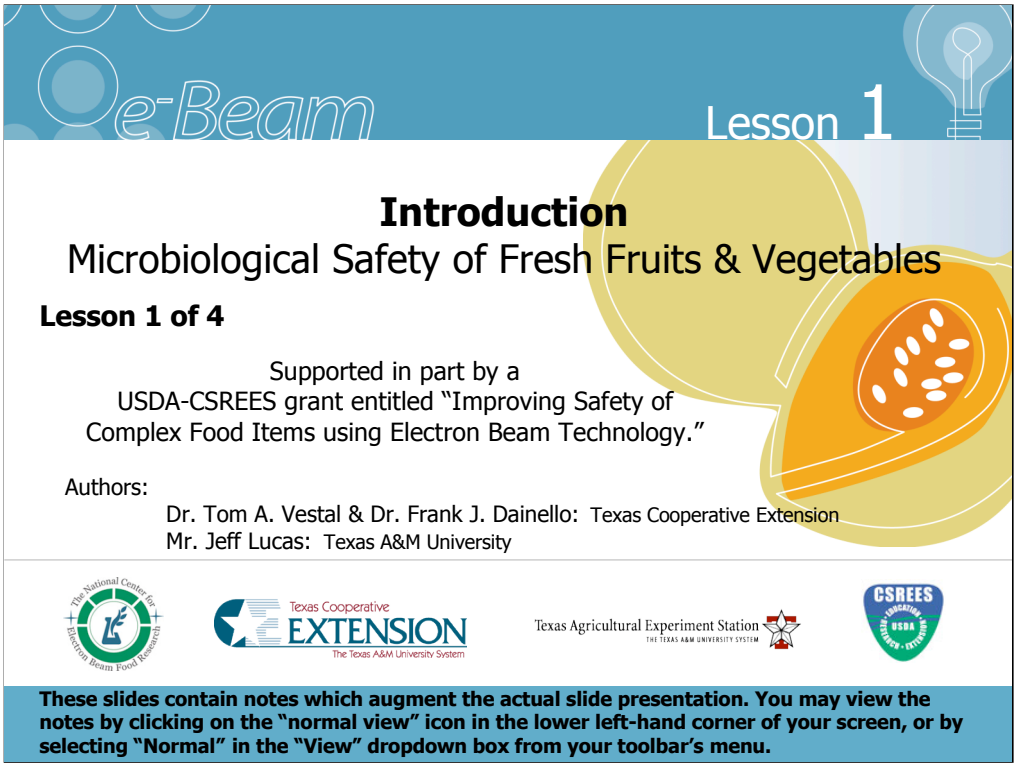
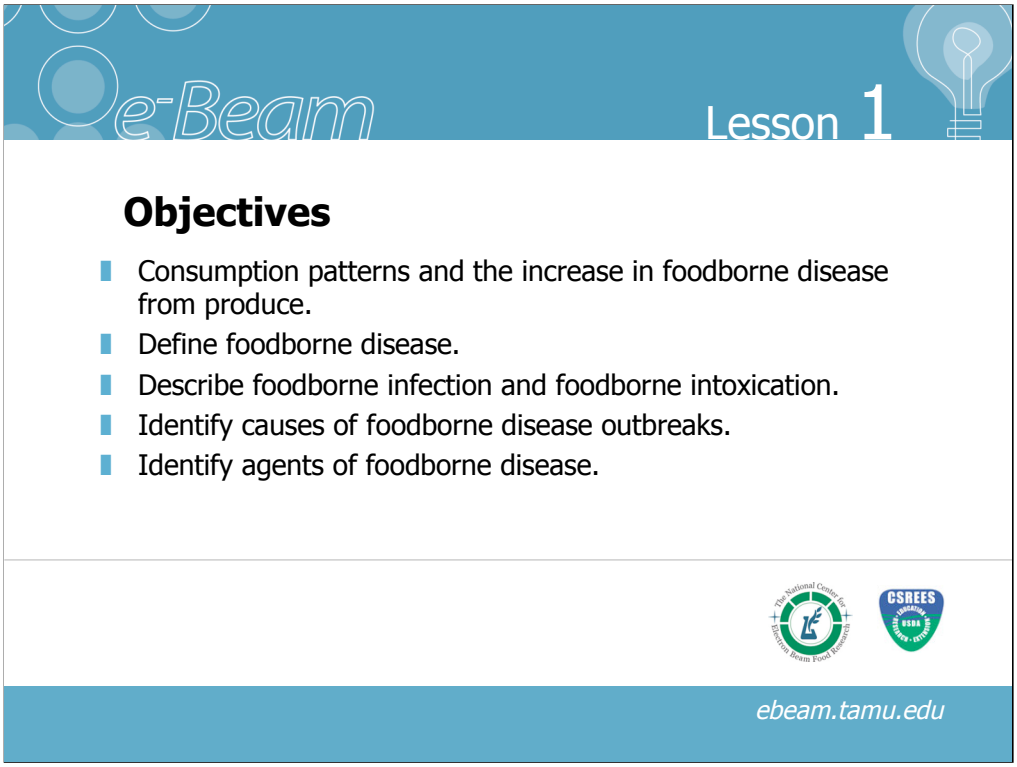


This brief lesson "Introduction to the Microbiological Safety of Fresh Fruits and Vegetables" is brought to you from Texas Cooperative Extension at Texas A&M University. A USDA-CSREES grant entitled "Improving Safety of Complex Food Items using Electron Beam Technology" was awarded to Texas Agricultural Experiment Station and Texas Cooperative Extension to support this lesson. Texas Cooperative Extension food safety experts seek this opportunity to share food safety knowledge with you so that the food that you produce, process, prepare, and consume are of high quality, wholesome, and safe from pathogens.



