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Rapid Detection of *Escherichia coli* O157:H7 in Ground Beef Using a Fiber-Optic Biosensor

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ABSTRACT

A portable fiber-optic biosensor was used to detect *Escherichia coli* O157:H7 in seeded ground beef samples. The principle of the system is a sandwich immunoassay using cyanine 5 dye-labeled polyclonal anti-*E. coli* O157:H7 antibodies for generation of a specific fluorescent signal. Signal acquisition is effected by launching light from a 635-nm diode laser into a dual tapered 600- μ m silica fiber. Fluorescent molecules within approximately 100 nm of the fiber surface are excited by the evanescent field, and a portion of the emission recouples into the fiber. A photodiode allows for quantitation of the collected emission light at wavelengths of 670 to 710 nm. Biotin-avidin interactions are used to attach polyclonal antibodies specific for *E. coli* O157:H7 to the final 7.5 cm of the fiber probe. The biosensor was able to detect *E. coli* O157:H7 to 3 to 30 CFU/ml in seeded ground beef samples. The reaction was highly specific. Signals with *Listeria monocytogenes*, *Salmonella* Typhimurium, or *E. coli* nonO157:H7 were 2 to 3% of those observed with a similar concentration of *E. coli* O157:H7. Assays were conducted at or near real-time with results obtained within 20 min of sampling.