Starting or Expanding Your Environmental Monitoring Program

Creating or maintaining a comprehensive environmental monitoring program is becoming increasingly critical in the food industry today. Programs that effectively monitor and manage areas of microbiological risk in the plant environment can serve as "early warning systems" to identify and eliminate sources of potential contamination.

A good environmental monitoring program will include testing to verify that cleaning and sanitizing procedures are keeping indicator organisms and any organisms of particular concern in check. Indicator organisms are used to show when conditions permit levels of troublesome organisms to flourish. Organisms of concern may be pathogens or may be spoilage organisms common to the particular food being produced by that plant. While important, testing for specific pathogens alone can be costly and may not be sufficient to determine the actual risk of product contamination.

Producers that use ATP bioluminescence equipment should also incorporate indicator testing into their programs. ATP results can be compromised by some sanitizers, are less reliable when low levels of microorganisms are present, and cannot differentiate living cells (such as bacteria) from dead cells left by plant or animal sources. For more information on the importance of indicator testing in monitoring or verification programs, see Compendium of Methods for the Microbiological Examination of Foods, American Public Health Association, Chapter 3.

In the U.S., coliforms are commonly used as indicator organisms while Europe generally uses *Enterobacteriaceae*. *Enterobacteriaceae* offers an expanded view from just coliforms. The family of *Enterobacteriaceae* includes coliforms as well as several other organisms of concern, including *Salmonella, Yersinia* and *Shigella*.

Because areas that do not come into direct contact with food may still be a source of contamination, a comprehensive plan to enhance product quality, shelf life and safety will include testing:

- Equipment and environment
- In-process sampling
- Finished product sampling

Sampling should be conducted on both food contact surfaces and nonfood contact surfaces. Areas to sample may include conveyor belts, sprayer heads, rollers, walls, drains or even air. There are many means of migration from a nonfood contact surface to food, including by aerosol or worker contact.

Any areas on equipment that can hold moisture or food particles, such as cracks or crevices, may provide a haven for microbial contamination and should be considered potential trouble spots and closely monitored. Also, as equipment wears and ages, physical and chemical changes of exposed surfaces may require additional care and improved sanitation procedures.

Overall objectives for environmental monitoring programs may include:

- To find possible indicator or spoilage organisms and/or pathogens
- To determine the effectiveness of cleaning and sanitizing procedures
- To determine cleaning frequency
- To reinforce employee training programs

To meet these objectives, many processors are interested in implementing an environmental monitoring program but are unsure how to get started. There are several resources available to help design and implement a program that makes sense for your plant. Visit our web site at www.3m.com/microbiology for many government and industry links.

In addition, processors may wonder about standards for acceptable counts in their environmental testing program. Adequate cleaning and sanitizing should be sufficient to keep counts low. The Compendium of Methods references the U.S. Public Health Service recommendation that "adequately cleaned and sanitized food service equipment have not more than 100 colonies per utensil"[1] and also states, "Generally, the level of microorganisms should not exceed more than a few colonies per sampling site." [1]

Because counts may vary depending on the operation or type of product being processed, it is difficult to give a one-size-fits-all standard. What may be "normal" for one product or process may not be "normal" for another. For instance, an incoming area for food which comes directly from a farm field may have higher counts than an area containing a highly processed frozen food. Both count levels may be acceptable based on the expected microbial load of the food being processed.

Programs that test and monitor a variety of environmental sources for microbial contamination can give the most comprehensive view of microbiological risks in the plant. Initially, a large number of tests will need to be performed to get a thorough understanding of the plant environment, cleaning effectiveness, and locations of any trouble spots.

Another purpose of gathering many test results is to determine a baseline. The baseline will provide an understanding of what is normal for your process after adequate cleaning and sanitizing. Once a baseline is developed, it will be easier to track trends.

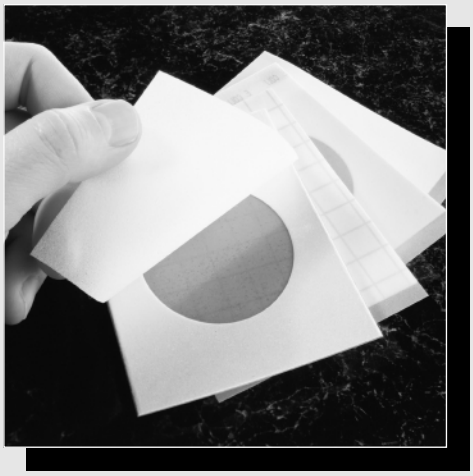
The ability to track trends can be enhanced with available software programs. It may then be possible to reduce the amount of testing and move to a rotating schedule. However, it's important to continue frequent monitoring of any trouble spots identified during initial testing.

