

Risk Factors for Sporadic *Escherichia coli* O157 Infections in the United States: Case-control Study in FoodNet Sites 1999-2000

M.H. Kennedy MPH¹, T. Rabatsky-Ehr MS, MPH², S.M. Thomas MSPH³, S. Lance-Parker DVM, PhD³, J. Mohle-Boetani MD⁴, K. Smith DVM, PhD⁵, W. Keene PhD, MPH⁶, P. Sparling DVM, MS⁷, F.P. Hardnett MS¹, P.S. Mead MD¹ and the EIP FoodNet Working Group

¹ Centers for Disease Control and Prevention, Atlanta, GA

² Connecticut Emerging Infections Program, Yale University, New Haven, CT

³ Georgia Division of Public Health, Atlanta, GA

⁴ California Department of Health Services, San Francisco, CA

⁵ Minnesota Department of Health, Minneapolis, MN

⁶ Oregon Department of Human Services, Portland, OR

⁷ USDA, Food Safety and Inspection Service, Washington, D.C.



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Escherichia coli O157:H7

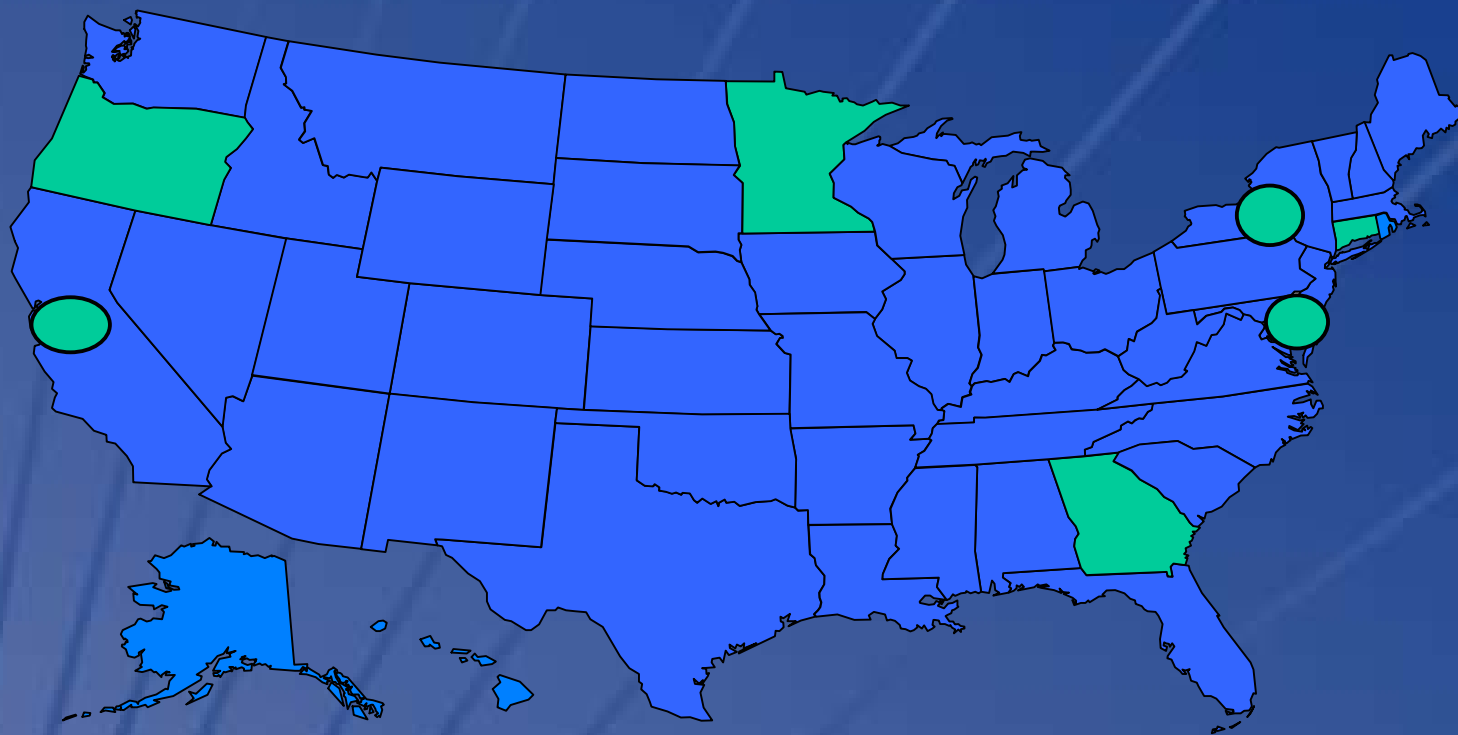
- **Illness characterized by:**
 - **Diarrhea, often bloody**
 - **Abdominal cramps**
- **Estimate 73,000 illnesses annually in the United States**
- **Of reported cases**
 - **~ 15% in recognized outbreaks**
 - **~ 85% “sporadic”**