Learners who complete this lesson will be able to…

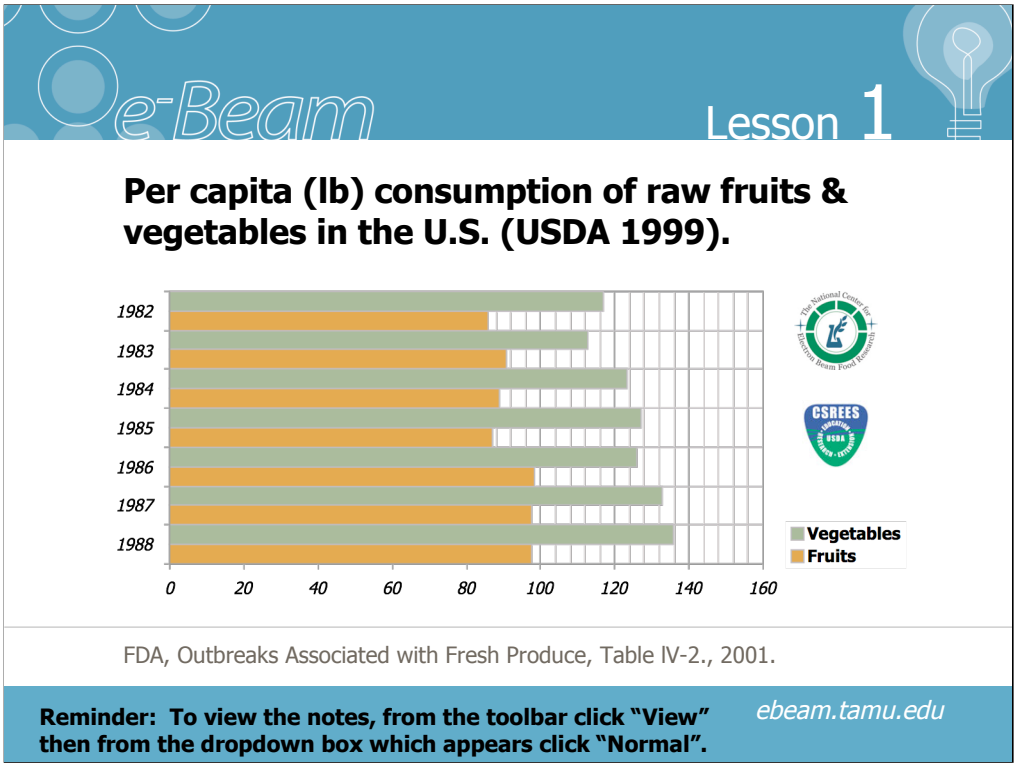
…describe consumption patterns of fresh produce and related increases in foodborne disease.

…define foodborne disease.

…describe foodborne infection and foodborne intoxication.

…define an outbreak.

…identify agents of foodborne disease.



Per capita consumption of fresh produce has increased because we have the technology—refrigeration and distribution channels—to rapidly move produce from farm to market. Food safety has become an important issue since the development of mass distribution.

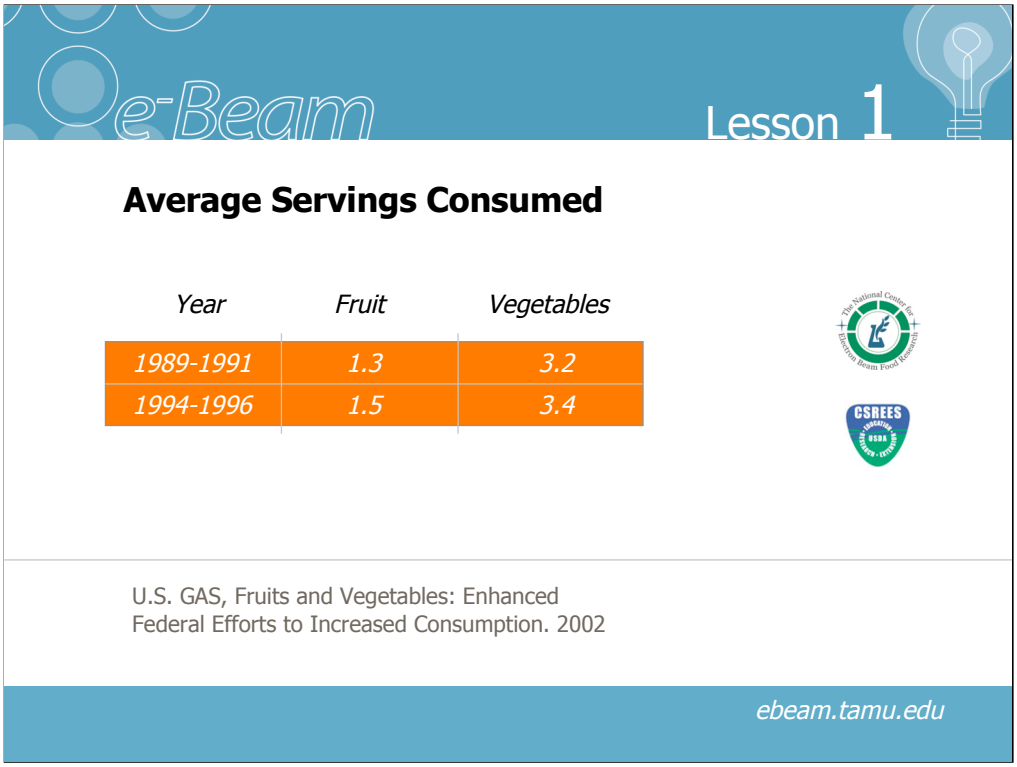
Produce, whether foreign or domestic, may have common distribution and processing pathways. If a pathway becomes contaminated with a foodborne pathogen, the prospects of public risk are greater due to the increased prospect of mass distribution of the pathogen.

Diversity in our population has led to greater demand for foreign and domestic produce, elevating consumption patterns of fruits and vegetables.

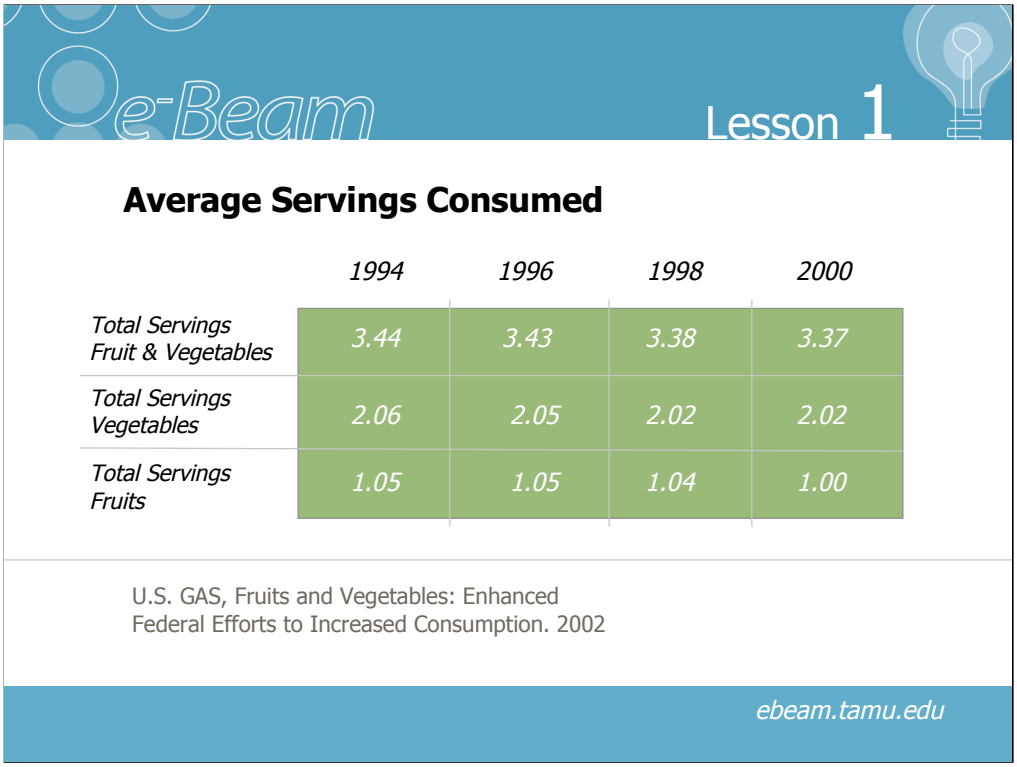
Food safety issues are compounded by the fact that many countries of origin of these products do not have the high level of sanitation that exists in the U.S.

