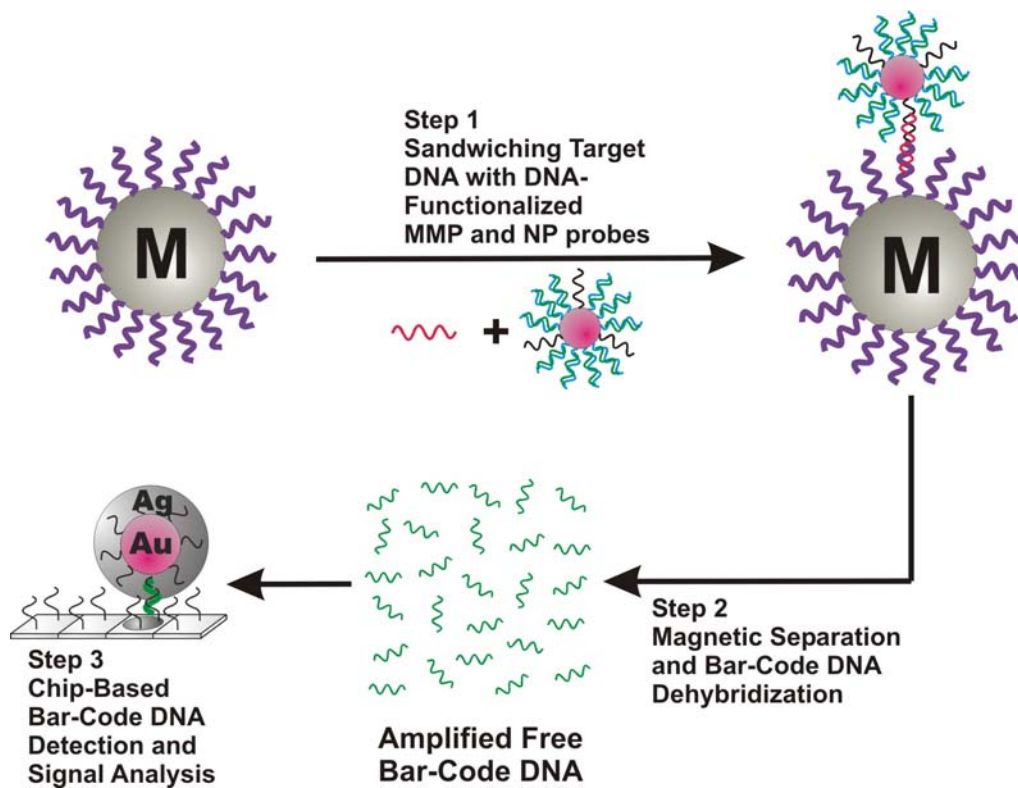


4.2.4 TARGET DNA DETECTION USING THE BCA AMPLIFICATION METHOD

J.-M. Nam, S. Stoeva, C. A. Mirkin; "Bio-Barcode-Based DNA Detection with PCR-like Sensitivity," *J. Am. Chem. Soc.* **2004**, *126*, 5932-5933.

Techniques have been developed to detect low concentrations of DNA. This bio-barcode amplification (BCA) assay has the potential for a wide range of applications including forensic science, molecular diagnostics, and infectious disease, where a fast, reliable, low-cost and user-friendly test is required. The BCA relies on two novel components – oligonucleotide-modified magnetic nanoparticles and probes. The modified nanoparticles contain recognition agents for a target disease. If the target is present, it will adhere to the magnetic nanoparticle. The nanoparticle probes with DNA strands (the bio-barcode strands) are added to the solution and form a sandwich complex with the target and the magnetic microparticle probes. A magnet is used to pull the particles to the side of the test tube and hold the captured target. The remainder of the sample is removed and the barcodes are then released by heating and detected by scanometry. For every target recognition event, 1000s of barcodes are released, thereby amplifying the signal. BCA is able to detect extremely small concentrations of the target. For example, BCA was able to detect *Bacillus anthracis* (anthrax) target DNA sequences as low as 500 zeptomolar (zepto = 10^{-21}).



A schematic representation of the BCA amplification method for target DNA detection.