Episode Three- Understanding microorganisms that affect food safety

Welcome to episode 3 of Food Safety Bites Brought to you the University of Wisconsin Madison, and funded by the USDA Food Safety Outreach Program, this is your host Harriet Behar. This episode is **understanding microorganisms that affect food safety.** In these podcast episodes, I will identify issues, and provide suggestions for how to reduce various fresh produce contamination risks and keep your customers safe. We will not talk in detail about what is required for a GAP audit or a FSMA inspection. If you want more information on those, please see the links on the website where you found these podcasts.

It is easy to not pay attention to things that cannot be seen, like microorganisms. But when considering food safety, we know that numerous microorganisms can contaminate the food and cause illness such as pathogenic bacteria. Remember that most bacteria do not make us sick, and indeed keep us alive and healthy, and keep our soil strong and active and plants able to take up nutrients. No one is saying all bacteria are bad. However, just like the bugs that cause the flu or colds, there are specific species of bacteria, specifically those found in feces of warm-blooded animals and humans, that can make us very sick when ingested. Therefore, that is why it is our job to “keep the poop off the food”, as they say. (Could even give a shout out to Chris B here since that was his “catch phrase” :))

Luckily there are sanitation and personal hygiene activities that can give you confidence that you are doing all you can to provide your customers with healthy food. Another aspect to controlling potentially harmful microorganisms is that they will probably not be everywhere. For example, a deer may have pooped near a zucchini squash on one end of the field, but would not have contaminated the whole field, the same with a bird pooping on a tomato as it flew overhead. Developing systems that prevent the contamination from spreading during handling is important and will be discussed in future episodes on growing, harvesting and post-harvest.

Why do microbes present a problem in fresh produce? First, many times the produce is eaten fresh, and not cooked. That cooking step can kill those pathogens. In addition, even if the produce is to be cooked, it will be handled by your customer in a fresh state, and those pathogens could spread by your customer before the food is cooked by contaminating hands and cutting surfaces.

Some types of produce are trickier to manage when it comes to control of bacterial contamination. Rough or folded surfaces, like cantaloupe or many types of leafy greens, make it difficult to see the poop, or notice if there has been some damage to the skin to allow bacteria to enter into the fruit. Greens have a lot of surface area, with lots of bumpy and folded leaves where bacteria can hide and potentially grow in storage. Even the stem scars on tomatoes when there is a small tear, can provide a place for bacteria to enter, and it is difficult to clean these areas. The most important thing to consider, is to prevent the presence of pathogenic microorganisms on the produce in the first place.

Let's consider the many sources of fecal matter … people (field and packing shed workers), wild and domestic animals, irrigation water, water used for cooling, water used for spraying fertility or pest control inputs, wash water, and soil amendments. Also, dirty equipment, hand tools, places within buildings where food and packaging are stored and handled, harvest wagons and tubs. Think about every surface your employees may touch, and where the produce may touch from the field to the final package, and you can see there are many vectors for these problematic bacteria to spread. Ecoli, salmonella, listeria can be present in soil and spread through hands, wash water etc. We have all heard of numerous recalls of spinach, romaine lettuce, cantaloupes, raspberries and more that caused sickness and death in those that purchased and ate that produce. Beyond bacteria in fecal matter, there are diseases such as hepatitis A, Noroviruses, shigella, and parasites, can be spread from ill workers through their hands and the tools or water they have touched.

Let's start with people: Ineffective or lack of handwashing can lead to contamination of the produce but is a problem that can be solved. There are episodes in this series that cover how to handwash and how-to setup of accessible and acceptable hand wash stations. It is also important to have accessible toilet facilities accessible, and to allow for workers to leave their work to use the restroom, so they don't go to the edge of field where there are no hand washing facilities. People who are sick, should not have contact with fresh produce. It is especially important to tell your crew you do not want them to work when they have diarrhea, vomiting or a fever or jaundice, since these are signs of more serious communicable illness that could make customers sick if spread via the produce. If they have lesser symptoms, like sniffles or a slight cough, you might allow them to come to work and do tasks that don't involve touching the fresh produce, but also be careful that they don't also get the rest of your crew sick with a cold. Sick workers can spread disease on the produce by coughing, sneezing or by their hands if they don't wash well after going to the bathroom.

Workers who are eating or smoking without a subsequent handwash, can spread their saliva and sickness onto the produce. The good news is, we can develop easy to follow protocols that lessen the risk of contaminated produce from people.

Animals- Wild and domestic animals can carry and transmit fecal matter. We have all seen dogs roll in manure or dead animals, and once they have done this, they could run through produce field. I will be talking about mitigation measures, with environmental conservation in mind for these issues in other episodes. They are not as difficult to manage as you may think.

Water: If you are using surface water for irrigation, animals like deer, raccoons etc. can cause contamination by peeing or pooping in that water, and we would never know. When irrigating, consider your source, any contamination risk and its application method. Water can easily carry and spread pathogens, and depending on the water source, there could be more risk from overhead irrigation vs drip tape under plastic. Consider the sources and distribution equipment for all of the areas you use water, including spraying in the field for frost protection, using it for crop sprays, cooling and post-harvest washing.

Soil amendments originating from animals such as raw manure should be used when only in a way where they are not applied too close to harvest. Pathogens in manure will die off over time, but they can persist a surprisingly long time in soil. So, if you use raw (meaning untreated manure), you should allow enough time between application and harvest. GAPs guidelines defer to NOP rules here and use it as a best practice for food safety. Under organic regulations, food for human consumption cannot be harvested sooner than 120 days after raw manure was incorporated into the soil, if the crop is in contact with the soil (like carrots or even peppers where soil could splash up on the peppers, and 90 days if the crop is not in contact such as sweet corn. Is a fully composted product originating from animal products is safer than raw manure? Many times yes, but it must have gone through a true composted process to kill those pathogens. And yes, there is a food bites episode on this topic as well!

Prevention is key, give thought to how your areas are setup and are they discouraging or encouraging problems. It is not possible to completely eliminate all risk. We can only manage risk and work to lessen the spread of microorganisms through our handling activities.

There are many places in life where people take protective action- like wearing seatbelts in your car or those hard-plastic hats when baseball players are at bat. There are many areas of risk, but we can be proactive and manage it.

So that's it for this episode of Food Safety Bites, the next episode is worker hygiene, this is your host Harriet Behar brought to you by the University of Wisconsin Madison, talk to you next time!