As you can see in this 1982-88 data, we have increased our consumption of fresh fruits and vegetables. This illustrates consumption increases of 13.94% and 16.26% for fruits and vegetables, respectively, during the seven years of the study. Observing U.S. health conscious consumption patterns of the 1990s and 2000s one might expect this pattern to continue.

In the U.S., growing health consciousness and public education activities by organizations such as Cooperative Extension, American Cancer Society, American Heart Association, and USDA (Food Guide Pyramid) and the fact that fruits and vegetables are more readily available have contributed to the elevation of consumption patterns. Evidence supports the assumption that fruit and vegetable consumption has sustained higher levels in the most recent decade.

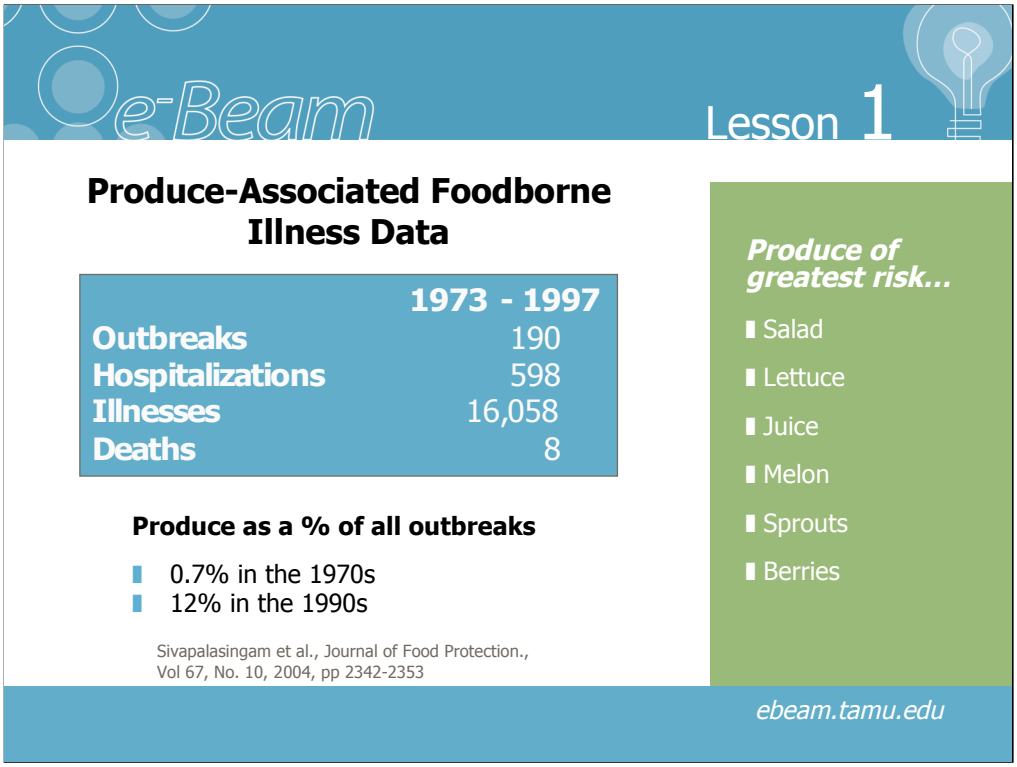


Evidence supports the assumption that fruit and vegetable consumption has and continues to spiral upward.



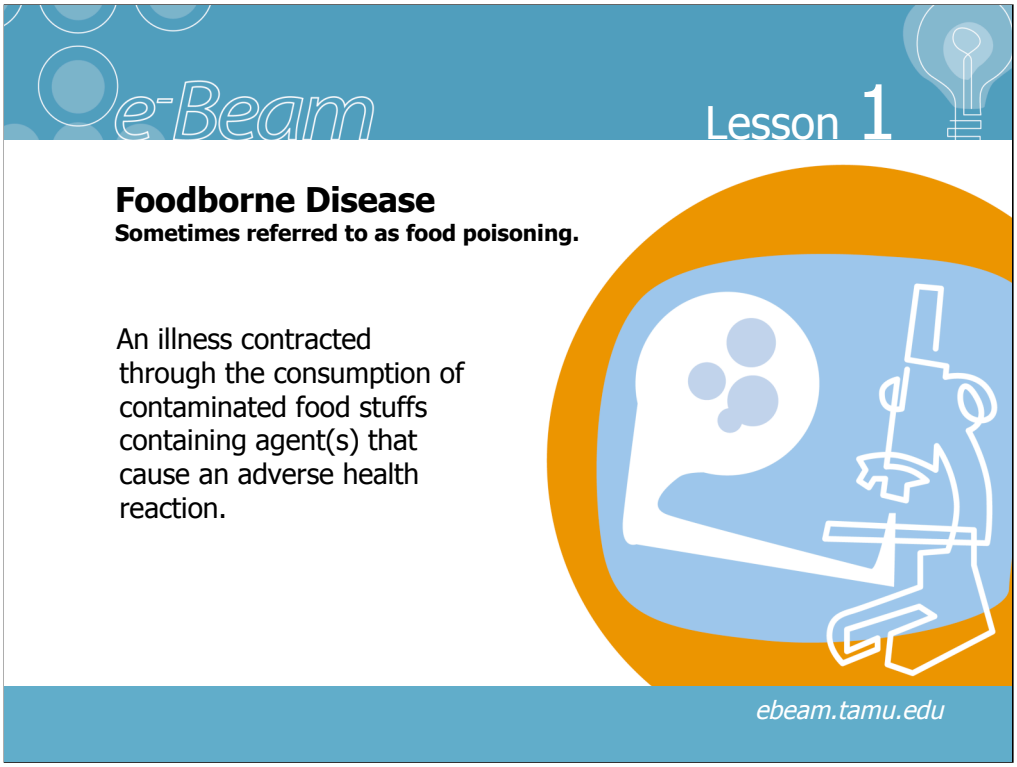
This frequency data for 1994-2000 indicates that consumption of fruits and vegetables remained relatively constant throughout the mid-to-late 1990's indicating that the 1980's trend became the norm. Still, the 3.37 servings in 2000 was below the USDA's recommended 5-A-Day servings, therefore consumers should expect to see continued promotion of fruit and vegetable consumption for optimal nutrition and health.

Along with increased consumption, the number of outbreaks caused by foodborne pathogens associated with fresh produce has also increased.



