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Bioconjugation of gold nanoparticles with DNA for *in situ* hybridization

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ABSTRACT

This paper examines the *in situ* hybridization (ISH) coupled with nanoparticle bioconjugates in order to address the disadvantages of using fluorescently labeled probes for ISH, as well as to access the permeability of nanoparticles across bacterial cell walls. Accordingly, relatively high hybridization temperatures are used, resulting in nanogold precipitation and leaving dark precipitated granules under the microscope. In particular, high dense black dots, representing nanogold particles sized 5–10 nm, are easily observable. Plasma membranes and cell walls measuring approximately 25 nm in thickness can also be observed within the cell. This paper specifically proves the binding of very small size (1 nm) nanogold particles exploiting streptavidin-biotin noncovalent systems. Accordingly, functionalized DNA gold nanoparticle surfaces are free to diffuse across bacterial membranes, hybridizing freely with 16s and 23s rRNA ribosomal targeted DNA. This ISH coupled with nanoparticle bioconjugates represents a beneficial tool in the detection of specific bacteria.

Keywords: Bioconjugates; Hybridization temperature; ISH; Nanoparticle; Nanogold

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