Previously Identified Risk Factors for Sporadic Infection

- 1996-1997 FoodNet case-control study
 - Exposure to farms
 - Cattle
 - Consumption of pink hamburgers
 - Eating at table service restaurant
 - Using immune suppressive medication
 - Beef from private slaughter arrangement

Study Objectives and Population

- Matched case-control study of sporadic infections in 1999-2000 in FoodNet sites
- Identify changes in risk factors



Methods

- **Cases**

- Culture-confirmed *E. coli* O157 infection with diarrhea in resident of FoodNet catchment area
- Not part of outbreak

- **Controls**

- 2 age and telephone exchange matched controls per case
- Excluded if diarrhea or culture-confirmed case in household
- Interviewed within 7 days of matched case interview

Methods

- **Interviews**
 - Conducted by telephone
 - Written questionnaire
- **Collected information**
 - Demographics
 - Clinical illness
 - Food, water, and animal exposures
 - In 7 days before patient's illness

Reasons for exclusion from study

531 cases of *E. coli* O157

141 did not meet inclusion criteria:

Outbreak associated (79)

Family member with +culture/bloody diarrhea (26)

Unable to answer questions/ non-English speaker (24)

Diarrhea onset > 10 days before collection (8)

Asymptomatic or could not give onset of diarrhea (4)

390 eligible cases

57 not included in study:

Unable to interview within 21 days of collection (37)

Refused (9)

No matched control found (4)

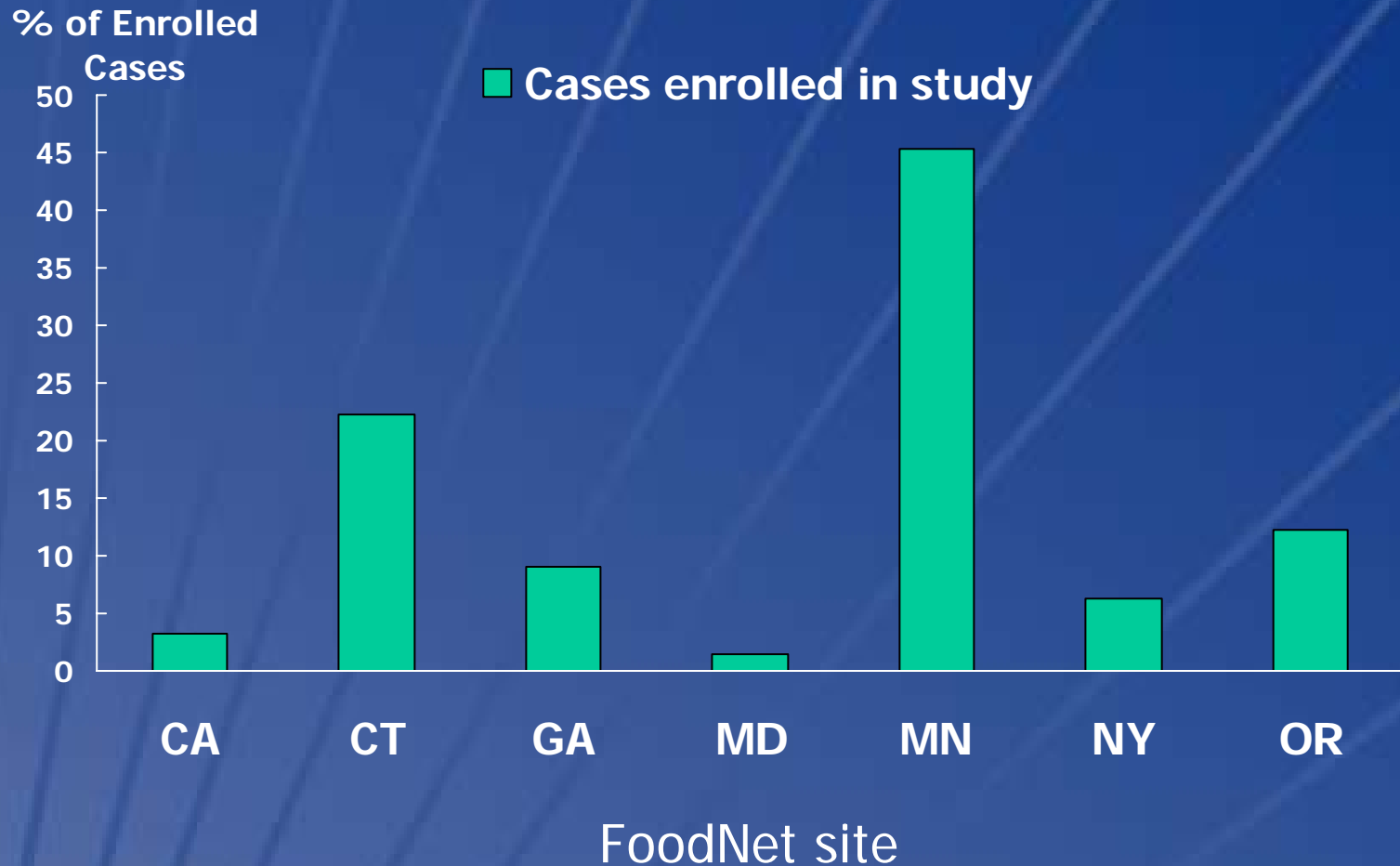
Unable to contact patient (7)

