Rapid and Facile Detection of Pathogenic Bacteria with the Naked Eye using Magnetophoretic Chromatography Technique

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A colorimetric method that uses magnetic nanoparticle clusters (MNCs) and magnetophoretic chromatography is developed to detect pathogenic bacteria. Monoclonal Escherichia coli O157:H7 (EC) antibodies were functionalized to MNCs and used to capture E. coli bacteria in milk. After magnetic separation of free MNCs and MNC-EC complexes from the milk, a precision pipette was used to imbibe the E. coli-containing solution, then a viscous polyethylene glycol solution. The MNC-EC complexes were separated from the free MNCs by applying an external magnetic field, then added to a tetramethylbenzidine (TMB) solution. Catalytic oxidation of TMB by Pt produced color changes of the solution, which enabled identification of low concentration of E. coli bacteria with the naked eye.