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Safe Handling and Storing of Raw Fruits and Vegetables

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Fruits and vegetables are essential for a healthy diet. Nutritious produce can be purchased at your local grocery store, farmers' market or even grown in your backyard. While produce is usually safe, it can become contaminated throughout the farm to fork continuum with harmful microorganisms (pathogens), including bacteria, viruses, parasites, or other microbial organisms that can cause illness. A foodborne illness, often referred to as "food poisoning", can occur by consumption of contaminated food products. There can be a higher risk of foodborne illness from consumption of fresh fruits and vegetables because they are eaten raw or minimally processed. Fresh produce frequently lacks a kill step (cooking for example) to destroy pathogens. The Center for Disease Control and Prevention (CDC) estimates that 1 in 6 people are affected by foodborne illnesses annually in the US (CDC, 2014). Therefore, when you purchase, prepare, store, and consume fresh fruits and vegetables, follow these best practices to protect yourself and others.

Once produce becomes contaminated, the microorganisms are difficult to wash off. Therefore it is important to prevent contamination in the first place! Washing (with clean running water) does reduce the number of bacteria on your produce by 99%, which is good, but can't guarantee that there are no pathogens present. Pathogens, at even low numbers may still be able to cause illness. Using proper temperature control and cleaning practices can reduce your chance for foodborne illness.

Best Practices for Handling Fruits and Vegetables

Purchasing Produce from a Grocery Store or Farmers' Market

- Avoid buying bruised or damaged fruits and vegetables.
- If purchasing bagged or pre-cut produce, select items that have been refrigerated or placed on ice at the grocery store of farmers' market.
- Keep fresh fruits and vegetables separate from raw meat, seafood, and poultry products in the grocery cart and bags.
- After purchasing your food, go straight home. Perishable foods including fresh cut produce, raw meat, poultry, seafood and eggs, should be refrigerated within 2 hours; however, when outside temperatures are 90°F or higher, foods should be refrigerated within 1 hour.

*Tip: If these transport times recommendations are not possible (e.g., your market is 30 minutes or more away) then bring a cooler to store perishable foods for the return trip home.

Storing Produce

- Refrigerate perishable produce (e.g. strawberries, leafy greens, pre-cut and ready-to-eat bagged produce, among others) in a clean refrigerator at 40˚ F or below to maintain quality and safety.
- Discard produce if it has not been refrigerated within 2 hours after cutting, peeling or cooking
- Store raw produce on shelves or in bins above meats, poultry and seafood to reduce the risk of cross-contamination from dripping of juices.
- Place produce in perforated bags when refrigerating to maintain freshness and quality.
- Store produce that does not require refrigeration on a clean countertop or in a cupboard or pantry out of direct sunlight.
- Separate produce (e.g., apples, pears, bananas, mangoes) that release ethylene gas during ripening from other produce to extend the shelf life (i.e., to prevent premature spoilage). This can be done by placing in separate refrigerator bins.

*Tip: Keep a thermometer in the refrigerator to ensure your foods are kept below 40°F!

Image from FDA, 2012

Recommended storage temperature and shelf-life of common produce items (The storage times listed in this chart are helpful guidelines, not set rules)**:**

Storage Location	Fruits	(Shelf life)		Vegetables	(Shelf-life)	
Store in Refrigerator (set at 40 ℉ of lower)	Apples	> 7 days	Artichokes	1-2 weeks	Ginger	1-2 weeks
	Apricots	2-3 days	Asparagus	3-4 days	Green onions	1-2 weeks
	Blackberries	1-2 days	Green beans	1 week	Herbs	1 week
	Blueberries	1-2 days	Lima beans	3-5 days	Leeks	1-2 weeks
	Citrus fruit	1-2 weeks	Beets	7-10 days	Lettuce	1 week
	Cherries	1-2 days	Broccoli	3-5 days	Mushrooms	2 days
	Cut fruits	2-4 days	Cabbage	1-2 weeks	Peas	3-5 days
	Grapes	3-4 days	Carrots	3 weeks	Peppers	4-5 days
	Mango	1 week	Cauliflower	3-5 days	Radishes	10-14 days
	Raspberries	1-2 days	Celery	1-2 weeks	Spinach	3-7 days
	Strawberries	1-2 days	Cucumbers	4-5 days	Summer squash	4-5 days
			Eggplant	3-4 days	Sweet corn	1-2 days
Ripen, then Store in Refrigerator	Avocados	3-5 days				
	Kiwifruit	3-4 days				
	Nectarines	3-4 days				
	Peaches	3-4 days				
	Pears	3-4 days				
	Plums	3-4 days				
Store out of Direct Sunlight and at Room Temperature	Apples	< 7 days	Basil	1 week	Sweet potatoes	2-3 weeks
	Bananas	until ripe	Dry onions*	2-4 weeks	Winter squash	1 week
	Citrus fruit	10 days	Garlic*	1 month		
	Mangoes	3-5 days	Potatoes*	1-2 months		
	Melons	1-2 days	Pumpkins	2-3 months		
	Pineapple	5-7 days	Tomatoes	Until ripe		

* Potatoes, onions and garlic should be stored in a cool well-ventilated location (like a pantry).
(Adapted from Kader, Thompson & Harris, 2012 & McCurdy, Peutz, & Wittman, 2005)

Rinsing Produce

- Rinse produce with clean tap or distilled, running water only before use. This will remove any dirt or residue and prevent their transfer into the product.
- A clean brush may be used to scrub produce with a hard rind or firm exterior (e.g. potatoes, carrots, cantaloupes).
- Do not wash produce with soap, baking soda, or other cleaning solutions. Many fruits and vegetables are porous, and the use of soap and cleaning solutions may be absorbed by the produce and expose consumers to harmful chemicals.
- Produce washes and baking soda have not been scientifically validated to be more effective than rinsing with clean water; in addition, these washes and baking soda rinses may affect the flavor of the produce.

*Tip: Avoid rinsing produce prior to storage as the addition of water/moisture can speed up bacterial spoilage!

- Rinsing packaged ready-to-eat and pre-washed produce is unnecessary because re-rinsing (addition of water/moisture) can provide opportunities for contamination.
- To reduce some bacteria that may be present after rinsing, dry produce with a clean, disposable paper towel.

Preparing Produce

- Wash hands for 20 seconds with warm water and soap before and after preparing produce.
- Designate a cutting board for preparing fresh produce that is separate from the one used for raw meat, poultry, and seafood (to prevent cross contamination).
- Wash the cutting board with hot soapy water and rinse with clean water or place in a dishwasher for cleaning before use.
- Before cutting or peeling produce, utensils, and countertops should be cleaned with hot, soapy water.
- Cut out bruised spots on produce before consumption. Cut the tops of celery and trim exterior areas of lettuce and other leafy vegetables that appear dirty. Spoiled produce should be discarded.
- Additional information on shelf life and storage recommendations for fresh fruits and vegetables can be found in the "Food Storage Guidelines for Consumers" publication listed in the references.

*Tip: Produce that has been peeled or cut should be consumed within 2-4 days or discarded!

Consumption of fresh fruits and vegetables are an essential component of a healthy diet; however, produce consumed raw or within minimal processing may pose a food safety risk. Therefore, following appropriate best practices for produce storage, rinsing, and preparation will help reduce the likelihood of foodborne illness.

References and other resources:

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