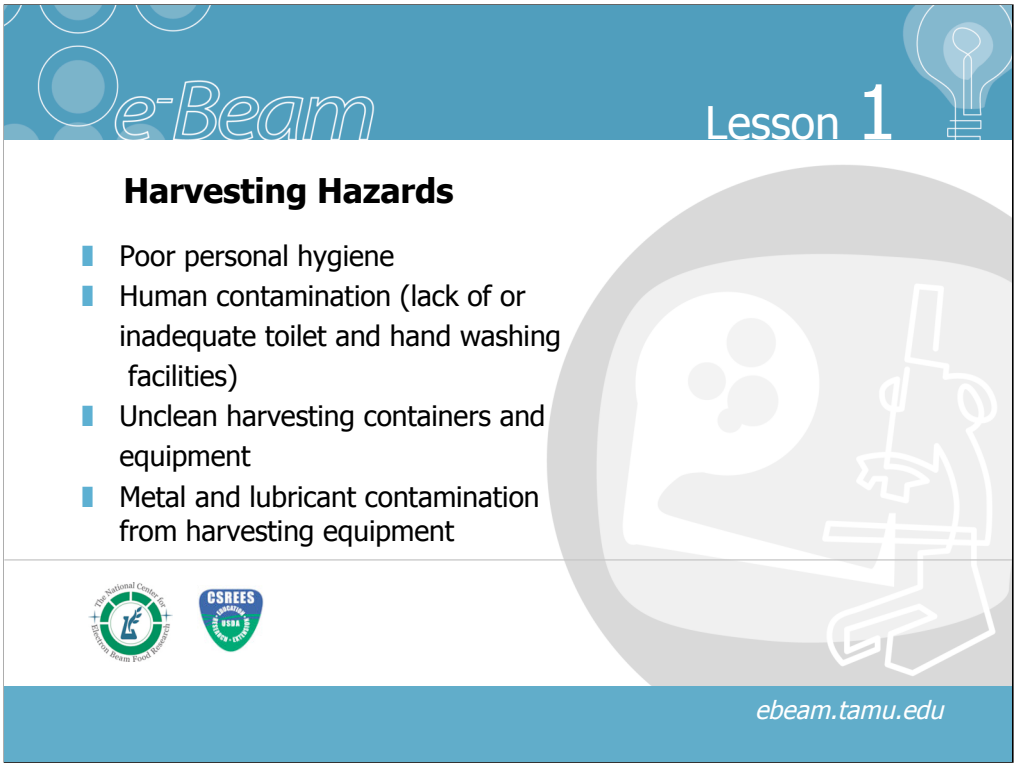
In comparison to previous years when produce consumption was lower and cold channel distribution was less developed, produce today is implicated in a higher number of foodborne illness outbreaks. For example in 2001 alone, preliminary estimates from the CDC's ESFORS indicated 57 produce-associated disease outbreaks occurred resulting in 16, 058 illnesses, 598 hospitalizations, and 8 deaths. Produce of greatest risk are salad items, juices, melons, and berries.

Many factors have contributed to increased incidence of foodborne illness from fresh produce. Public consumption patterns contribute to greater potential exposure. Demand for fresh cut and packaged produce increases potential for cross contamination, and other critical factors contribute to increased foodborne illness.

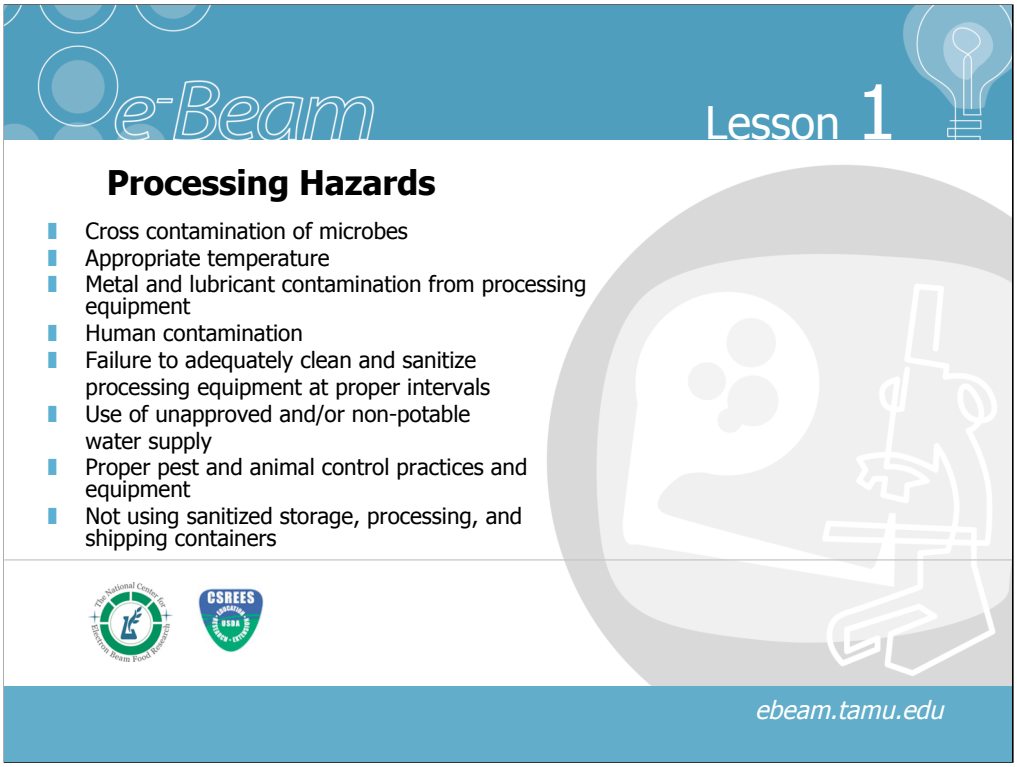


First, let's make sure we understand what foodborne illness actually is. It is an illness contracted through the consumption of food that is contaminated by chemical, physical or microbiological contaminants. There are inherent hazards involved in the growing, harvesting, processing, storage, distribution and preparation of fresh produce.

