

RESEARCH ARTICLE

Incidence and Tracking of *Escherichia coli* O157:H7 in a Major Produce Production Region in California

Michael Cooley^{1*}, Diana Carychao¹, Leta Crawford-Miksza², Michele T. Jay², Carol Myers³, Christopher Rose⁴, Christine Keys⁵, Jeff Farrar³, Robert E. Mandrell^{1*}

1 Produce Safety and Microbiology Research Unit, United States Department of Agriculture-Agricultural Research Service, Western Regional Research Center, Albany, California, United States of America, **2** California Department of Health Services, Food and Drug Laboratory Branch, Richmond, California, United States of America, **3** California Department of Health Services, Food and Drug Branch, California, United States of America, **4** Central Coast Regional Water Quality Control Board, California Environmental Protection Agency, San Louis Obispo, California, United States of America, **5** Food and Drug Administration/Center for Food Safety and Applied Nutrition (CFSAN)/Office of Plant and Dairy Foods (OPDF)/DMS, College Park, Maryland, United States of America

Abstract

Fresh vegetables have become associated with outbreaks caused by *Escherichia coli* O157:H7 (EcO157). Between 1995–2006, 22 produce outbreaks were documented in the United States, with nearly half traced to lettuce or spinach grown in California. Outbreaks between 2002 and 2006 induced investigations of possible sources of pre-harvest contamination on implicated farms in the Salinas and San Juan valleys of California, and a survey of the Salinas watershed. EcO157 was isolated at least once from 15 of 22 different watershed sites over a 19 month period. The incidence of EcO157 increased significantly when heavy rain caused an increased flow rate in the rivers. Approximately 1000 EcO157 isolates obtained from cultures of >100 individual samples were typed using Multi-Locus Variable-number-tandem-repeat Analysis (MLVA) to assist in identifying potential fate and transport of EcO157 in this region. A subset of these environmental isolates were typed by Pulse Field Gel Electrophoresis (PFGE) in order to make comparisons with human clinical isolates associated with outbreak and sporadic illness. Recurrence of identical and closely related EcO157 strains from specific locations in the Salinas and San Juan valleys suggests that transport of the pathogen is usually restricted. In a preliminary study, EcO157 was detected in water at multiple locations in a low-flow creek only within 135 meters of a point source. However, possible transport up to 32 km was detected during periods of higher water flow associated with flooding. During the 2006 baby spinach outbreak investigation, transport was also detected where water was unlikely to be involved. These results indicate that contamination of the environment is a dynamic process involving multiple sources and methods of transport. Intensive studies of the sources, incidence, fate and transport of EcO157 near produce production are required to determine the mechanisms of pre-harvest contamination and potential risks for human illness.

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