

Outbreaks of Foodborne Diseases Associated with Tomatoes¹

Angela M. Valadez, Keith R. Schneider, and Michelle D. Danyluk²

Fresh-market tomatoes are a popular commodity in homes and food service around the world. The inherent risks of contamination by foodborne pathogens present a challenge to the produce industry and regulators. Since fresh-market tomatoes are intended to be consumed fresh, there is no “kill-step” in the processing that would eliminate pathogens in the event that tomatoes become contaminated (Maitland et al., 2011). Public health officials often meet numerous challenges when conducting traceback investigations in the event of a produce outbreak, such as tomatoes. It is often difficult for them to isolate organisms from the raw product, when the raw product may have been consumed, discarded, or reached the end of its shelf-life (Lynch et al., 2009). It can be difficult for public health officials to determine where the implicated food was produced. As a consequence, recognizing unusual food vehicles, such as certain items of fresh produce, can delay the foodborne outbreak investigation (Lynch et al., 2009).

A “case” in a foodborne illness outbreak is identified as an infected patient carrying a strain that was isolated from a collected stool sample and documented to be associated with an outbreak. The number of sporadic cases linked to the consumption of contaminated fresh fruits and vegetables is unknown (Heaton and Jones 2008).



Figure 1. Tomatoes
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This document is intended to serve as a reference for everyone concerned about the safety of fresh-market tomatoes by highlighting tomato-related outbreaks in the United States and Europe and reviewing locations and venues of tomato preparations as well as the severity of outbreaks. Three tables are presented, separated by foodborne outbreaks where tomatoes are confirmed as the food vehicle (Table 1); confirmed as part of complex foods vehicles (Table 2); and suspected, but not specified or confirmed, as the food vehicle (Table 3).

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2. Angela M. Valadez, graduate research assistant, CREC (Citrus Research and Education Center, Lake Alfred, FL); Keith R. Schneider, associate professor, FSHN (Food Science and Human Nutrition Department, UF Main Campus); Michelle D. Danyluk (contact author), assistant professor, CREC; Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

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Table 1. Outbreaks of foodborne disease associated with tomatoes, 1990–2009

Year	Month	Location	Pathogen ^b	Location of consumption	Cases (deaths)	Food Vehicle	Reference
1990	NR ^a	US (multistate)	<i>S. Javiana</i>	Various	176 (0)	Tomato	Hedberg et al., 1999
1993	NR	US (multistate)	<i>S. Montevideo</i>	Various	100 (0)	Tomato	Hedberg et al., 1999
1994	NR	US (AK)	Hepatitis A	Food handler	92 (0)	Diced tomato	FDA, 2009
2002	February	US (CT)	<i>S. Newport</i>	Private home	7 (0)	Grape tomato	CDC, 2011
2004	June	US (multistate)	<i>S. Braenderup</i>	Private home; Restaurant – other or unknown type	137 (0)	Roma tomato	CDC, 2011
2004	July	US (multistate)	<i>S. Anatum</i> ; <i>Javiana</i> ; <i>Muenchen</i> ; <i>Thompson</i> ; <i>Typhimurium</i>	Restaurant – other or unknown type	429 (0)	Roma tomato	CDC, 2011
2005	July	US (multistate)	<i>S. Newport</i>	Restaurant – other or unknown type	52 (0)	Tomato	CDC, 2011
2005	November	US (multistate)	<i>S. Braenderup</i>	Restaurant – other or unknown type	84 (0)	Roma tomato	CDC, 2011
2006	September	US (ME)	<i>S. Typhimurium</i>	Unknown	8 (0)	Tomato	CDC, 2011
2006	January	US (PA)	<i>S. Berta</i>	Hospital; Nursing home, assisted living facility, home care; Restaurant – other or unknown type	16 (0)	Tomato	CDC, 2011
2007	June	US (multistate)	<i>S. Newport</i>	Private home; Restaurant – other or unknown type	65 (0)	Tomato	CDC, 2011
2009	May	US (MI)	<i>S. Saintpaul</i>	Private Home; Restaurant – “Fast-food” (drive-up service or pay at counter); Restaurant – Sit-down dining	21(0)	Tomato	CDC, 2011

^aNR – Not reported

^bPathogens abbreviated and associated with outbreaks include various serotypes of *Salmonella* (*S.*).

Table 2. Outbreaks of foodborne disease associated with complex foods including tomatoes, 1979–2008

