Isolation of Shiga Toxin-Producing *Escherichia coli* from Ground Beef Using Multiple Combinations of Enrichment Broths and Selective Agars

Victoria Brusa, 1,3 Pablo E. Piñeyro,2 Lucia Galli,3 Luciano H. Linares,1 Emanuel E. Ortega,1 Nora L. Padola,4 and Gerardo A. Leotta3

1Laboratorio de Microbiología de Alimentos, Facultad de Ciencias Veterinarias, Universidad Nacional de La Plata (UNLP), Buenos Aires, Argentina.
2Department of Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University, Ames, Iowa.
4Centro de Investigación Veterinaria Tandil, Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Comisión de Investigaciones Científicas de la Provincia de Buenos Aires (CICPBA), Facultad Ciencias Veterinarias, Universidad Nacional del Centro de la Provincia de Buenos Aires, Buenos Aires, Argentina.

**Abstract**

Shiga toxin-producing *Escherichia coli* (STEC) are foodborne pathogens, and beef cattle are recognized as the principal reservoir. The aims of this study were (1) to identify the most sensitive combination of selective enrichment broths and agars for STEC isolation in artificially inoculated ground beef samples, and (2) to evaluate the most efficient combination(s) of methods for naturally contaminated ground beef samples. A total of 192 ground beef samples were artificially inoculated with STEC and non-*stx* bacterial strains. A combination of four enrichment broths and three agars were evaluated for sensitivity, specificity, and positive predictive value for STEC isolation from experimentally inoculated samples. Enrichments with either modified tryptic soy broth (mTSB) containing 8 mg/L novobiocin (mTSB-8) or modified *Escherichia coli* (mEC) broth followed by isolation in MacConkey agar were the most sensitive combinations for STEC isolation of artificially inoculated samples. Independently, both enrichments media followed by isolation in MacConkey were used to evaluate ground beef samples from 43 retail stores, yielding 65.1% and 58.1% *stx*-positive samples by RT-PCR, respectively. No difference was observed in the isolate proportions between these two methods (8/25 [32%] and 8/28 [28.6%]). Identical serotypes and *stx* genotypes were observed in STEC strains isolated from the same samples by either method. In this study, no single enrichment protocol was sufficient to detect all STEC in artificially inoculated samples and had considerable variation in detection ability with naturally contaminated samples. Moreover, none of the single or combinations of multiple isolation agars used were capable of identifying all STEC serogroups in either artificially inoculated or naturally occurring STEC-contaminated ground beef. Therefore, it may be prudent to conclude that there is no single method or combination of isolation methods capable of identifying all STEC serogroups.


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