



Safe Food for a Healthy Life

An Initiative of The Pew Charitable Trusts at Georgetown University

Foodborne Pathogens Associated with Fresh Fruits and Vegetables

There are a number of foodborne microbial pathogens associated with the consumption of fresh fruits and vegetables that can cause illness or death among consumers who eat contaminated produce.

This document summarizes the major foodborne microbial pathogens that may be found in fresh produce, including *Cyclospora cayetanensis*, *Escherichia coli* O157:H7, Hepatitis A, *Listeria monocytogenes*, Norovirus, *Salmonella* spp., and *Shigella* spp.¹

- **Cyclospora:** This pathogen is commonly characterized by watery diarrhea, loss of appetite, weight loss, abdominal bloating and cramping, low-grade fever, nausea, vomiting, and fatigue. Contaminated water used for irrigation and pesticide application and poor worker hygiene has been suggested as the most likely causes of contamination. Cyclospora outbreaks have been linked to fresh raspberries, mesclun lettuce, and basil or basil-containing products.
- **Escherichia coli O157:H7:** Most *E. coli* strains are nonpathogenic (they suppress harmful bacterial growth), and are commonly found in the intestines of all animals, including humans. However, there are a minority of strains such as serotype O157:H7 that may cause human illness. *E. coli* O157:H7 is a life-threatening bacterium that produces large quantities of potent toxins that can cause severe damage to the lining of the intestines. Human illness associated with *E. coli* O157:H7 infection may include hemorrhagic colitis, hemolytic uremic syndrome (HUS), or thrombotic thrombocytopenic purpura (TTP). HUS largely affects young children and is the leading cause of acute renal failure in children. *E. coli* O157:H7 outbreaks have been linked to fresh produce (such as spinach and leafy greens).
- **Hepatitis A:** This virus may cause a serious, and sometimes fatal, disease, characterized by sudden onset of fever, malaise, nausea, anorexia, and abdominal discomfort, followed in several days by jaundice. Hepatitis A outbreaks have been linked to fruits, vegetables, salads and with infected workers in food processing plants.
- **Listeria monocytogenes:** This bacterium causes listeriosis, a serious disease in pregnant women, the elderly, and those with weakened immune systems. Listeriosis is characterized by flu-like symptoms, including persistent fever, and can be accompanied by gastrointestinal symptoms such as nausea, vomiting, and diarrhea. Listeriosis outbreaks have been linked to raw vegetables.
- **Noroviruses:** These are viruses (also known as "Norwalk-like viruses") that cause acute gastroenteritis in humans. Norovirus outbreaks have been linked to contaminated water and salad ingredients.

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- ***Salmonella spp.***: Typical symptoms of salmonellosis are nausea, vomiting, abdominal cramps, fever, mild diarrhea, and headache. Salmonella outbreaks have been linked to fresh produce.
- ***Shigella spp.***: Contamination by this pathogen has often been associated with poor personal hygiene of food workers. Typical symptoms include abdominal pain, cramps, diarrhea, fever, vomiting, and blood, pus, or mucus in stools. Shigellosis outbreaks have been linked to shredded lettuce, potato salad, green onions, and parsley.

¹ HHS, FDA, USDA, CFSAN, *Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables, Appendix B* (2008), <http://www.cfsan.fda.gov/~dms/prodgui4.html>.

Additional information can be found at:

FDA, CFSAN " *Foodborne Pathogenic Microorganisms and Natural Toxins Handbook, Bad Bug Book* (2008) <http://www.cfsan.fda.gov/~mow/intro.html>.

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