

Deadly Infection from Spinach: It's The Beef!

by Ann Gerhardt, MD www.drugsmedisense.com
(12/2006)

Bottom line at the top: The recent illnesses and deaths due to spinach consumption were caused by E. coli O157:H7. This bacteria has caused many outbreaks of illness associated with ground meat and a variety of other foods. It usually resides in animal, most commonly cow, manure. Foods become contaminated when they come in contact with manure. To prevent illness, wash your hands, thoroughly cook ground beef, wash fruits and vegetables under running water and consume only pasteurized dairy products.

Sources of information: The Centers for Disease Control (http://www.cdc.gov/ncidod/dbmd/diseaseinfo/escherichiacoli_g.htm), the Food and Drug Administration (<http://www.cfsan.fda.gov/~dms/spinacqa.html>) and Maki DG. NEJM 2006;355:1952-1955.

A nationwide moratorium on fresh spinach consumption last September followed its connection to severe illness. Two hundred four people fell ill, 104 seriously enough to require hospitalization, due to an infection with a type of bacteria called E.Coli. Three people died.

E. coli normally lives in human and animal colons in large numbers. Run-of-the-mill E. coli serve a useful function in the body by suppressing the growth of harmful bacterial species and by synthesizing appreciable amounts of vitamins. The particular strain related to the current outbreak, O157:H7, produces a toxin that causes life-threatening disease. The toxin severely damages the lining of the intestine, causing bloody diarrhea. It may also cause life-threatening diseases called hemolytic uremic syndrome, which damages kidneys, and thrombotic thrombocytopenic purpura, which causes clotting in vital organs.

The Centers for Disease Control, which investigates all outbreaks of food-related disease, linked the infections to consumption of spinach processed by a packaging company in the Salinas Valley, where more than 75% of the nation's spinach is grown. Other E. coli O157:H7 outbreaks have resulted from contaminated Salinas Valley produce and the FDA and growers are working towards tighter standards to "develop a comprehensive plan which is designed to minimize the risk of another outbreak due to *E. coli* O157:H7 in spinach grown in central California."

E. coli O157:H7 was isolated from thirteen spinach packages turned in by patients. The strains were identical to the strain causing disease. Eleven of them had lot numbers showing they were processed on a single day at the Natural Selection Food plant. FDA investigators found the same strain of E.

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coli that caused the infections in manure from one of the cattle ranches bordering the spinach field.

According to epidemiologist Dennis Maki, MD at the University of Wisconsin, *more than* 100,000 cases of infection and 80 deaths due to E. coli O157:H7 occur in the United States each year. Most of these are isolated cases, not associated with outbreaks. No one knows the true frequency, because E. coli O157:H7 probably causes a whole range of disease, from minor diarrhea in some, to the unmistakable symptoms of profuse, bloody colitis in the severe cases. Most mild cases would never come to the attention of medical professionals and be counted.

Undercooked or raw hamburger (ground beef) has caused ~75% of the documented E. coli O157:H7 outbreaks. The others have been traced to alfalfa and bean sprouts, lettuce, spinach (26 outbreaks since 1993), unpasteurized fruit juices and cider, dry-cured salami, game meat, cheese curds and raw milk. People also have acquired the bacteria from sewage-contaminated water, swimming holes, petting zoos and other people with diarrhea.

Where does all this E. coli come from and why is it so toxic? Epidemiologists have long recognized that various strains of toxin-producing E. coli cause the bulk of traveler's diarrhea. For those who haven't left the U.S., most toxic E. coli comes from our homegrown cows.

Cows' digestive systems evolved to handle grass, clover and other forage. They succeed in doing this by fermenting high fiber forage in the rumen, a part of their complex stomach system. Instead of range-fed cattle, virtually all beef currently sold in grocery stores comes from cows raised in CAFO's (Confined Animal Feeding Operations). After a short, pastoral youth spent grazing in a field, cows are shipped to industrial feedlots and fed corn. Tens of thousands of cattle, living in close quarters fostering disease spread, are fed inexpensive corn to bulk them up massively and quickly, so they can get to market.

The unnatural feeding system encourages proliferation of toxic bacteria. It is bacteria (normally a healthy kind) that ferment food at neutral pH in the cow's rumen. A diet of high starch, low fiber corn interferes with normal digestion

by fostering non-native bacteria which produce less gas and more acid. An acidic rumen conditions the resident bacteria to resist acid.

Acid resistant bacteria present a danger to humans. We don't sterilize our food, drink, fingers or most other things that make their way into our mouths. Exposed to micro-organisms all day, we rely on the acid in our stomachs to kill most microbes as they pass through. An acid-resistant bacteria like *E. coli* O157:H7 passes through unscathed to our intestines and wreaks havoc.

Up to 3% of domestic cattle carry *E. coli* O157:H7 at the time of slaughter. *E. coli* from manure may end up on the animal's hide or udder. Bacteria present on the cow's udders or on equipment may get into raw milk. In a petting zoo, *E. coli* O157:H7 can contaminate the ground and hides. Meat can become contaminated during slaughter, and organisms can be accidentally mixed into meat when it is ground. Because the meat of many cattle is ground together to make ground meat, the possibility that at least some of that is meat is contaminated is much greater than with a single cut of meat from one animal. Hamburger should be cooked well to kill all the bacteria. The guy who overcooks your burger on the grill is actually doing you a favor.

CAFO feedlot cattle produce astronomical amounts of manure, at least some of which contains harmful bacteria. Farmers use manure for fertilizer, which may contaminate agricultural products like lettuce and spinach. Cows produce far more manure than farmers need for fertilizer, so the excess is dumped into huge lagoons. Periodic spills and runoff during heavy rains wash raw manure into streams, fields, lakes and wells. Hence, bacteria appear in foods considered to be the essence of health, like spinach and sprouts. It's amazing that more people don't fall ill every day.

No one knows how many *E. coli* O157:H7 it takes to produce an infection, but it may be as few as ten. That means you should be very careful. **Consumers can prevent *E. coli* O157:H7 infection by thoroughly cooking ground beef** and (in a restaurant) sending any under-cooked meat (along with the plate and bun) back to the chef to be replaced. Ground beef should be cooked until a thermometer inserted into several parts of the patty, including the thickest part, reads at least 160° F. **Always wash hands carefully** after having a bowel movement and before preparing or eating food. **Fruits and vegetables should be cooked or washed well under running water.** If you have diarrhea, do not swim in public pools or lakes or share baths with or prepare food for others. **Drink only treated municipal water or well water that has tested negative** for contamination. **Drink only pasteurized milk, juice and cider.** Avoid swallowing lake water when swimming. **Avoid spreading harmful bacteria in the kitchen by keeping raw meat separate from ready-to-eat foods. Wash anything that has touched raw meat,** such as

hands, counters, utensils and plates, with hot soapy water before they are used to serve food. Re-wash the pre-washed, bagged leafy vegetables before serving, no matter how clean they look in the bag. It seems stupid to wash sprouts for a salad, because it makes them look soggy and stupid, but do it anyway. For more information about reducing your risk of food borne illness, visit the [U.S. Department of Agriculture's Food Safety and Inspection Service website](http://www.fda.gov/oc/ohrt/).