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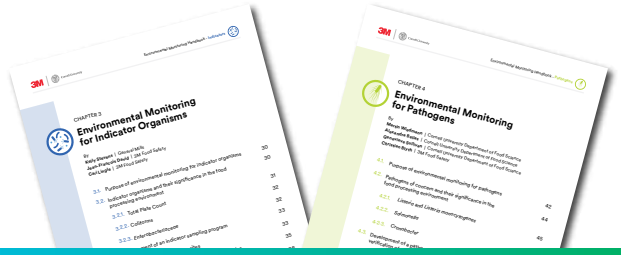
Testing for Indicator Organisms and Pathogens



Eating fads continue to come and go, and some of those trends bring new safety challenges for the food industry. Locally-sourced food – including gardens inside restaurants — raw smoothies, and peoples' undying love of cookie dough have led to the consumption of unsafe food. Testing for indicator organisms and pathogens in an environmental monitoring program are one way to focus on the prevention of foodborne illness.

One trend embraced among food safety experts is a focus on the prevention of foodborne illnesses.

More and more, the food industry is taking a preventative, proactive approach to correcting potential safety issues. Part of the preventative approach? Testing for pathogens in food and food processing environments. Food manufacturers should use additional monitoring methods to determine the general hygiene of food processing areas.

Why test for indicator organisms in an environmental monitoring program?

Monitoring for indicator organisms doesn't test for specific pathogens but provides information about the microbial ecology of food manufacturing areas. Indicator organisms are groups of organisms that reflect the general condition of a food or environment where food is processed. It's a way to monitor or validate sanitation and process controls.

The practice of monitoring for a broad view of the food handling environment has been used since the early 1900s. Microbiologists know that if the manufacturing process is under control, the number of indicator organisms will also be in control. Common tests for indicator organisms include Total Plate Count tests, coliforms and *Enterobacteriaceae*.

Total Plate Count (TPC) is one of the most common indicator tests. Also known as Aerobic Plate Count, it provides information on the total population of bacteria present. Methods vary slightly, but this test involves counting bacteria, fungi and yeast that grow within a moderate temperature range, typically between 20 and 40 degrees Celsius, in the presence of oxygen. TPC counts above a certain threshold would typically suggest that sanitation of the specific environment or equipment was ineffective or improperly performed.

Coliforms are a diverse group of bacteria found in the environment and are always present in the digestive tracts of animals, including humans. They are known for their ability to ferment lactose to produce acid and carbon dioxide gas. They are not necessarily evidence of fecal contamination, but coliforms are monitored and regulated in many countries and industries. Research shows that only a fraction of coliforms has a fecal origin – the majority are environmental contaminants, according to a 2016 study on coliforms.

Food safety experts show an increasing preference for *Enterobacteriaceae* testing. *Enterobacteriaceae* consists of a diverse group of bacteria, including coliforms and some pathogens, such as *Salmonella*.

Enterobacteriaceae testing serves the same purpose as coliform testing in that it indicates:

1. **Improper cleaning,**
2. **Unsanitary conditions**
3. **Post-process contamination**

A program should be established with sampling procedures and frequency, appropriate test methods, results interpretation and corrective action procedures. Frequency should be determined and may vary from facility, commodity and target analyte. Sampling sites should be mapped out with the goal of finding potential issues in the most likely sources of contamination. Quantitative results will be useful in establishing baselines and identifying trends over time.

Testing for pathogens

A primary goal of pathogen environmental monitoring (PEM) programs is eliminating pathogens and the associated risks including foodborne illnesses and recalls. Foodborne pathogen contamination of finished products typically occurs at a low frequency, which makes finished product testing alone an ineffective strategy for ensuring food safety. Those using PEM programs work to identify contamination sources before they reach a finished food product.

Pathogen tests can check for the presence of a specific microbe, but since pathogens can be difficult to find, using additional methods to validate cleaning and sanitation procedures are recommended, such as adenosine triphosphate (ATP) tests and TPC.

PEM is typically used in facilities that process ready-to-eat (RTE) products or in facilities that handle RTE products. While many different pathogens can cause foodborne illness, only a few are linked to food processing and handling environments. Key pathogens targeted for environmental monitoring programs include *Listeria monocytogenes, Salmonella,* and *Cronobacter* spp.

As with other environmental monitoring programs, it is important to have a good sampling strategy. A key challenge with PEM programs is that the specifics of sample collection, including the pressure applied to a sponge and the specific locations tested (e.g., a floor crack vs. an adjacent intact, smooth floor section) can have a direct impact on whether pathogens are detected. Hence, it is important to design the sampling plan to target bacterial growth niches so the source of the pathogen can be identified and eliminated.

What's in the handbook?
Learn more about the importance of environmental monitoring and the steps you can take to be more proactive about food safety in your facility. Download the full handbook by visiting 3M Environmental Monitoring.

Download the Handbook

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