Year	Month	Location	Pathogen ^b	Location of consumption	Cases (deaths)	Food Vehicle	Reference
1979	NR ^a	US (MA)	<i>L. monocytogenes</i>	Hospitals	20 (5)	Tomato, lettuce, celery	FDA, 2009
1989	NR	US (multistate)	<i>G. lamblia</i>	Unknown	21 (0)	Lettuce, onion, tomato	FDA, 2009
1992	NR	UK	Norovirus	Hospital	NR	Lettuce, tomato	ACMSF, 2005; Hughes et al., 2007
1995	NR	UK	<i>S. Typhimurium</i> DT104	Hotel	NR	Sandwich of turkey and tomato	ACMSF, 2005; Hughes et al., 2007
1995	NR	UK	<i>E. coli</i> O157	Pub	NR	Lettuce, tomato	ACMSF, 2005; Hughes et al., 2007
1996	NR	UK	<i>Campylobacter</i>	Hotel	NR	Lettuce, tomato	ACMSF, 2005; Hughes et al., 2007
1996	NR	UK	Norovirus	Club	NR	Tomato and cucumber salad	ACMSF, 2005; Hughes et al., 2007
2003	NR	UK	<i>B. cereus</i>	Unknown	NR	Quiche (tomato, lettuce, mushroom)	ACMSF, 2005; Hughes et al., 2007
2008	July	US (CA)	<i>S. Blockley</i>	Private home	9 (0)	Mole (sauce); and, pasta with tomato sauce	CDC, 2011

^aNR – Not reported

^bPathogens abbreviated and associated with outbreaks include various serotypes of *Bacillus* (*B.*), *Escherichia* (*E.*), *Giardia* (*G.*), *Listeria* (*L.*), and *Salmonella* (*S.*).

Table 3. Outbreaks of foodborne disease where tomatoes are suspected, but not specified or confirmed, 1998–2011

Year	Month	Location	Pathogen ^a	Location of consumption	Cases (deaths)	Food Vehicle	Reference
1998/9	December/January	US (multistate)	<i>S. Baildon</i>	Nursing home, assisted living facility, home care	86 (3)	Tomato, unspecified	CDC, 2011
2000	November	US (multistate)	<i>S. Thompson</i>	Private home	43 (0)	Tomato, unspecified	CDC, 2011
2002	July	US (multistate)	<i>S. Newport</i>	Hospital; Restaurant – other or unknown type; School	510 (0)	Tomato, unspecified	CDC, 2011
2002	June	US (MA)	<i>S. Javiana</i>	Other; Restaurant – other or unknown type	3 (0)	Tomato, unspecified	CDC, 2011
2002	June	US (FL)	<i>S. Javiana</i>	Restaurant – other or unknown type	159 (0)	Tomato, unspecified	CDC, 2011
2003	March	US (CA)	<i>S. Virchow</i>	Other	11 (0)	Tomato, unspecified	CDC, 2011
2003	June	US (CA)	<i>S. Saintpaul</i>	Private home; Restaurant – other or unknown type	17 (0)	Mango, unspecified; Tomato, unspecified	CDC, 2011
2003	November	US (multistate)	<i>S. Saintpaul</i>	Restaurant – other or unknown type	33 (0)	Chicken, unspecified; Iceberg lettuce, unspecified; Tomato, unspecified	CDC, 2011
2005	July	US (NY)	<i>S. Newport</i>	Grocery store; Picnic; Private home; Restaurant – other or unknown type	27 (0)	Onion, unspecified; Tomato, unspecified	CDC, 2011
2005	June	US (WY)	<i>S. Enteritidis</i>	Private home; Restaurant – other or unknown type	20 (0)	Egg, unspecified; Tomato, unspecified	CDC, 2011
2005	June	US (CA)	<i>S. Enteritidis</i>	Picnic; Private home; Restaurant – other or unknown type; Workplace, not cafeteria	85 (0)	Salsa, unspecified	CDC, 2011
2006	June	US (MD)	<i>S. Typhimurium</i>	Private home; Restaurant – other or unknown type	18 (0)	Lettuce, unspecified; Tomato, unspecified	CDC, 2011
2006	September	US (multistate)	<i>S. Typhimurium</i>	Private home; Restaurant – other or unknown type	192 (0)	Tomato, unspecified	CDC, 2011
2006	June	US (multistate)	<i>S. Newport</i>	Restaurant – other or unknown type	115 (0)	Tomato, unspecified	CDC, 2011
2007	June	US	<i>S. Newport</i>	Private home; Restaurant – other or unknown type	46 (0)	Avocado, unspecified; Cilantro; Guacamole, unspecified; Tomato, unspecified	CDC, 2011
2007	June	US (MD)	<i>S. Javiana</i>	Private home; Restaurant – other or unknown type	5 (0)	Cheese, unspecified; Chicken, unspecified; Tomato, unspecified; and, Unspecified fruit	CDC, 2011
2007	July	US (NY)	<i>S. Newport</i>	Unknown or undetermined	10 (1)	Tomato, unspecified	CDC, 2011
2007	October	US (MN)	<i>S. Typhimurium</i>	Restaurant – other or unknown type	23 (0)	Tomato, unspecified	CDC, 2011
2008	July	US (CA)	<i>S. Braenderup</i>	Restaurant – other or unknown type	17 (0)	Salsa, unspecified	CDC, 2011
2008	April	US (IA)	<i>S. Braenderup</i>	Restaurant – other or unknown type	12 (0)	Green salad; Tomato, unspecified	CDC, 2011
2011	October	Denmark	<i>S. Strathcona</i>	Various locations	43 (0)	Tomato, unspecified	SSI, 2012

^aPathogens abbreviated and associated with outbreaks include various serotypes of *Salmonella* (*S.*).