Good Agricultural Practices (GAP) Document

The Leopold Center for Sustainable Agriculture (2004, 1) explains why gardeners need to undertake good agricultural practices:

> Food safety concerns are increasing as once unheard of illness-causing microorganisms become more prevalent and as products previously considered safe cause an increasing number of illnesses each year. Produce, recently thought of as a safe product, has been identified as a cause of major foodborne illness outbreaks in recent years.
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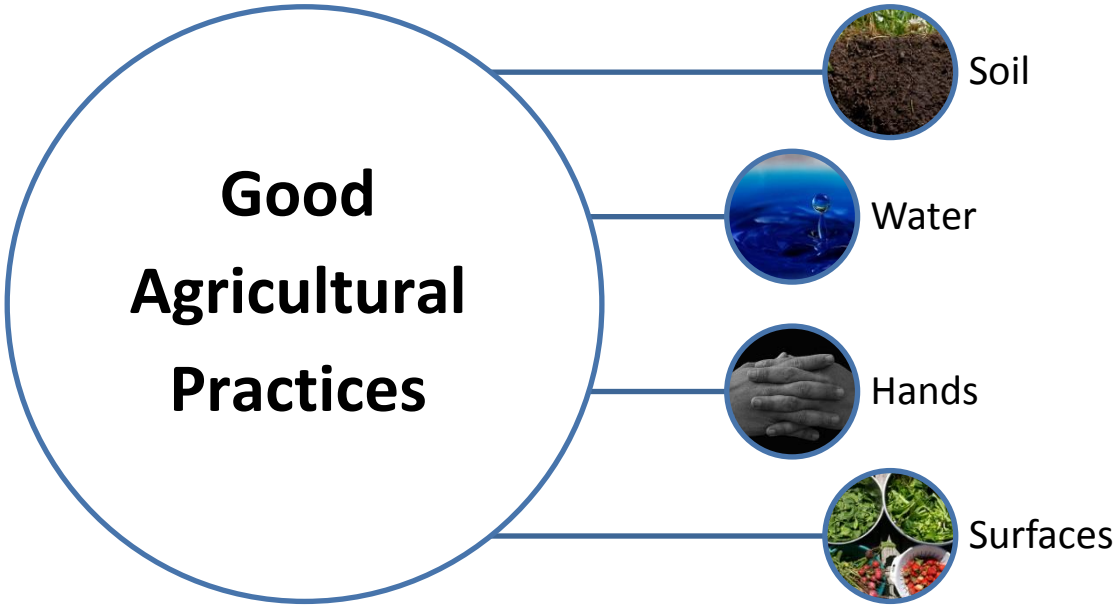
> Illnesses are primarily caused by bacteria, viruses, parasites, and fungi. These microorganisms, often referred to as pathogens or biological hazards, also are associated with ground beef, poultry, eggs, and seafood. Cooking is a common method of easily killing most pathogens in those foods. However, fresh produce is often consumed raw.
>
> In addition, produce is exposed to naturally occurring, biological hazards in the soil, water, and air. The potential risk for contamination is increased by production practices using manure for fertilizer and human handling of products.

It is likely that you or someone you know has suffered from food poisoning. The U.S. Centers for Disease Control and Prevention estimates that 1 in 6 people in the United States gets sick from a foodborne diseases (also called food poisoning) each year, which results in 128,000 hospitalizations and 3,000 deaths (CDC 2014). Causes of foodborne diseases include bacteria, viruses, parasites, molds, toxins, contaminants, and allergens. For details on each of these causes, read the Food and Drug Administration's *Bad Bug Book: Handbook of Foodborne Pathogenic Microorganisms and Natural Toxins* (FDA 2012).

There are four primary considerations to make when following good agricultural practices (Figure 1).



The Leopold Center for Sustainable Agriculture (2004, 1-2) provides an overview on each of these topics.

Soil

Maintaining "clean soil" reduces the risk of contaminating produce with illness-causing microorganisms found in soil during stages of growth and harvesting. Illness-causing microbes always are present in the soil, but their populations and resulting risk of product contamination can be increased tremendously by improper manure management and application.

Although manure is a good form of fertilizer, all manure contains pathogens. Some pathogen levels in the soil will decrease over time due to competition from other bacteria in the soil or because of less-than-desirable conditions.

The following steps are recommended to minimize risks from manure.

- Incorporate manure or use cover mulch after application to reduce the risk of physical contamination of product from rain or irrigation splash.
- Reduce microbes through high temperature, aerobic composting.
- Apply manure to cover crops in the fall.
- Apply manure in the spring two weeks before planting and preferably on grain crops or perennials.
- Allow a minimum of 120 days between manure application and fruit or vegetable harvest.

Water

Water used for irrigation, cooling, processing, or for cleaning equipment and facilities should be free of microbial contaminants. Water quality and safety can be dependent on the water source. Municipal water usually has the best quality because of previous testing and safety requirements. Ground or well water will have fewer pathogens than surface water (such as ponds, streams, or rivers) because there is less chance of contamination.

Regularly testing water sources provides documentation that the water is not a source of contamination. The frequency of water testing is dependent on the type of water source and the time of year. Water quality becomes more important as harvest approaches and water contact with the product occurs or increases. The method and timing of water use also has an effect on its contribution to product contamination. Using drip irrigation instead of sprinklers helps prevent contamination from soil splash and from product contact.

Hands

Having "clean hands" refers to the human element involved in food safety during production and processing. The food producer and handler each have an important role in ensuring the safety and quality of foods grown and processed. Poor hygiene and health, unclean clothing or shoes, or unsafe

practices on the part of workers can threaten food safety. Providing clean and appropriately stocked restroom and handwashing facilities to field and processing employees helps prevent product contamination.

Surfaces

Produce items will have physical contact with many surfaces during harvest and processing. These may include harvest equipment and containers, transport bins, knives and other utensils, sorting and packaging tables, product packaging, and storage areas. Basic GAPs to help ensure clean surfaces include the following:

- Keep potential contaminants, such as soil and manure, out of the processing area or facility.
- Cull soiled produce in the field and damaged produce prior to processing.
- Use plastic containers and totes that are suitable for routine and efficient cleaning and sanitizing.
- Clean and sanitize equipment and facilities daily.
- Consider including a sanitizer in prduce rinse water to reduce bacterial contamination.
- Control animal contamination sources, including pets, wildlife, birds, insects, and rodents.

Works Cited

CDC. 2014. CDC 2011 Estimates: Findings. http://www.cdc.gov/foodborneburden/2011-foodborne-estimates.html

FDA. 2012. Bad Bug Book: Handbook of Foodborne Pathogenic Microorganisms and Natural Toxins. http://www.fda.gov/downloads/Food/FoodborneIllnessContaminants/UCM297627.pdf

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