



Preventing *E. coli* Infection at Petting Zoos and Farm Animal Fairs

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Animals exhibited at fairs, farm centers, and petting zoos are very popular and educational, and they bring much joy to visitors, especially children. But in addition to warm memories of holding fuzzy animals comes the risk of infection and transmission of harmful—even deadly—pathogens. This is particularly dangerous for people with existing health issues and compromised immune systems. Fortunately, observing sanitation precautions can reduce the risks of contact with farm animals.

Animal-contact transmission of disease is widely recognized in the United States. Diseases transmitted from animals to humans are called *zoonotic diseases*. Microorganisms implicated in the transmission of zoonotic diseases include *Escherichia coli* O157:H7 (*E. coli* O157:H7), *Salmonella*, *Listeria*, *Cryptosporidium*, West Nile virus, Swine Influenza virus, Avian Flu virus, and rabies. One of the pathogens currently of broad concern to the scientific community is *E. coli* O157:H7.

E. coli O157:H7 is found, among other places, in animal manure. Farm animals defecate wherever they happen to be, contaminating their environment and themselves in the process. Each day a cow produces about 100 pounds of manure containing billions of fecal coliform organisms. Because animals can be contaminated with fecal matter containing *E. coli* O157:H7, people's hands can become contaminated with this pathogen when they touch the animals and anything in the animal's environment, such as pens and fences. Subsequent touching of the face, body, and clothing with contaminated hands increases the risk of contaminating the mouth or uncovered wounds on the body.

The most recent petting zoo outbreak occurred in October 2013 in Minnesota. By October 28, 2013, three children ages 15 months to 7 years were confirmed as having *E. coli* O157:H7 infections, with two others reporting the same symptoms, after contacting cattle and goats at Dehn's Pumpkins in Dayton, MN. One child developed hemolytic uremic syndrome (HUS), or kidney failure (1,2). There have been other illnesses resulting from contacting farm animals. *Bites*, a publication of the Kansas State University, has tabulated petting zoo-related outbreaks that have occurred from 1988 (3).

It is important to emphasize that *E. coli*, which we all carry in our intestines, is not necessarily the same as *E. coli* O157:H7. Most *E. coli* types are harmless and are important in maintaining a healthy human intestinal tract. However, a few *E. coli* strains are disease causing. Their presence in water supplies indicates fecal contamination and the potential presence of enteric pathogens, which cause illnesses characterized by diarrhea but possibly far more dangerous symptoms as well.

There are six different pathotypes of *E. coli* that cause diarrhea. Certain kinds of *E. coli* produce a toxin, Shiga toxin, which causes diseases. These microorganisms are called Shiga toxin-producing *E. coli*, or STEC. *E. coli* O157:H7 (sometimes just called "*E. coli* infection") is the most commonly identified STEC in North America. *E. coli* O157:H7 produces a toxin that destroys small blood vessels, particularly in the lining of the kidneys. Blood vessels of other organs, such as the heart and brain, may also be affected. Symptoms associated with *E. coli* O157:H7 illness are abdominal cramping and watery diarrhea, becoming grossly bloody, and with little

or no fever. When the red blood cells of the kidneys are destroyed (*hemolysis*), kidney failure (*uremia*) results, requiring blood transfusion or even dialysis. HUS is the common cause of renal failure in children (6). This is of particular concern because children and families are the main demographic of petting zoos and animal fairs.

The Centers for Disease Control and Prevention estimate that there are about 265,000 *E. coli* infections annually in the United States, approximately 36% caused by O157 STEC. About 5–10% of those with *E. coli* O157:H7 illness develop HUS, with a mortality rate of about 10% in the United States. Among HUS survivors, about 1 in 20 develop end-stage kidney disease requiring dialysis or a kidney transplant, and the same number have neurological or pancreatic problems.

Until a few decades ago, *E. coli* O157:H7 was known primarily as a veterinary pathogen, found only in animals. It was first identified as a human pathogen in 1975 in a California patient with bloody diarrhea

and first associated with a foodborne source in 1982 when outbreaks in Oregon and Michigan resulted in 47 people developing hemorrhagic colitis (5). Hamburgers from a fast-food restaurant chain were implicated when the same organism was isolated from both the stricken patients and the chain's ground beef patties. Sources of STEC include undercooked hamburger, raw milk, fresh apple cider, mayonnaise, produce fertilized with improperly treated manure or irrigation water, and even contaminated swimming-pool water (4).

