



The Food Safety of Sprouts

Sprouts

Sprouts are the immature growth that is produced from a germinated seed. Depending on the seed type, the sprout is generally harvested 1 to 8 days after germination. At harvest the sprout will have a stem (1 to 3 inches in length) and two small leaves. The varieties of sprouts that are most commonly consumed are alfalfa, mung bean, red clover, radish, broccoli and wheat grass. Sprouts are most commonly consumed raw or lightly cooked as they provide a crisp texture to sandwiches, salads and stir-fries. Unfortunately, the environment that the sprout needs for growth, combined with the fact that they are generally eaten raw or only lightly cooked, has caused many foodborne illness outbreaks.

Sprouts and Foodborne Illness

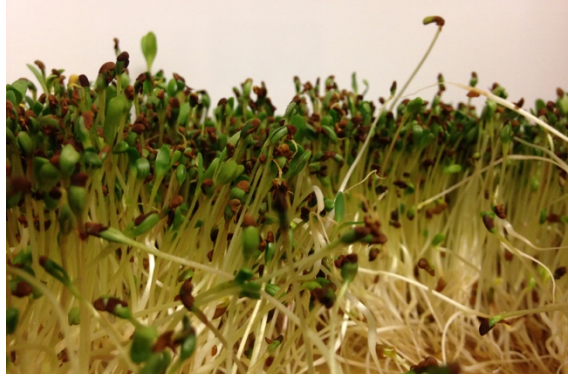
Between 1996 and 2010, there were 34 reported foodborne illness outbreaks related to the consumption of sprouts. These outbreaks resulted in 2,150 cases of illness, 123 hospitalizations and one death. In the past 5 years (2011 to 2016), the Centers for Disease Control and Prevention have reported 9 foodborne illness outbreaks that resulted from the consumption of sprouts. Due to the high number of outbreaks, sprouts have been labeled as a “high risk” food. This means that people with compromised immune systems, such as children, elderly, pregnant women and those who are sick or taking medications that impair the immune system, should avoid eating sprouts.

What Causes Sprouts to be “High Risk”?

Sprout seeds can often be the starting point of a foodborne illness outbreak. This is because the seeds can potentially become contaminated during production while growing in the field. In the field, contamination can come from irrigation water, animal manure, wild animals or unsanitary practices or dirty hands of field workers. Upon harvest, seeds can be introduced to contamination from transportation containers and vehicles, equipment, rodents, pests and workers.

Some varieties of seeds naturally have rough outer surfaces that can allow for microorganisms to easily attach. Additionally, some seeds are put through a process called scarification in which the outer surface of the seed is abrasively rubbed to thin the outer seed coat and increase germination rates. This process can also create rough outer surfaces in which microorganisms can hide.

The growing environment of the sprout supports an ideal growing environment for microorganisms. Sprouts require adequate moisture and warm temperatures (about 70°F) both of which create ideal conditions for the rapid growth of microorganisms. One study reported that the number of microorganisms on a sprouting seed can reach up to 1 billion within 2-3 days of the sprouting process. It does not take many cells of microorganisms to cause someone to become sick. For example, someone can consume just one cell of *Salmonella* or 10 to 100 cells of *Escherichia coli* (*E. coli*) and become sick with a foodborne illness.



Alfalfa Sprouts
Kimberly Baker, HGIC, Clemson Extension

Safety of Commercially Grown Sprouts

In 2011, the Food Safety Modernization Act (FSMA) was signed into law. This act is a complete overhaul to the United States' food safety system shifting the focus from responding to foodborne illness outbreaks to prevention. Several components to this law are intended to prevent foodborne illness in manufactured foods and produce; however, one aspect of the law specifically addresses the production of sprouts. Those who are producing sprouts for sale must comply with the regulations stated in the FSMA produce safety rule as well as four additional requirements that are specific to growing sprouts. These requirements are: (1) taking steps to prevent microorganisms on seeds; (2) testing irrigation water drained from growing sprouts; (3) testing of the sprout production areas (growing, harvesting, packing and holding) for *Listeria monocytogenes*; and (4) if any test results in a positive reading then corrective actions must be put into place so that contaminated sprouts are not released for sale. Additional educational trainings are also being given to sprout producers to teach them the new regulations and how to grow sprouts safely.