333 enrolled cases

Demographics

	Enrolled	Not Enrolled	Control
	N=333	N=198	N=591
Median age (yrs)	19 (0-87)	13 (1-86)	24 (1-93)
White	94%	87%	92%
Hispanic	5%	6%	5%
Female	54%	57%	62%
Income (median)	\$40-55,000		\$40-55,000
Education	Some college		Some college

Distribution of Enrolled Cases by FoodNet Site (N=333)



Clinical Features of Enrolled Cases (N=333)

Blood in stool	91%
Fever	49%
Vomiting	46%
Visited ER	63%
Admitted	40%
Median duration of diarrhea	6 days (range 1-74)
Median # workdays missed	4 days (range 0-18)
Median length of hospital stay	4 days (range 1-24)

Univariate Analysis

- Food
- Water
- Environment

Food Risk Factors

<u>Risk Factor</u>	<u>Cases / Controls</u>	<u>mOR</u>	<u>95% C.I.</u>
Microwave thawing of frozen ground beef	25% / 19%	1.5	1.0-2.2
Pink hamburger	17% / 11%	1.6	1.1-2.5
Pink hamburger eaten in home	9% / 6%	1.7	1.0-3.0
Pink hamburger eaten in restaurant	3% / 2%	1.7	0.8-3.6

Water Risk Factors

<u>Risk Factor</u>	<u>Cases/ Controls</u>	<u>mOR</u>	<u>95% C.I.</u>
Swimming in surface water with cattle nearby	3% / 0.4%	15.8	1.9-127.7
Drinking surface water	6% / 2%	3.5	1.6-7.6

Environmental Risk Factors

<u>Risk Factor</u>	<u>Cases/ Controls</u>	<u>mOR</u>	<u>95% C.I.</u>
Living on farm	11% / 7%	1.9	1.1-3.4
Living on farm with cows present	6% / 3%	2.4	1.1-4.9
Visited farm 1 to <12 times per year	4% / 1%	3.0	1.1-8.3

Factors Associated with Decreased Risk of Illness

Consumption of:

- Ground turkey
- Pork chops / Roast pork
- Organic produce
- Bottled water
- Any of 12 produce items

Preliminary Multivariate Analysis

<u>Risk Factor</u>	<u>mOR</u>	<u>95% C.I.</u>
Pink hamburger	2.0	1.2-3.4
Microwave thawing of frozen ground beef	1.6	1.1-2.5
Swimming in surface water with cattle nearby	18.6	2.1-165.4
Living on farm with cows present	2.2	1.0-5.0

Summary

- Pink hamburger, surface water, and farms continue to be sources of sporadic *E. coli* O157 infections
- Home food preparation practices such as microwave thawing of frozen ground beef play role in illness
- Restaurant consumption of pink hamburger was not associated with infection

Recommendations: Food

- Encourage the continuation of meat industry efforts to reduce *E. coli* O157 contamination of ground beef
- Support ongoing educational efforts to promote safe preparation and adequate cooking of ground beef

Recommendations: Water

- Discourage recreational use of surface waters likely to be contaminated with cattle feces

Recommendations: Environment

- Encourage hand washing practices among farm visitors and residents
 - Alcohol-based hand washing gels
 - Hand washing stations

