Organic and Hydroponic Food Safety

By Lynette Morgan, (/contributors/lynette-morgan) December 1, 2013

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> **Takeaway:** *As many as 76 million people in the United States report coming in contact with some form of foodborne illness every year and of this, around 5,000 cases result in death. However, this is just the tip of the iceberg…*

Foodborne-illness outbreaks originating from fresh fruit and vegetables are a frightening reality. Bacteria like salmonellaon tomatoes and cantaloupe and the virulent E.coli O157:H7 on lettuce, spinach and fresh sprouts have all made headlines. However, these outbreaks are perhaps only the tip of the iceberg.

Many occurrences of foodborne illness are neither life-threatening nor widely reported— even though they affect more than one person—probably because they go unidentified by the sufferer, who might just attribute the symptoms to a tummy bug instead of linking the problem back to any food source.

Another lesser known fact is that while foodborne illness outbreaks from commercially grown fruits and vegetables make big headlines, homegrown produce is also at risk.

Being grown in a protected indoor garden is no guarantee that a foodborne disease will never occur; so, some important rules need to apply to our indoor gardens just as they do to the large commercial producers of fresh fruit and vegetables. Unfortunately, however, few of us know how to prevent ourselves from becoming a victim of our own garden.

While hydroponics does have a lower risk of foodborne illness contamination simply because the plants are not in contact with soil or at risk of flooding or of being invaded by animal pests, studies have shown that soilless production does not necessarily exclude contamination with foodborne pathogens.

One 1999 study into food safety of hydroponically cultivated greens found that other strains of E. coli (not E. coli O157) were isolated in 14% of leafy vegetables and in 5% of hydroponic herbs, thus indicating there is a small and variable potential risk of hydroponically grown vegetables harboring a pathogen.

Foodborne Illnesses: The pathogens

What has been proven with food poisoning cases is that certain foods are more high risk than others. Most of us are aware of the dangers of undercooked chicken or burgers and food kept incorrectly chilled; however, many are not so well-educated about the risks of raw fruits, vegetables and sprouts (which have caused some serious foodborne illness outbreaks in recent years).

Although cyclospora and salmonella are the cause of some foodborne-illness outbreaks, E. coli is responsible for 85.7% of outbreaks caused by fresh fruit and vegetables. Pathogenic strains of the latter bacteria cause significant illness, including hemorrhagic diarrhea, kidney failure and abdominal cramps.

Of the strains that are pathogenic to humans, E. coli O157:H7 has particularly been the cause of serious disease outbreaks associated with contaminated fresh salad vegetables, fruits and sprouts.

It can also be contracted from undercooked ground beef, house flies, unpasteurized milk and juice, drinking infected water and contact with an infected person. This particular strain of E.coli is highly virulent and needs only a low infectious dose to cause illness (compared to relatively higher dose from other stains of E. coli).

Why are raw fruits and vegetables a risk?

Many of the healthy super foods popular with indoor growers—such as salad greens, lettuce, many fresh herbs, sprouts, micro-greens and wheat grass—are in the highest risk category for foodborne illnesses. This is because they are largely consumed raw and unpeeled (cooking destroys most harmful bacteria).

What is even more alarming is that many of the same folk who carefully wash the salad greens they bought at the grocery store or grew

outdoors are tempted to just snip and eat clean hydroponic salads, tomatoes, herbs, berries, micro-greens or throw some freshly cut wheat grass in the juicer.

Unfortunately, even the cleanest produce and growing area has the potential to harbor some very harmful bacteria that can cause significant illness. The best line of defense is prevention (especially since thorough washing—even with chlorinated solution—does not necessarily remove all pathogenic bacteria). For this, growers need to know where the enemy can strike from.

Many of the possible contamination issues within indoor gardening are found in both organic and traditional hydroponic methods; however, (while fully decomposed and processed organic matter is not usually an issue, materials that are not handled and used correctly present potential problems for food contamination).

Water, tools, animals, pests, manure and incorrectly processed composts, as well as human handling, can also spread harmful organisms to your hydroponic plants. Bacteria like salmonella and E.coli O157:H7 are the main culprits, but there are actually a wider range of bacteria, viruses and parasites that can contaminate your hydroponic produce in surprising ways.

The food safety rules for hydroponics

Food production safety rules and guidelines for growing hydroponic vegetables, particularly those we want to eat raw, are very similar as those for outdoor gardeners. The University of California has a particularly good guideline called *Food Safety In Your Home Vegetable Garden* that also applies to indoor gardens.

