expected to be superior in several ways. Compared to existing labels, nanoparticles in general and QDs especially, are more stable and cheaper. They allow more flexibility, faster binding kinetics (similar to those in a homogeneous solution), high sensitivity and high-reaction rates for many types of multiplexed assays, ranging from immunoassays to DNA analysis.

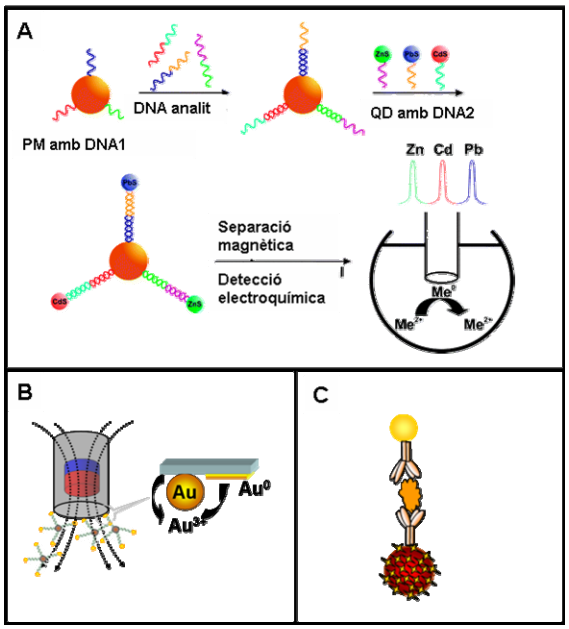


**Figure 1:** Schematic, not in scale, of A) multidetection technology of DNA based on three different quantum dots, ZnS, CdS and PbS; B) magnetic based genosensing using gold nanoparticles; C) immunosensing using gold nanoparticles as labels. Adapted from references 1,2,3.

The developed sensing platforms are applied for diagnostic as well as for other fundamental studies. Binding nanoparticles to a specific antibody for cancer cells could make cancer detection much easier. Based on these ideas specific optical & electrochemical biosensors with interest for DNA, protein and cell analysis are being designed and will be described in details.

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