FoodNet Working Group, 2000

CDC

Frederick Angulo
Timothy Barrett
Michael Beach
Nancy Bean
Richard Bishop
Chris Braden
Laura Conn
Stephanie DeLong
Sara Ehlers
Cindy Friedman
Patricia Griffin
Peggy Hayes
Mike Hoekstra
Jeff Jones
Malinda Kennedy
Beth Imhoff
Jenny Lay
Deborah Levy
Kathleen Maloney
Paul Mead
Thomas Navin
Oshine Najarian
Robert Pinner
Laurence Slutsker
Karen Stamey
Bala Swaminathan
Robert Tauxe
Thomas Van Gilder
David Wallace
Stephanie Wong

California

Sharon Abbott
Mary Ann Davis
Pam Daily
Lisa Gelling
Alexander McNees
Janet Mohle-Boetani
Nandeeni Mukerjee
Joelle Nadle
Jan O'Connell
Gretchen Rothrock
Michael Samuel
Sue Shallow
Ben Silk
Duc Vugia
Ben Werner

Colorado

Jim Beebe
Steve Burnite
Matt Finke
Ken Gershman
Lucinda Hammond
Sally Hauser
Sean Lieske
Sue Lynch
Ellen Mangione
Pam Shillam

Connecticut

Gary Budnick
Matthew Cartter
Terry Fiorentino
James Hadler
Robert Heimer
Robert Howard
Sharon Hurd
Kati Kelley

Aristea Kinney
Ruthanne Marcus
Donald Mayo
Patricia Mshar
Quyuan Phan
Charles Welles

Georgia

Wendy Baughman
Paul Blake
Laurel Boykin
Sabrina Burden
Shama Desai
Monica Farley
Katherine Gibbs- McCombs
Laura Gilbert
Susan Lance-Parker
Susan Ray
Cathy Rebmann
Matthew Sattah
Suzanne Segler

Maryland

Alicia Bustamante
Michael Carter
Yvonne Deane-Hibbert
Diane Dwyer
Lora Gay
Althea Glenn
Charmaine Gregg
Marguerite Hawkins
Kim Holmes
Jackie Hunter
Kelly Henning
Tobi Karchmer
Meghan McGavern
J. Glenn Morris, Jr.
Lola Olabode

Peggy Pass
Jafar Razeq
Jeffery Roche
Dale Rohn
Christian Steiner
Alexander Sulakvelidze
Yongyu Wang
Frances Yarber

Minnesota

Jeff Bender
John Besser
Richard Danila
Valerie Deneen
Craig Hedberg
Heidi Kassenborg
Carlota Medus
Kirk Smith
Dana Soderlund
Ellen Swanson
Julie Wicklund

New York

Bridget Anderson
Dianna Bopp
Kathy Carlton
Hwa-Gan Chang
Barbara Damaske
Nellie Dumas
Marie Fitzgerald
Karim Hechemy
Jonathan Hibbs
Dale Morse
Candace Noonan
Brian Sauders
Perry Smith
Nancy Spina
Shelley Zansky

Oregon

Vijay Balan
Chris Biggs
Maureen Cassidy
Paul Cieslak
Emilio DeBess
David Fleming
Bill Keene
Lore Lee
Eileen Lorber
Steve Mauvais
Teresa McGivern
Yijun Pang
Beletshachew Shiferaw
Bob Sokolow

Tennessee

Effie Boothe
Allen Craig
Diane Eigsti Gerber
Timothy Jones
William Moore
William Schaffner
Pat Turri