E. coli O157:H7 can survive refrigeration and frozen storage very well and can even grow slowly at refrigeration temperatures. Although it can be easily destroyed by heat, small numbers of *E. coli* O157:H7 are sufficient to cause illness among individuals with immunocompromised systems. These include children less than 5 years old, the elderly, pregnant women, those with AIDS, and those undergoing chemotherapy or radiation therapy.

Precautions at the farm fair or petting zoo

To prevent *E. coli* O157:H7 illness caused by animal contact, observe the following guidelines.

Precautions in the Kitchen

Contact with animals isn't the only way to contract *E. coli* O157:H7 illness. To guard against foodborne contamination, the following practices are strongly recommended:

- Separate cooked from raw foods to prevent cross-contamination.
- Cook all ground beef to 160°F (a thermometer is needed—don't rely on the no-pink-color test!).
- Consume only pasteurized (or heat-treated) milk, dairy products, and cider.
- Wash fruits and vegetables very well if served raw.
- The very young, the elderly, pregnant women, and those with compromised immune systems should avoid eating alfalfa sprouts until the safety is established by health authorities.
- Practice good personal hygiene—wash your hands thoroughly with soap and water before eating, especially after visiting a farm or touching animals. Do not rely on hand antiseptics only.

Precautions for the animal handler

- Provide information about the animals, activities, displays, and precautions—preferably ahead of time—for visiting groups.
- Inform visitors of the risks of transmission of diseases and explain how to prevent those risks.
- Give the same information to your staff, and train them to supervise and coach visitors when touching animals.
- Create a one-way traffic flow in the animal area with separate entrance and exit areas. Entrance areas are geared for educating the visitors toward risks involved in the petting zoo, guidelines about hand-to-mouth contact, and limiting the number of visitors that can be effectively managed. Exit areas are designed to ensure proper handwashing.
- Designate an area where animal interaction is allowed. To better control human–animal contact, clearly separate animal-interaction areas from areas where public interaction is not allowed; use barriers or signage.
- Keep birthing animals out of all public areas.

- Provide only healthy animals for display and visitor contact.
- Use clear signs to prohibit hand-to-mouth contact in animal areas (e.g., do not allow eating, drinking, smoking, or carrying toys or pacifiers).
- Separate food establishments, eating areas, and infant-care settings from animal areas.
- Do not allow animals to eat people food.
- Follow strict environmental sanitation procedures to prevent dust from contaminating water sources, eating areas, and surfaces likely to be touched.
- Provide and maintain adequate hand-washing facilities in both animal-interaction and noninteraction areas. All hand-washing facilities must be accessible, sufficient for the anticipated maximum attendance, configured for use by adults and children, clean, and equipped with running hot or warm water, soap, disposable towels, and covered trash bins.
- Maintain separate hand-washing facilities for food establishments, eating areas, and infant-care settings.

Precautions for visitors

When visiting animals with children:

- Feed children *before* the visit to minimize infections from hand-to-mouth contact.
- Explain some of the hazards of visiting and touching animals.
- Keep an eye on their hands! Watch for hand contact with mouth, face, body, and clothing.
- Bring along a change of clean clothes and shoes. Wash used clothes very well before using them again.
- Touch animals knowing they are colonized with potentially pathogenic human enteric microorganisms (*E. coli*).

Be aware of the groups of people who are at serious risk of contracting zoonotic diseases:

- The very young (under 5 years old)
- The elderly
- Pregnant women
- Those with weakened immune systems—with AIDS, or undergoing chemotherapy or radiation treatment.

During the visit, do not allow:

- Eating or drinking
- Touching the mouth or licking or sucking fingers
- Wounds left uncovered
- Wiping hands on clothing
- Bringing toys or pacifiers that may become contaminated
- Kissing animals.

Remember to wash your hands thoroughly:

- Even if you don't touch the animals
- After touching animals or their surroundings
- After being mouthed, bitten, spat on, or licked by animals
- Before eating and drinking.

Use the proper hand-washing technique:

- Use warm or hot water.
- Lather for 20 seconds, especially the backs of the hands, between the fingers, and underneath the fingernails.
- Rinse well with running water.
- Dry with clean, disposable towels.

Warning signs

If symptoms such as nausea, vomiting, and diarrhea (especially with blood) develop after visiting animals, inform your physician immediately. Avoid giving antibiotics and antidiarrheal medications, such as loperamide, due to the increased risk of kidney complications.

Animals can give a lot of happiness and pleasure to people, especially children. Knowing appropriate sanitation precautions and using common sense will allow you and your family to stay healthy while you enjoy them.

This is an updated version of FST-17, titled "Hazards of Getting Sick from Contact with Farm Animals at Fairs and Petting Zoos," published in 2005.

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