3M Microbiology has many products that can simplify and streamline your environmental monitoring program. The 3M™ Quick Swab is one of the most efficient and cost-effective methods available for environmental swabbing. 3M™ Petrifilm™ Plates are easy to use, and offer consistent, reproducible results to help assess and monitor general microbial risks in the plant environment. 3M Petrifilm plates are available for aerobic plate count, *Enterobacteriaceae*, coliform, *Escherichia coli*, *Staphylococcus aureus*, and yeast and mold testing.

[1]George M. Evancho, William H . Sveum, Lloyd J. Moberg and Joseph F. Frank, "Microbiological Monitoring of the Food Processing Environment," Compendium of Methods for the Microbiological Examination of Foods. Ed Frances Pouch Downes and Keith Ito. (Washington, DC: American Public Health Association, 2001) 26.

Methods of Testing Available Using 3M Microbiology products

Some of the more common methods for environmental monitoring are listed below along with the procedures for using 3M Microbiology products.



Most 3M Petrifilm plates can be used for the direct contact method. *More detailed instructions on using 3M Petrifilm plates for environmental monitoring are available from your 3M representative or can be downloaded at our web site at www.3m.com/microbiology. Refer to the product package insert for information on proper use, appropriate diluents, hydration, incubation and storage.*

Direct Contact: Useful for large, flat or lightly curved areas. An advantage of direct contact method is greater precision in results.

- Pre-hydrate a 3M Petrifilm plate with 1 mL of sterile water or other suitable diluent. Allow a minimum of 1 hour for gel to solidify.
- Carefully lift top film. Avoid touching center circular growth area. Gel will adhere to top film.
- Turn plate over and touch the circular gel portion of the top film to the surface being tested. Gently rub finger over the outer film side of the gelled area to ensure good contact with the surface.
- Lift film from surface. Close top film and incubate Petrifilm plate as indicated by instructions in package insert.

Sponge: Useful for large, flat or lightly curved areas. The 3M Cattle/Swine Carcass Kit can be used for this procedure.

- Wet sponge in small amount of appropriate sterile diluent inside sterile bag.
- Using clean, gloved hands carefully push sponge to top of bag and remove, allowing excess liquid to stay in bag.
- Sponge area several times, reversing direction each time.
- Return sponge to bag. From outside the bag, gently massage the sponge in the remaining liquid.
- Draw out 1 mL of liquid to 3M Petrifilm plate. Incubate plate according to instructions in package insert.

Swab: Especially useful for small crevices or hard to reach areas. Monitoring these areas are especially important, as they can often be most difficult to clean. The 3M Quick Swab is useful for this testing. The 3M Quick Swab can also be used on employee's hands or gloves to emphasize good hygiene habits on the job.

- Label the 3M Quick Swab.
- At the sampling location, hold the bulb end near your thumb. Push sideways on the bulb and red snap valve at a 45˚ angle until you hear the valve break. Squeeze the bulb end to force all the letheen broth into the tube end of the swab. Twist and pull apart the bulb end from the tube.
- Hold swab handle to make an angle to the surface. Rub the swab slowly and thoroughly over desired area, reversing direction between strokes.
- After sampling is complete, securely insert the swab back into the tube and transport to the lab for inoculation.
- In the lab, vigorously shake or vortex the swab for approximately 10 seconds to release bacteria from the swab tip into the liquid. Wring out the contents of the swab tip by pressing and twisting the swab against the wall of the tube. Dispose of swab.
- Carefully pour entire contents of tube onto a 3M Petrifilm plate. Incubate the 3M Petrifilm plate according to instructions in package insert.

Note: It is good practice to always follow any environmental test procedure with thorough re-cleaning of the area tested.

Air Testing:

- Pre-hydrate a 3M Petrifilm plate with 1 mL of sterile water or other suitable diluent. Allow a minimum of 1 hour for gel to solidify.
- Carefully lift top film. Avoid touching center circular growth area.
- Hold open in air for up to 15 minutes. Double-stick tape may be used to hold plate to a surface.
- After appropriate time for air testing, close top and bottom films and incubate the 3M Petrifilm plate as directed by instructions in package insert.

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