Introduction

The objective of this project is to evaluate commercially available and homemade lateral flow devices for detection of E. coli O157:H7 in raw milk and produce to make alternative rapid screening methods available to meet FDA and IDF’s mission of rapid detection of foodborne pathogens.

Summary

Detection of E. coli O157:H7 in produce and raw milk by standard methods can be difficult due to the low levels of contamination. However, many lateral flow assays are available for the rapid detection of E. coli O157:H7 in food samples. In this study, commercially available rapid screening lateral flow devices were used to detect E. coli O157:H7 in raw milk and produce. The principle behind these devices involves a combination of immunosorbent assay and a lateral flow assay. These devices can be used to detect E. coli O157:H7 in raw milk and produce at levels as low as 0.1 cfu/g.

Materials and Methods

Microorganisms

E. coli O157:H7 strains were used in the study: ATCC 15618 (strain 1), ATCC 6309 (strain 2), ATCC 19984 (strain 3), E. coli SE 4263 control.

Experimental Parameters

Levels of contamination with E. coli O157:H7 for each food are presented in Figure 1. For raw milk samples, 25 g portions were added to 225 mL of mBPWp and incubated at 37°C for 5 hours. For strawberry samples, approximately 45 g (1.5 x the Enterococcus standard) of strawberries were added to an equal weight of mBPWp and incubated at 37°C for 5 hours. After 24 hours, portions of the mBPWp sample were extracted and added to the RapidChek E. coli O157:H7 strip. For all lateral flow devices, an overnight enrichment step was necessary in order to detect E. coli O157:H7 at the low level (0.1 cfu/g). When incubation temperature was increased to 42°C for an additional 16 hours, E. coli O157:H7 was detected in 17/20 samples (Table 1).

Results

For EHEC strains from artificially contaminated raw milk, 25 g samples were enriched in mBPWp at 37°C for 5 hours and then analyzed using FDA BAM and the lateral flow device for a low level of contamination (0.1 cfu/g). Inoculated raw milk was incubated at 37°C and then overnight. All lateral flow devices gave positive results for E. coli O157:H7 at the low level of contamination. E. coli O157:H7 was detected in 19/20 samples by the FDA-Neogen 1.0, FDA-Neogen 2.0, RapidChek and VIP devices. For leafy greens (cilantro, spinach and Romaine lettuce) and strawberries, additional enrichment at 42°C was necessary to detect E. coli O157:H7. E. coli O157:H7 was recovered on all lateral flow devices for leafy greens and strawberries except for the Neogen 1.0 strain.

Conclusions

Lateral flow devices were shown to be effective for screening BAM EHEC enrichment cultures, for E. coli O157:H7 in produce and strawberries. For leafy greens (cilantro, spinach and Romaine lettuce) and strawberries, additional enrichment at 42°C was necessary to detect E. coli O157:H7. E. coli O157:H7 was recovered on all lateral flow devices for leafy greens and strawberries except for the Neogen 1.0 strain.