USDA-FSIS

Noreen Hynes
Tamar Lasky
Denise Lewis
Phyllis Sparling
Kaye Wachsmuth

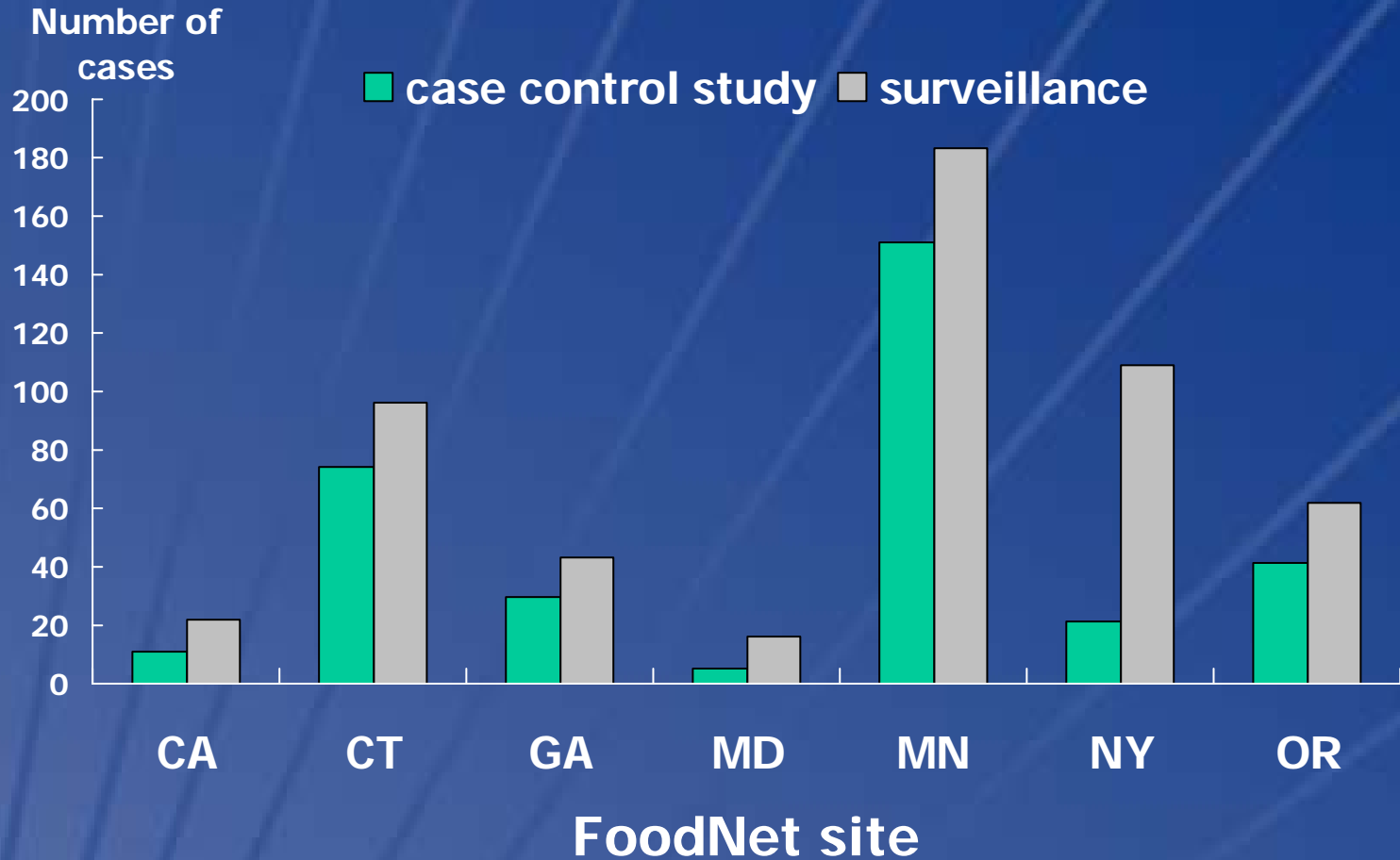
FDA-CFSAN

Ken Falci
Bing Garthright
Clifford Purdy



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Distribution of Cases by FoodNet Site



Univariate Analysis

Risk Factor	mOR	95% C.I.
Apples	0.59	(0.43-0.82)
Broccoli	0.64	(0.43-0.94)
Cantaloupe	0.53	(0.36-0.77)
Carrots	0.59	(0.43-0.8)
Cilantro	0.43	(0.19-0.98)
Honeydew	0.55	(0.31-0.97)
Green onions	0.49	(0.3-0.81)
Parsley	0.33	(0.13-0.86)
Raw cabbage	0.45	(0.27-0.73)
Red leaf lettuce	0.40	(0.19-0.84)
Romaine lettuce	0.53	(0.33-0.86)
Strawberries	0.46	(0.31-0.69)
Watermelon	0.69	(0.48-0.99)

Previously Identified Risk Factors for Sporadic Infection

Country	Year	# of Cases	Risk Factor
USA	1985-86	24	Rare ground beef, raw milk
Canada	1986-87	81	Undercooked meat
USA	1990-92	73	Eating undercooked hamburger
USA	1994	23	Hamburgers prepared in the home, not washing hands after handling ground beef
England	1994-96	142	Hamburger from restaurant other than fast food A, cold cooked sliced meat from caterer
England	1996-97	369	Farm contact
USA (FoodNet)	1996-97	196	Farms, cattle, pink burgers, eating at table service restaurant, using immune suppressive medication and obtaining beef through private slaughter arrangement
Scotland	1996-99	183	Contact with animal feces