Nanoparticles simplify DNA identification and quantification

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In an article published in *Small*, researchers successfully applied a new qualitative and quantitative method for the detection of a DNA sequence characteristic of Leishmania infantum kinetoplast, a frequent parasite in veterinary that affects humans too.

Overcoming the classical PCR technique

The Polymerase Chain Reaction (PCR) is today's standard method to identify the presence of a specific DNA sequence in a sample. The PCR uses enzymes and two primers, strands of short nucleic acid sequences that serve as a starting point for DNA copy. When the detection is positive, this technique produces millions of copies of the problem sequence to facilitate its detection. This DNA amplification involves precise thermal changes (thermocycling) and sophisticated and expensive equipment, which are overcome by an alternative approach called isothermal amplification, performed at constant temperature.

The authors of the article present a novel design of isothermal amplification using primers labelled with both gold nanoparticles and magnetic microbeads. The amplified product carries both labels allowing a rapid purification and quantification. The magnetic properties of the first primer facilitate the purification/preconcentration of the amplified DNA through magnetic separation methods. On the other hand, the gold nanoparticles are easily quantified by simple electrocatalytic detection methods. Thus, the use of primers labelled with gold nanoparticles and

magnetic microbeads turns isothermal amplification into a faster and easier qualitative and quantitative diagnostic method.

Nanoparticles for Leishmania detection and other point-of-care tests

This approach was successfully applied for the detection of a DNA sequence characteristic of Leishmania infantum kinetoplast, a parasite responsible for a disease in domestic dogs, wild canids and humans. The electrochemical method exhibited a good reproducibility and sensitivity. Furthermore, amplified DNA from dogs without Leishmania was perfectly discriminated, demonstrating the specificity of both the amplification procedure and the electrochemical detection. In fact, the performance of the proposed approach is better than the obtained with other point-of-care tests for Leishmania detection, offering also a quantitative tool for parasite determination. This method represents a universal methodology that could be applied for any isothermal DNA amplification design.

More information: Alfredo de la Escosura-Muñiz et al. Magnetic Bead/Gold Nanoparticle Double-Labeled Primers for Electrochemical Detection of Isothermal Amplified DNA , *Small* (2015). DOI: 10.1002/smll.201502350

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