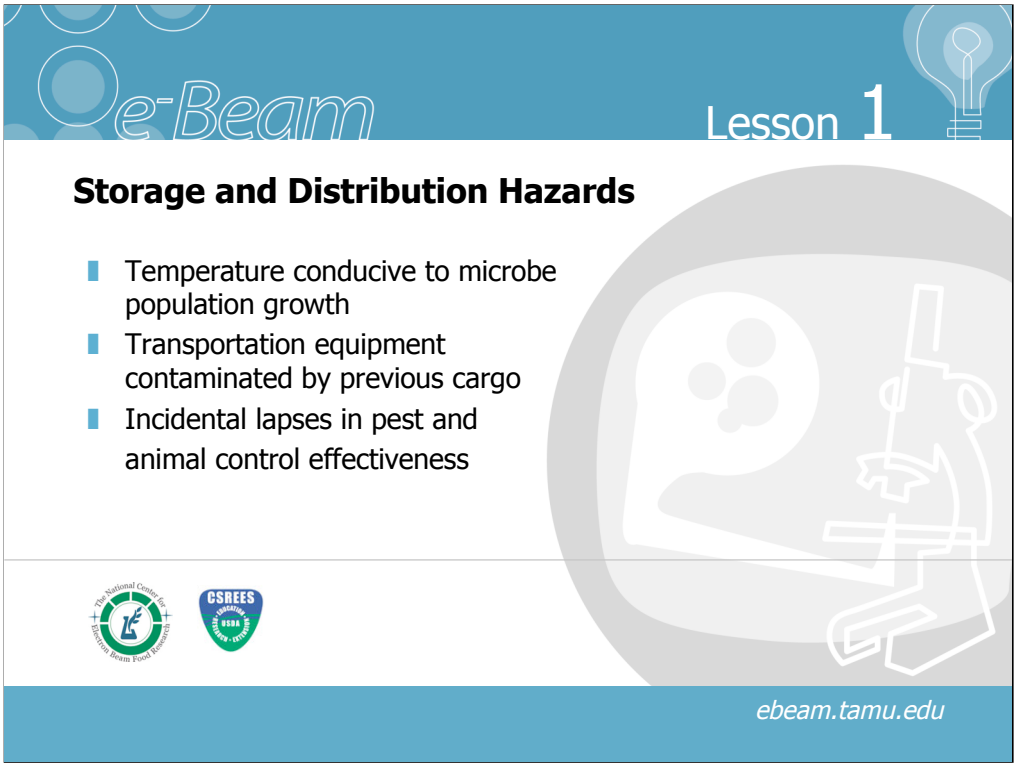
Some microbial hazards have become more apparent over time.



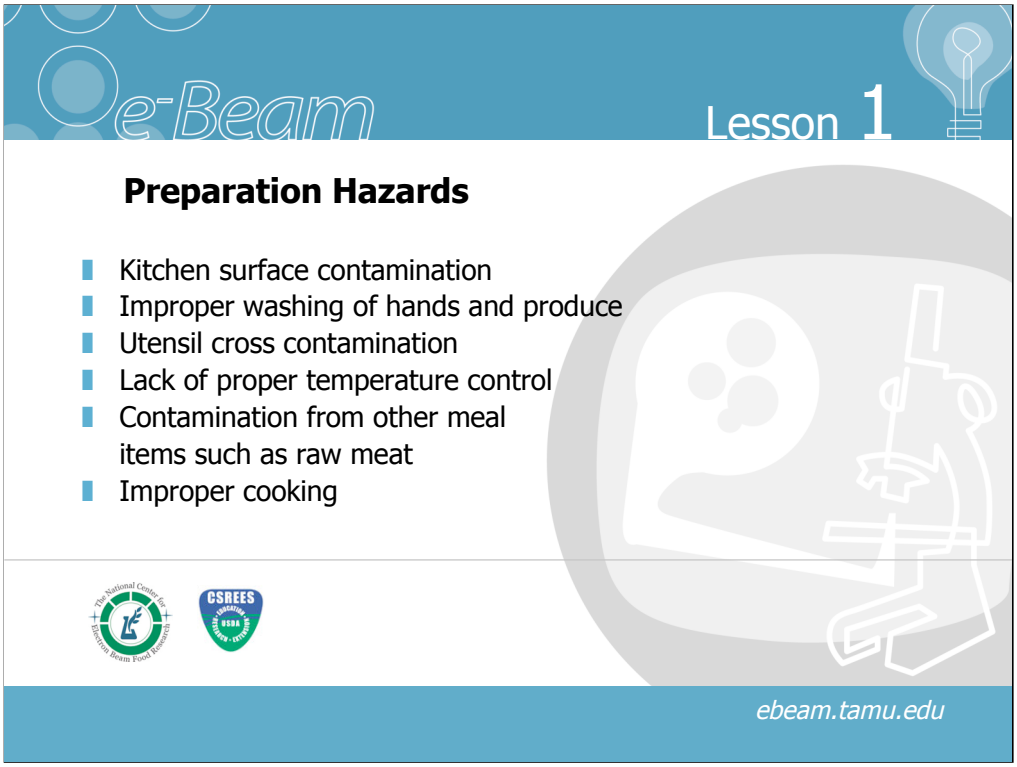
Food safety begins on the farm.



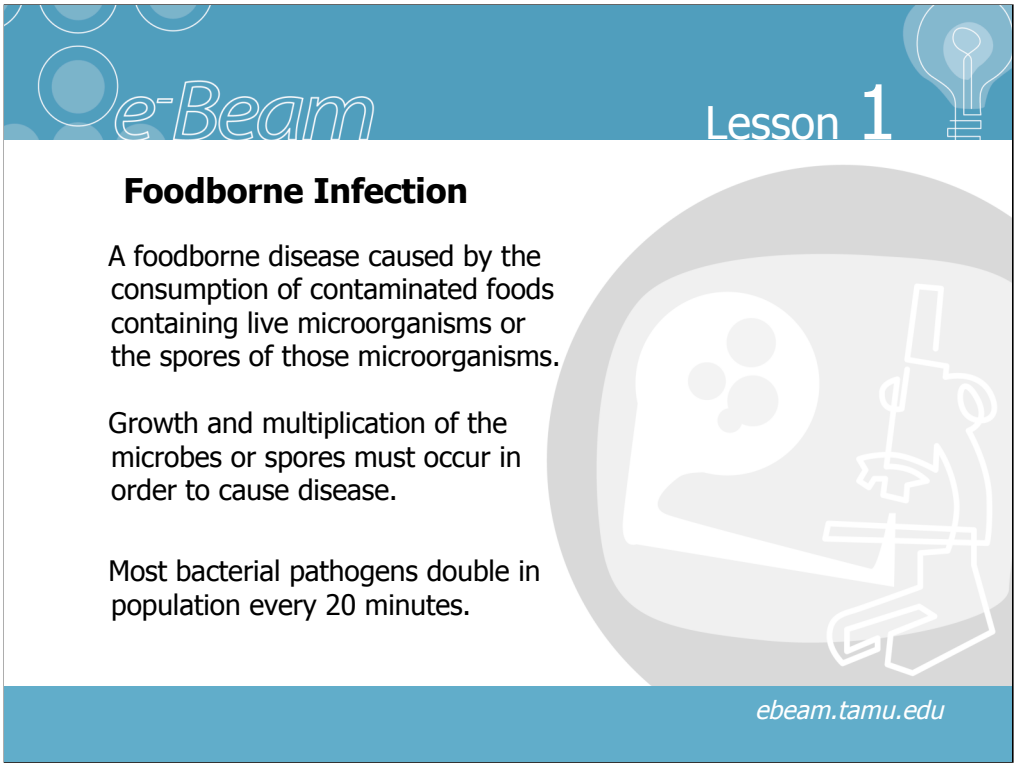
Handlers at each stage of the food chain have responsibility for food safety.



Detailed food handling practices are critical at every stage which adds to the number of potentially vulnerable sites for food contamination.



