



## Prevalence of *Escherichia coli* O157:H7 and *Salmonella* spp. in Special-Fed and Bob Veal in the Northeastern United States

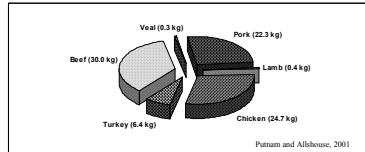
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### ABSTRACT

The ilea and carcass surfaces of special-fed and bob veal calves from the Northeastern United States were sampled prior to antimicrobial intervention from May to July 2001 to determine the prevalence of *Escherichia coli* O157:H7 and *Salmonella* spp. Ileal contents and sponge swabs of the ventral perineum, inside hock and outside hock were pre-enriched and selectively enriched prior to plating upon appropriate selective or differential media. Samples were enriched with immunocapture beads and presumptive colonies confirmed with latex agglutination, a rapid antibody-based test, and pulsed-field gel electrophoresis for the detection of *E. coli* O157:H7. Presumptive *Salmonella* isolates that exhibited agglutination by latex and somatic O antisera were serotyped by the National Veterinary Services Laboratory. Sample proportions were calculated with 95% confidence intervals by veal type and pathogen. Contamination with *E. coli* O157 and *E. coli* O157:H7 was present on 3.3% and 10.0% of special-fed veal carcasses and 1.7% and 6.7% of bob veal carcasses, respectively. None of the *E. coli* O157:H7 isolates showed Xba-I endonuclease restriction patterns that were related to the control strain (ATCC 43895), suggesting that isolates were of diverse origins. Contamination with *Salmonella* spp. was detected on bob veal carcasses (11.5%; 7/61). Five of these seven isolates were serotyped as *S. Newport*. Based on this indicator study, special-fed and bob veal carcasses can be contaminated with *E. coli* O157:H7 and *Salmonella* spp. Further research may confirm the presence of these pathogens on veal carcasses prior to antimicrobial intervention and determine prevalence at pre- and other post-harvest levels.

### 2000 PER CAPITA CONSUMPTION OF RED MEAT AND POULTRY IN THE UNITED STATES



Per capita veal consumption throughout the U. S. was 0.3 kg in 2000. However, this figure does not describe the greater preference for veal in the metropolitan areas of the northeast, north central or western states.

### OVERVIEW OF THE U. S. VEAL INDUSTRY

In 2001, 980,000 calves were slaughtered under federal inspection of which 170,000 head (17.3%) were processed in Pennsylvania.

Major production areas include the Northeast (456,000 head), Upper Midwest (374,000), and California (105,000).

There are three major types of veal in the U. S.

Special-fed (50%)

Bob (48%)

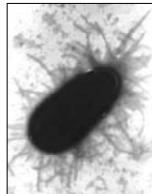
Southern (2%)



### INFECTION WITH *E. coli* O157:H7

- 73,000 cases annually
- Approximately 61 deaths each year
- Disease manifestations
  - Hemorrhagic colitis
  - Hemolytic uremic syndrome (HUS)
  - Thrombotic thrombocytopenic purpura (TTP)

As few as 10 cells may cause infection.



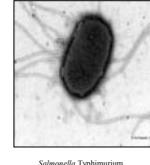
*Escherichia coli* O157:H7  
Duke University Medical Center Department of Pathology

### INFECTION WITH *Salmonella* spp.

- 40,000 infections every year
- 1,000 deaths annually

More than 2,300 strains have been identified. *S. Enteritidis* and *S. Typhimurium* are most commonly associated with human salmonellosis. Symptoms include diarrhea, cramps, headaches, nausea, fatigue.

Infection may be caused by as few as 100 cells.



### OBJECTIVE

The objective of this study was to assess the occurrence of *E. coli* O157:H7 and *Salmonella* spp. in the gastrointestinal tract of special-fed and bob veal as well as on the carcass surfaces following slaughter but prior to intervention treatments.