A summary—sourced and adapted from this guide—of how best to protect home grown produce from contamination with foodborne illnesses is below. Note that gardeners dabbling in organic hydroponics or who just want to incorporate a few more natural supplements, substrates or products into their soilless crops particularly need to know the basic facts of how to avoid the risks associated with this system of production.

1. When growing leafy vegetables or any other produce that will be consumed raw, it is best not to use composted or stabilized manure, or amendments containing any animal compounds. If manure or animal-based amendments are to be used, however, make sure they are composted, stabilized and packaged commercially. Keep in mind, though, that no compost material is guaranteed to be 100%-free of bacteria. While this is not an issue for traditional hydroponic systems, it could apply to some organic hydroponic methods. Clean, high-quality coco fiber, however, could be considered a good organic medium for growing produce that will be eaten raw.
2. Clean, good-quality water is essential for hydroponic systems, since it is possible for pathogens to occur in untreated water supplies. Also take into consideration the water used in foliar or pest and disease sprays, misting sprays, overhead irrigation, fog or any other application that might make contact with the edible portion of the plant. Irrigation water containing pathogens will contaminate foliage for a number of days (sometimes up to 30 days) before the pathogens naturally die off. Municipal water supplies are treated to kill human pathogens and, thus, are safe for use on hydroponic produce; however, collected rain water, well water, surface water and other sources should be tested and treated if necessary. Organic hydroponic systems generally cannot use chemicals like bleach or hydrogen peroxide to sterilize water, so you might want to consider non-chemical options like RO, ozone, UV or distillation.
3. Considering how bacterial contamination of fresh produce can occur from animal and insect sources, keeping pets, wild animals and insects out of the indoor garden is advisable.
4. Human contact is another common source of foodborne illness on fresh produce. Washing hands and use of hand sanitizer when handling plants and equipment in the hydroponic garden is essential. Also, be particularly aware that dirty hands or gloves can transfer pathogens from incompletely composted organic materials to crops or equipment.
5. In hydroponic systems, try to avoid getting the edible portion of the plant wet with nutrient solution or other water sources. One of the reasons salad vegetables are prone to pathogen contamination is their squat nature—they sit close to the soil and water and, thus, are more likely to pick up bacteria than fruits, which are produced well above the substrate in hydroponic systems.
6. Keep the growing area as clean as possible. Before planting, wipe down surfaces (particularly the tops of growing channels where salad vegetables or herbs might sit) with a diluted bleach solution. Remove any plants that are sick or rotting, and immediately take out pruning remnants, old leaves and other organic matter.
7. At harvest time, wash hands, knives and other tools well before starting. Handle hydroponic produce carefully to avoid bruising. When cutting and preparing fresh vegetables, keep them covered and refrigerated if they are not to be eaten immediately.
8. Wash freshly harvested produce well under running tap water, rather then washing it in a container of water. Bacteria can spread via the washing water to a greater surface area of foliage in a restricted container of water. Dispose of any cut fruit and vegetables if they have been sitting around for longer than two hours at room temperature or longer than one hour at temperatures over 90°F.

Overall, the risk of a major foodborne illness being contracted from fresh salad greens and other raw produce from a clean and well-run hydroponic or hydro-organic garden is minimal and rare.

However, as with producing and handling any food, it pays to take basic precautions to ensure some real nasties don't create a potentially serious illness. A few simple guidelines followed right from the start of any hydroponic crop will ensure a safe and healthy environment for any homegrown fruit, veg or herbs.

References

Belton, D. J. (1999). *Food safety and hydroponically cultivated vegetables.* NZ Food Monitoring Program, Institute of Environmental Science and Research Limited.

Sivapalasingam, S., Friedman, C. F., Cohen, L., and Tauxe, R. (2004). Fresh product: a growing cause of outbreaks of foodborne illness in the United States, 1973 – 1996. *Journal of Food Protection, 65*(3), 2342-2353.

Soloman, E. B., Pang, H. J., and Matthews, K. R. (2003). Persistance of Escherichia coli O157:H7 on lettuce plants following spray irrigation with contaminated water. *Journal of Food Protection, 66*(12), 2198-2202.

Suslow, T. V., Harris, L. (2003). *Key points of control and management for microbial food safety: Edible landscape plants and home garden produce.* University of California, Division of Agriculture and Natural Resources, Publication 8101.