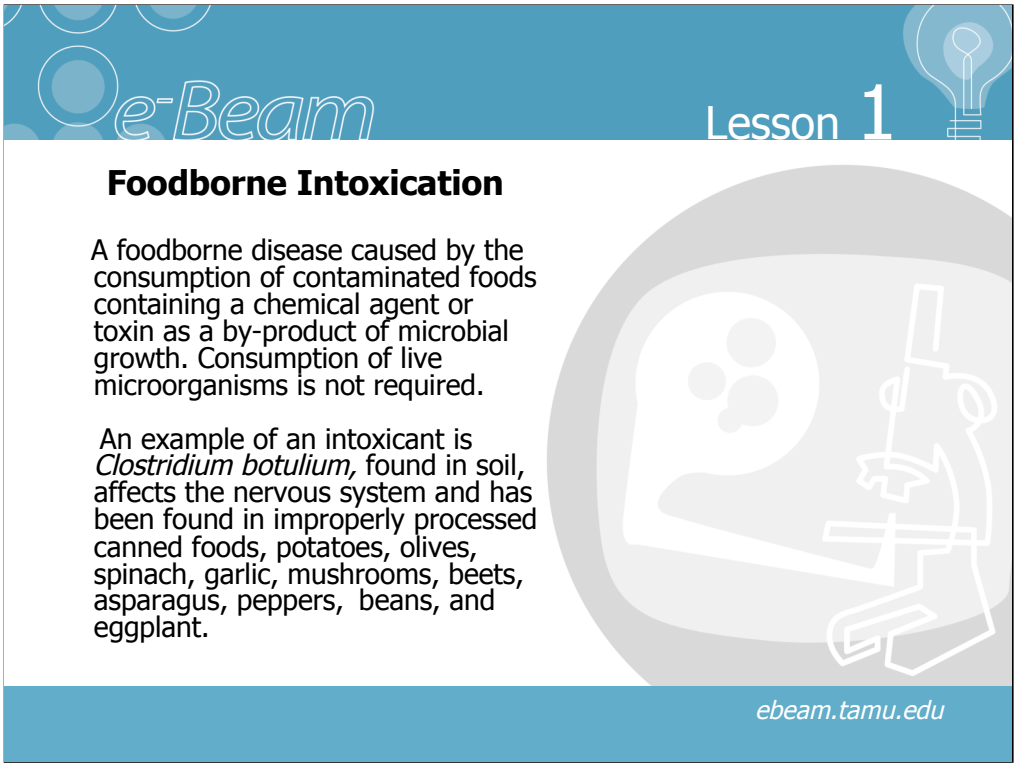
Ultimately, food safety responsibilities fall on the preparer. Home, institutional, or restaurant preparers have a number of hazards to avoid to insure wholesomeness, freshness, and safety.



Foodborne infections are caused by consuming sufficient numbers of pathogenic microorganisms that continue to grow and multiply in the gastrointestinal tract. Some species of bacteria double in population every 20 minutes. These pathogens reach a sufficient level in population to cause disease symptoms.

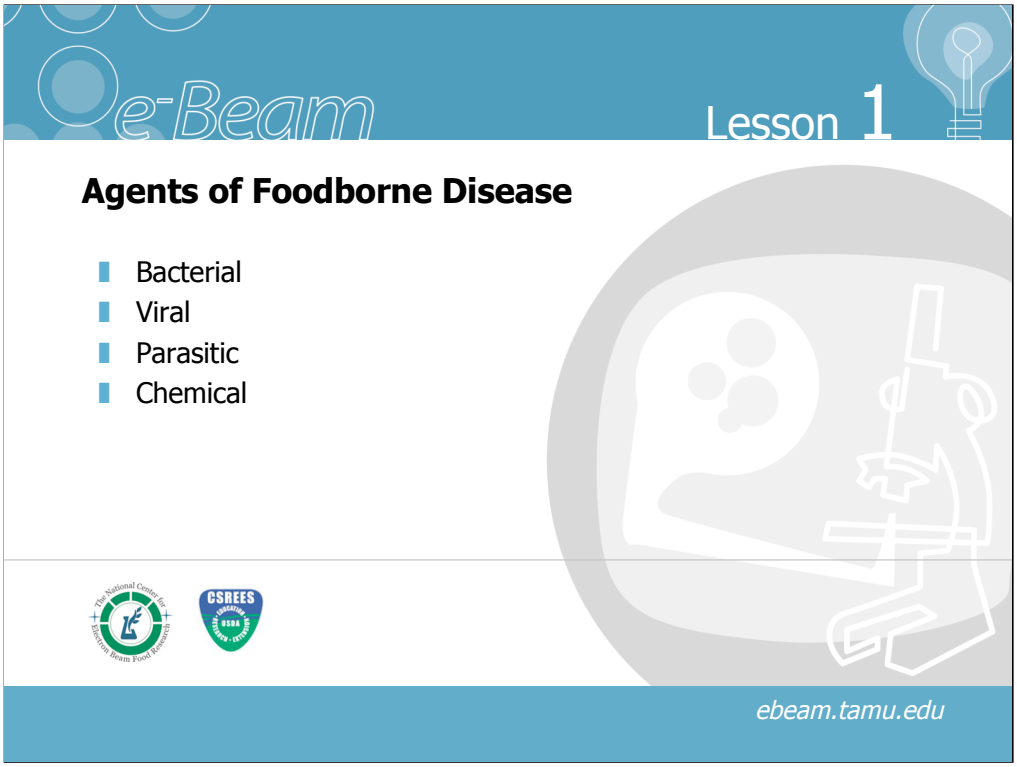
Examples of foodborne pathogens include *Salmonella*, *E. coli O157:H7*, *Listeria monocytogenes*, and *Shigella*.

The number of pathogens required to cause disease varies depending on a person's immune capacity. The state of an individuals immune system will predispose them to microbial infections. Individuals taking immune suppressive drugs such as patients receiving cancer therapy, with AIDS, as well as pregnant women, the very young, and the elderly, are particularly vulnerable.



Several microorganisms of public health significance produce toxin in food. These toxins are a by-product of pathogens actively growing in the food when those foods are held at a temperature suitable for microbial growth.

