E. coli: An Overview

Josh Payne
Area Animal Waste Management Specialist

Dave Sparks
Area Food-Animal Quality and Health Specialist

Oklahoma Cooperative Extension Fact Sheets are also available on our website at:
http://osufacts.okstate.edu

Introduction

Escherichia coli, often referred to as *E. coli*, are common bacteria found widely in nature including the gastrointestinal tracts of humans and warm-blooded animals. Many harmless strains of *E. coli* exist and are essential components of a healthy digestive tract; however, some strains can be pathogenic causing intestinal and urinary tract infections in both humans and animals. *E. coli* O157:H7, an epidemiologically significant bacterium, produces a powerful toxin capable of causing hemorrhagic colitis and hemolytic-uremic syndrome. Other serotypes of *E. coli* have also been known to cause human infection.

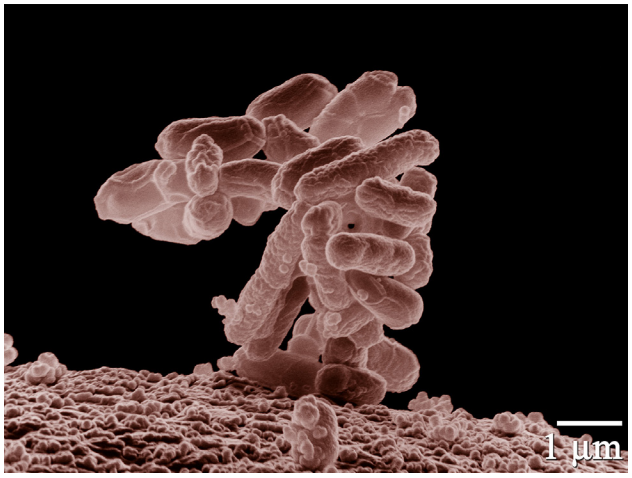

Figure 1. A cluster of *E. coli* magnified 10,000 times.

Sources

E. coli O157:H7 is commonly found in the feces or intestines of cattle; however, the organism has also been isolated from rabbits, deer, dogs, goats, pigs, horses, poultry, sheep and a variety of wild animal species. *E. coli* can survive for extended periods of time in feces, soil and water and often serves as an indicator organism for water contamination.

Transmission

E. coli O157:H7 can be transmitted to humans via contaminated food, water, animals and other humans. Ingestion of relatively few cells can cause illness.

Animals carrying *E. coli* O157:H7 can contaminate meat during processing if feces are allowed to come into contact with the carcass. The organism may be found on the surface of any raw meat product but can be distributed throughout ground meat during grinding, making proper cooking vital for ground meats compared to other cuts. Foodborne infections from contaminated meat are usually attributed to cross-contamination in the kitchen, inadequate cooking and improper storage temperatures.

Fresh produce contamination can occur during pre-harvest if irrigation water or planting areas are compromised by the feces of animals or field workers practicing poor personal hygiene. Numerous outbreaks have been associated with the consumption of contaminated plant products, including apple cider and vegetables such as lettuce, radishes, alfalfa sprouts and spinach.

Water can become contaminated anytime it comes into contact with feces. Waterborne infections have occurred from ingesting contaminated drinking and recreational water. Waterline breaks and swimming in contaminated pools have both been vehicles of outbreaks.

Both animals and humans can harbor *E. coli* O157:H7. Petting zoos have been implicated as a mode of transmission following contact with contaminated surfaces or animals. The organism can also be passed from person to person if hygiene or hand washing habits are inadequate.

Symptoms

Hemorrhagic colitis, resulting from human infection, includes symptoms such as abdominal cramps, fever, nausea, vomiting, and watery or bloody diarrhea. Symptoms usually occur 3 to 4 days after exposure and infections usually last about a week. Some individuals may show no symptoms or only mild diarrhea, while others may develop serious complications including hemolytic-uremic syndrome, which can cause kidney failure, seizures, strokes and eventually coma. Most people recover without treatment within 5 to 10 days. While antibiotics are not recommended for treatment, proper fluid and electrolyte intake is recommended to prevent dehydration. Children, the elderly and immunocompromised individuals are more susceptible to becoming infected and developing complications. Patients with complications may require intensive care.

Figure 2. Wash hands thoroughly with soap to reduce the risk of spreading infection. Photo courtesy of Kris Friedeck.

Prevention and Control

The USDA Food Safety and Inspection Service mandates policies in beef harvesting facilities to minimize foodborne contamination risks. These procedures include strict sanitation, proper product handling, carcass sanitizing, employee hygiene and testing of outgoing product. Mandatory regulations enforced by USDA and voluntary efforts by the beef industry have reduced the incidence of *E. coli* O157:H7 in ground beef to less than 1 percent.

Preventative measures to reduce *E. coli* infection both in and out of the home include:

- Cook ground meat to an internal temperature of 160 F, at which temperature the organism is destroyed.
- Store meat at proper refrigeration (< 40 F) and freezer (< 0 F) temperatures.
- Refrigerate raw meat products within 2 hours (1 hour if the ambient temperature is > 90 F).
- Wash hands, utensils and surfaces that have contacted raw meat with hot, soapy water to avoid cross contamination.
- Wash fruit and vegetables before preparation.
- Wash hands after visiting a restroom, changing a diaper or handling animals.
- Avoid swallowing water while swimming.
- Drink only pasteurized milk, juice or cider.

Summary

E. coli are bacteria found naturally in the environment. Sources include humans and many warm-blooded animals. While there are many harmless *E. coli* strains, certain strains such as *E. coli* O157:H7 are considered pathogenic and capable of infecting humans. Modes of transmission include contaminated food, water, animals and inadequate personal hygiene. By following recommended food preparation and personal hygienic practices, individuals can reduce their risk of becoming infected.

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, gender, age, religion, disability, or status as a veteran in any of its policies, practices, or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0909 TE