



Collagen-coated magnetic nanoparticles to capture pathogens from biological samples

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Abstract

Conventional methods of diagnosing bacterial infections such as microbial culture and molecular techniques, while highly sensitive, rely on expensive equipment and highly skilled operators. There is a need for affordable and portable diagnostic systems which are simple to operate while preserving reliability. Pre-enrichment of bacteria present in a sample coupled with subsequent bacterial identification steps can serve as a simple yet effective diagnostic technique. Magnetic nanoparticles (MNPs) coated with collagen were used to demonstrate enrichment of *E.coli* recombinantly expressing adhesins YadA and UspA2 since these adhesins are known to target and adhere to host collagen. The MNPs were synthesized chemically and characterized by Fourier transform infrared spectroscopy and Dynamic light scattering and the most stable MNPs were selected. Adhesion assays were performed together with fluorescent microscopy imaging to assess the pre-enrichment of bacteria by the collagen MNPs. Capture of bacteria by the collagen MNPs was successfully observed and capture efficiency of the collagen MNPs for *E.coli* YadA and *E.coli* UspA2 was calculated to be 50% and 68% respectively.

Keywords: collagen magnetic nanoparticles; adhesins; YadA, UspA2, enrichment; diagnostics

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