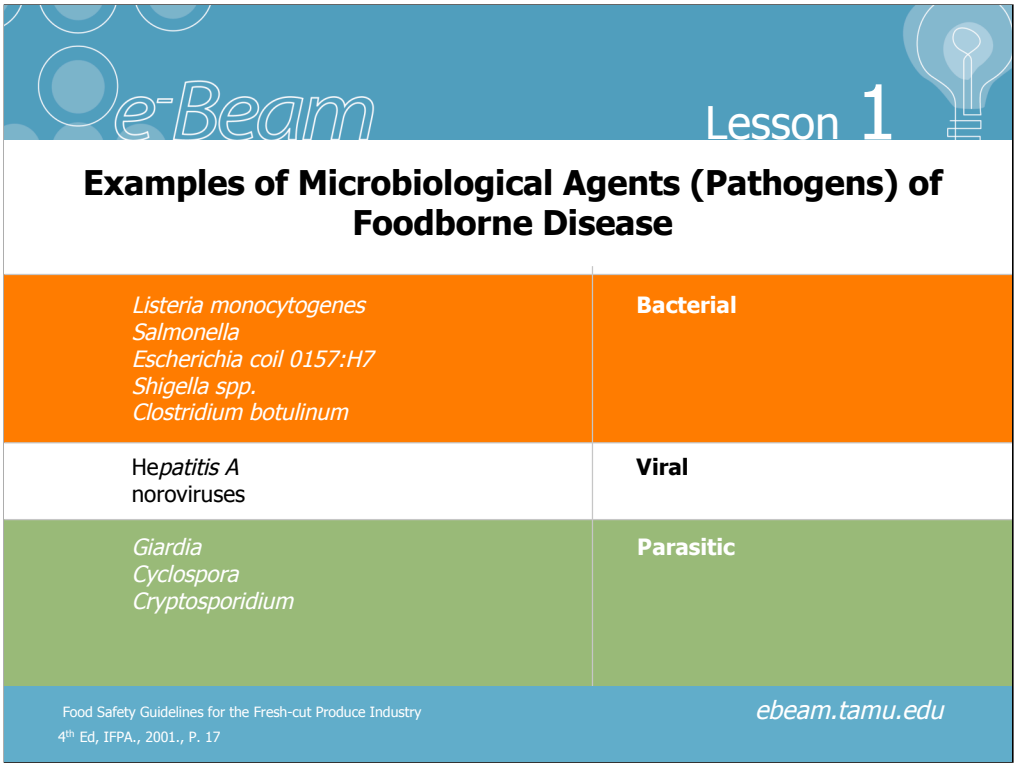
Clostridium botulium and *Staphylococcus aureus* are examples of pathogens that produce toxins in food. Some toxins, like *Staphylococcus* enterotoxin, simply give you gastroenteritis, are self-limiting, and non-life threatening. Other toxins, like *C. botulium*, have severe health consequences. Without immediate health care, *C. botulium* toxin causes death by central nervous system paralysis.



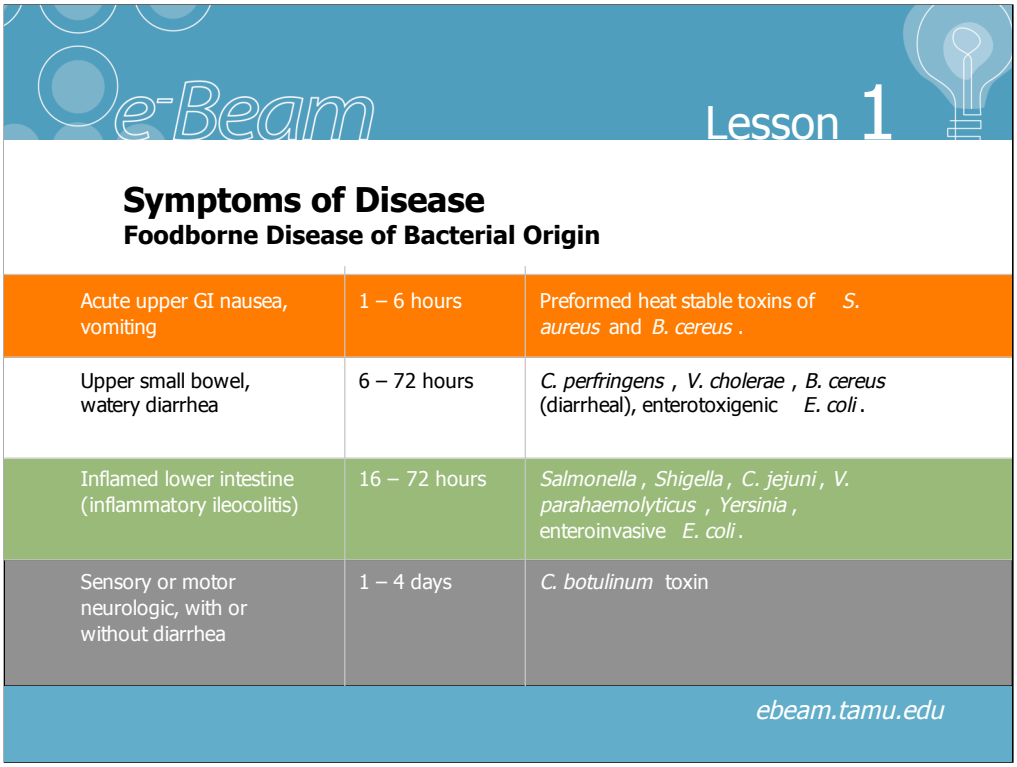
Bacterial contaminants are the largest category of agents which cause foodborne disease from a public health significance. Viral contamination is associated with improper handling and poor hand-washing. Most foodborne disease outbreaks from viral agents go undetected due to the short duration of the disease symptoms. Parasitic agents, another microbial contaminant such as Cyclospora in raspberries, can cause chronic health effects but outbreaks are rare.

Common examples of chemical agents of foodborne disease are agricultural chemicals, those used for cleaning in the processing facility, and lubricants that inadvertently contaminate food products. The incidence rate of these contaminants is quite low due to FDA, USDA, and EPA regulations. Farmers' use of good agricultural practices and food manufacturers' use of good manufacturing practices contribute to a low incidence of foodborne disease caused by chemical agents.

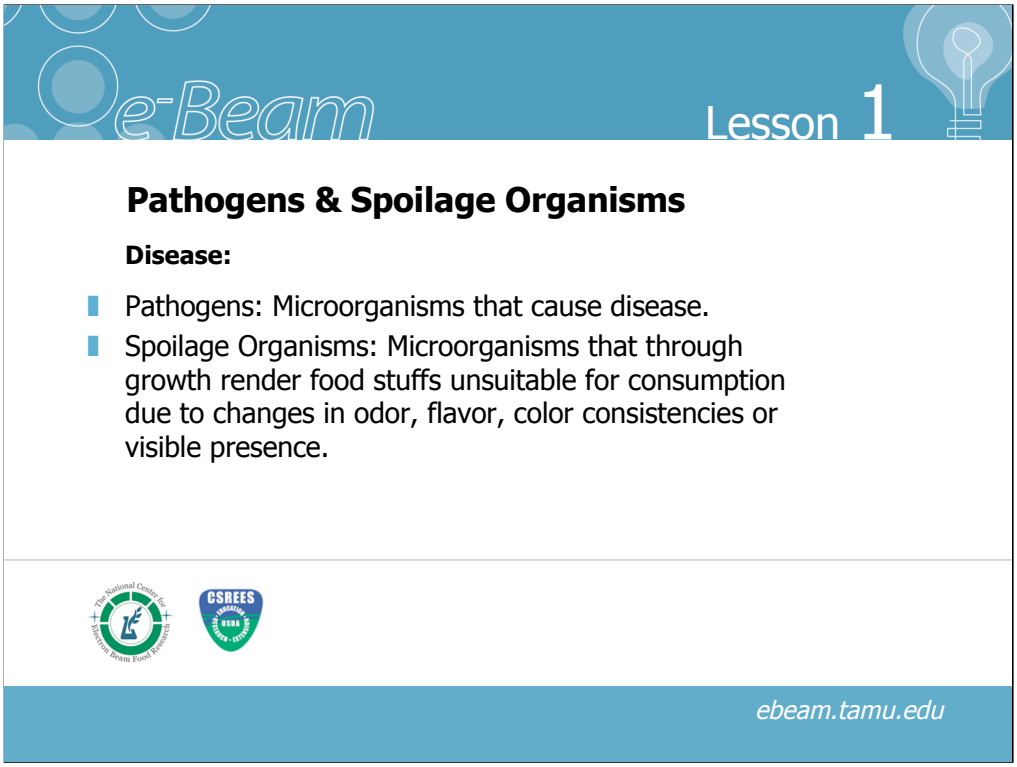
In terms of severity and frequency of foodborne disease outbreaks, bacterial pathogens are the most significant health risks.