### METHODS

The ilea and carcass surfaces of special-fed and bob veal calves were sampled prior to antimicrobial intervention from May to July 2001 to determine the prevalence of *Escherichia coli* O157:H7 and *Salmonella* spp. Samples were collected on two different days each from two different plants that process calves from at least six Northeastern states. Ileal contents and sponge swabs of the ventral perineum, inside hock and outside hock were pre-enriched and selectively enriched prior to plating upon appropriate selective or differential media. For the detection of *E. coli* O157:H7, samples were pre-enriched with Hafnia gram-negative broth that was supplemented with vancomycin (8 mg/L), cefixime (0.05 mg/L), and cefsulodin (10 mg/L) followed by immunomagnetic separation (Dynal Biotech, Inc., Lake Success, NY) and plating upon MacConkey and Sorbitol MacConkey (supplemented with 0.05 mg/L cefixime and 2.5 mg/L potassium tellurite) agars. Presumptive colonies were confirmed with the RIM® *E. coli* O157:H7 latex test (REMEL, Inc., Lenexa, KS), ImmunoCard® STAT! *E. coli* O157 Plus (Meridian Diagnostics, Inc., Cincinnati, OH), and pulsed-field gel electrophoresis (Gautam 1997). To detect *Salmonella* spp., samples were pre-enriched with lactose broth, selectively enriched in selenite cysteine and tetrathionate broths, and plated on xylose lysine desoxycholate and bismuth sulfite agars. Presumptive isolates of *Salmonella* spp. that exhibited agglutination by the Oxoid Salmonella latex test (Hardy Diagnostics, Santa Maria, CA) and DIFCO somatic O antisera (Becton Dickinson, Sparks, MD) were serotyped by the National Veterinary Services Laboratory in Ames, IA. Sample proportions were calculated with 95% confidence intervals by veal type and pathogen.

### *E. coli* O157:H7 IN SPECIAL-FED CALVES

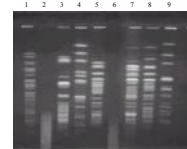
Lot	<i>E. coli</i> O157 isolates	<i>E. coli</i> O157:H7 isolates
<b>Ileum</b>		
Day 1	1/15 (6.7%)	0/15 (0.0%)
Day 2	1/15 (6.7%)	3/15 (20.0%)
<b>Carcass swab</b>		
Day 1	0/15 (0.0%)	2/15 (13.3%)
Day 2	0/15 (0.0%)	1/15 (6.7%)

### *E. coli* O157:H7 IN BOB CALVES

Lot	<i>E. coli</i> O157 isolates	<i>E. coli</i> O157:H7 isolates
<b>Ileum</b>		
Ileum 1	1/15 (6.7%)	0/15 (0.0%)
Ileum 2	0/15 (0.0%)	1/15 (6.7%)
<b>Carcass swab</b>		
Carcass	0/14 (0.0%)	1/14 (7.1%)
swab 1	0/16 (0.0%)	2/16 (12.5%); 2/16 (12.5%)*
Carcass	0/16 (0.0%)	2/16 (12.5%)
swab 2	0/16 (0.0%)	2/16 (12.5%)*

### PULSED FIELD GEL ELECTROPHORESIS OF *E. coli* O157:H7

Lane	Sample
1, 3, 4	special-fed ilea
2	bob ileum
5, 6, 7	bob carcass swabs
8	<i>E. coli</i> O157:H7
9	<i>S. Newport</i>



None of the samples appeared to be genetically related as each decipherable Xba-I restriction pattern showed at least seven fragment differences from the others.

### *Salmonella* spp. IN SPECIAL-FED VEAL

Lot	<i>Salmonella</i> isolates
<b>Ileum</b>	
Day 1	0/15 (0.0%)
Day 2	0/15 (0.0%)
<b>Carcass swab</b>	
Day 1	0/15 (0.0%)
Day 2	0/15 (0.0%)

### *Salmonella* spp. IN BOB VEAL

Lot	<i>Salmonella</i> isolates	Serogroup
<b>Ileum</b>		
Day 1	0/15 (0.0%)	
Day 2	0/15 (0.0%)	
<b>Carcass swab</b>		
Day 1	3/15 (20.0%)	B*, C <sub>1</sub> , C <sub>3</sub>
Day 2	4/16 (25.0%)	B*

\*Serotyped as *S. Newport* by the National Veterinary Services Laboratory (Ames, IA)

### IMPLICATIONS AND USE OF DATA

Sponge sampling did not strictly adhere to carcass sampling protocols of the Pathogen Reduction Act (U. S. D. A., 1996).

While *E. coli* O157:H7 and *Salmonella* spp. were isolated from ilea and carcass surfaces prior to intervention, one cannot assume that these pathogens are always present on veal carcasses. Further research may determine if veal is contaminated with pathogens of regulatory importance to a degree that is comparable to other red meats.

The veal industry should remain proactive and continue to improve food safety practices to reduce the likelihood of product recalls.

Logical extensions of this research could investigate pre-harvest sources of contamination, the application of antimicrobial interventions, and the presence of non-O157 enterohemorrhagic *E. coli* to more thoroughly understand the aspects of veal safety.

### ACKNOWLEDGMENTS

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### REFERENCES

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