Growing Sprouts at Home

Growing sprouts at home does not make them any safer than those purchased from the grocery store. Care should be taken when they are grown at home to reduce the likelihood of the sprouts causing a foodborne illness. Seeds should be purchased from a commercial source, where the seeds are produced for sprouting only and pre-tested for the presence of illness causing microorganisms. Ensure that all containers and contact surfaces that touch the seeds and sprouts are kept clean. Place growing sprouts in an area of your home where they are not disturbed and are not located close to food production areas where raw foods can splash onto the sprouts. Keep pets away from the seeds and sprouts. Always wash hands properly when handling the seeds or sprouts, and ensure that the water used to irrigate the sprouts is fresh drinkable water and held in a clean container.

Handling Sprouts at Home

Whether you have purchased sprouts from the store, or grown them at home, you can reduce the chance of developing a foodborne illness from sprouts by following these guidelines:

1. Buy/consume only fresh sprouts that are kept refrigerated.
2. Do not buy/consume sprouts that are limp, slimy, moldy or have an off odor.
3. Keep sprouts refrigerated at 40°F or below.
4. Store sprouts in clean containers.
5. Wash hands properly with hot running water before touching sprouts.
6. Wash sprouts with cool running water directly before use.

Sources:

1. Baker, K.A. 2016. Microbiological and quality characteristics of alfalfa (*Medicago sativa*) and mung bean (*Vigna radiate*)

- sprouts grown using different water sources and treated post-harvest (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (Accession Order No. 1621).
2. Centers for Disease Control and Prevention (CDC). 2016. List of selected multistate foodborne outbreak investigations. Atlanta, GA: Centers for Disease Control and Prevention. Available from: www.cdc.gov/foodsafety/outbreaks/multistate-outbreaks/outbreaks-list.html. Accessed December 14, 2016.
 3. Food and Drug Administration (FDA). 2012. Bad Bug Book, Foodborne Pathogenic Microorganisms and Natural Toxins. Second Edition. Silver Spring, MD: U.S. Food and Drug Administration. Available from www.fda.gov/downloads/Food/FoodbornenessContaminants/UCM297627.pdf. Accessed March 24, 2016.
 4. Food and Drug Administration (FDA). 2015. FSMA final rule on produce safety. Silver Spring, MD: U.S. Food and Drug Administration. Available from: www.fda.gov/food/GuidanceRegulation/FSMA/ucm334114.htm. Accessed February 27, 2016.
 5. Johanson, J. 2012. FDA's strategy of creating alliances. Silver Spring, MD: U.S. Food and Drug Administration. Available from: <http://blogs.fda.gov/fdavoices/index.php/tag/sprouts-safety-alliance/>. Accessed September 19, 2015.
 6. Liao, C.H. 2008. Growth of *Salmonella* on sprouting alfalfa seeds as affected by the inoculum size, native microbial load and *Pseudomonas fluorescens* 2-79. *Letters in Applied Microbiology* 46:232-236.
 7. Mueller, S. 2008. Alfalfa seed production in the western United States. Fresno, CA: UC Cooperative Extension, University of California Davis. Available from: www.alfalfaseed.ucdavis.edu/files/147738.htm. Accessed January 14, 2016.
 8. Oregon Public Health Division, Belabre, B., Dekevich, D., Dement, J. 2015. Sprouts. Fort Collins, CO: Food Source Information Colorado State University. Available from: www.fsi.colostate.edu/sprouts/. Accessed September 19, 2015.

Prepared by Kimberly Baker PhD, RD, LD, State Consumer Food Safety Program Coordinator, Clemson Extension, Clemson University, and reviewed by Adair Hoover, Food Safety Extension Agent, Clemson Extension, Clemson University (New 12/16)