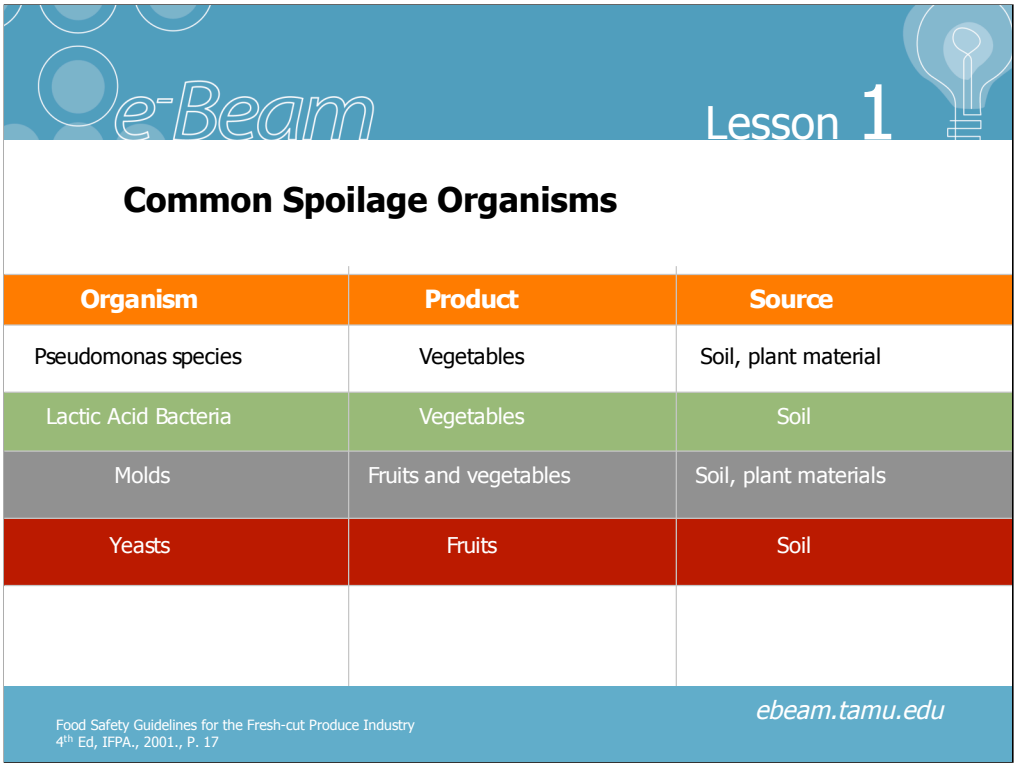
Here are a few examples of bacterial, viral, and parasitic agents found in fresh-cut produce. Some microbes are more commonly found, such as *Salmonell*a, and others, such as *Giardia*, are much less frequent.



Using this slide, lets take a look at a description of symptoms along with the estimated time from consumption to symptom onset.



There are two categories of organisms which exist on produce items. Spoilage organisms are a quality concern, but have no health significance. In this lesson we have focused our attention primarily on pathogens or those organisms that cause disease.



Examples of spoilage organisms which many are familiar with are listed above. They are of little consequence except that they cause economic loss. They are of no consequence to food safety.

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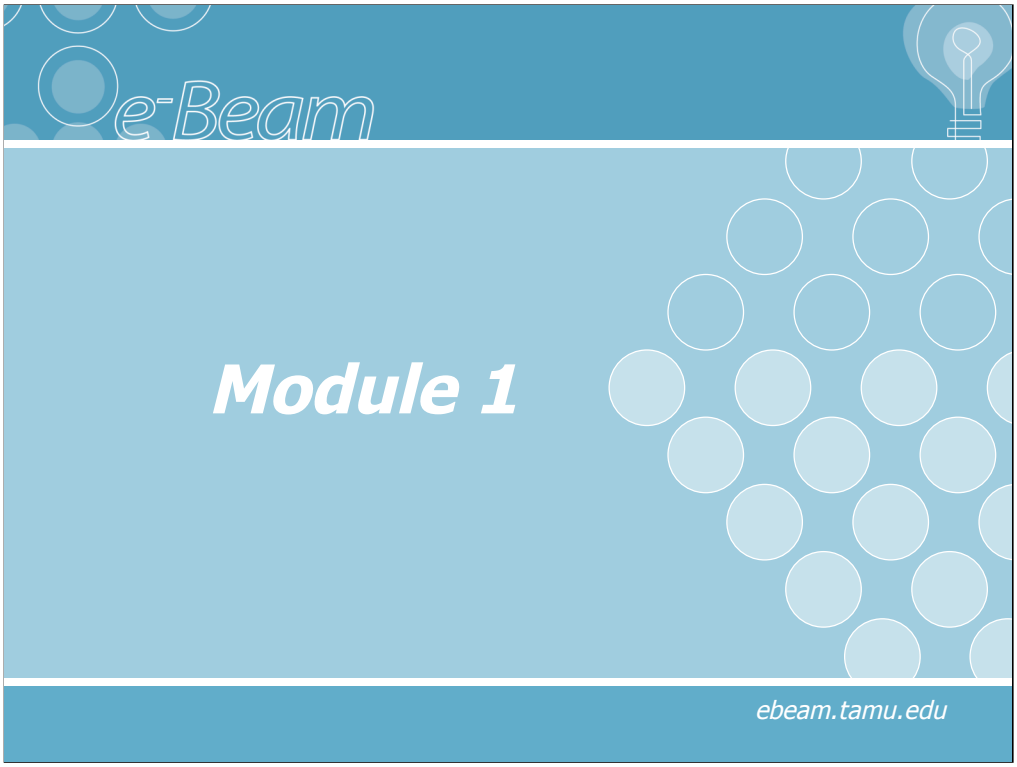
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