

## Environmental monitoring in the dairy industry

Environmental monitoring assesses the hygiene status of the processing area, providing a proactive approach to preventing product contamination, and is a critical element of a manufacturer's food safety program. It enables:

### ***Verification of the effectiveness of cleaning and sanitation***

Cleaning and sanitation can be verified by testing for the presence of microorganisms or other hygiene indicators (such as ATP or protein residues) on factory surfaces after cleaning.

This provides confidence that cleaning is adequate and may identify areas which require more attention in terms of cleaning and maintenance. An upward trend in the presence of hygiene indicators would prompt the initiation of corrective actions. Results can also be used to refine and optimise cleaning procedures.

### ***Monitoring risk of product contamination by environmental pathogens***

The presence of pathogens in any part of the processing environment, particularly on or near product contact surfaces, exposes the product to contamination and should trigger proactive action to reduce the risk. Environmental monitoring supports preventive approaches by identifying the location of any pathogens present in processing areas.

### ***Identification of sources of product contamination***

Where a pathogen or other contamination has been detected in finished product, environmental sampling can help identify the source of contamination. Testing of equipment should be undertaken during or after processing, and prior to cleaning and sanitising to increase the likelihood of detection. Sampling after the plant is sanitised may yield false negative results due to inhibition of the target microorganisms by the presence of residual sanitising agent.



### Development of environmental monitoring programs

Environmental monitoring programs require a documented sampling plan and schedule, which ensures systematic testing of all areas in the processing environment within a given timeframe.

An accurate diagram of plant layout assists in determining appropriate sampling points by identifying high and low risk areas. These points should be clearly identified on the drawing as should drains, transfer points, and cool rooms. The number of sampling sites depends on the size of the plant and the number of areas considered suitable for harbouring bacteria. The DFSV Technical Information Note *Listeria monocytogenes – management in dairy factories* provides further information on potential sources of contamination by *Listeria monocytogenes*.

Sampling sites are classified according to the risk they pose to product, and sampling should be scheduled accordingly. Product contact surfaces are most likely to result in contamination of product and are rated as high risk – these sites are termed Zone A areas. Non-food contact areas and areas in close proximity to the food production area are classed as Zone B while other non-contact areas including floors and drains are Zone C. The DFSV *Dairy Pathogen Manual* provides further information on classifying environmental sampling sites.

High-risk zones should be sampled most frequently with lower risk areas on a less frequent, rotating schedule. For example, several sites from Zone A may be tested each day with all sites being sampled at least once per week. Lower risk zones may have a lower sampling frequency, with all sites tested at least once per month.

Whilst food contact areas present the greatest risk, other non-food contact areas can contribute to product contamination. Floors and drains can serve as reservoirs for pathogens and monitoring of these areas provides an early warning of potential problems in the processing environment.

Sampling plans are dynamic and may need to be modified over time. For example, where a target pathogen is found to be consistently absent from a site, it may be appropriate to reduce sampling frequency and direct resources to more problematic areas.



## Environmental sampling methods

Samples collected as part of an environmental monitoring program undergo either qualitative or quantitative analysis. Qualitative testing is best undertaken using sterile swabs, sponges, or gauze which enable large areas to be sampled. Cotton tip swabs are ideal for small or difficult to reach areas.

Swab/template, contact plates or dip slides are appropriate for quantitative (enumeration) testing of a defined area. Data from quantitative testing can be used for comparisons with previous samples taken from the same site. Where the effectiveness of cleaning is being monitored, a total plate count and/or count of indicator organisms such as coliforms or Enterobacteriaceae will provide an indication of the cleanliness of the area.

Swabs and sponges used for sampling should be moistened with a suitable diluent prior to use. While it is best to sample before sanitising, swabs or diluents containing neutralising agents can be used to control the inhibitory effects of sanitisers. It is good practice to ensure that swabbed areas are cleaned and sanitised after swabbing.

Important considerations when undertaking environmental monitoring include:

- Testing of composite samples from a number of sites is an effective way of reducing testing costs.
- Compositing should only be used for sites within the same zone.
- Compositing is not recommended for incident investigations.
- Always use a fresh swab for each site and where possible let the testing laboratory undertake the compositing.
- Avoid using a a single swab for multiple locations.
- Staff collecting samples should be trained in aseptic technique.
- Once collected, samples should be kept cool (<4°C) and transported to the laboratory as soon as possible.



When pathogens are found in Zone A, all processed product should be isolated and held pending decisions as to whether it poses a risk. DFSV should be contacted to assist with this. The affected area should be inspected and cleaned and a heightened environmental sampling plan should be initiated to ensure the problem has been rectified.

Other methods such as ATP detection and protein residue testing of swabbed surfaces provide a real time indication of the cleanliness of the surfaces and equipment. When these methods are used as pre-operational checks they allow remedial action prior to start up.

## Key points to consider

- Environmental monitoring allows assessment of the effectiveness of cleaning.
- Monitoring of pathogens in the environment provides an early warning that the potential for product contamination is high and early corrective action can prevent costly product contamination incidents.
- Sampling of the processing environment can help identify the sources of product contamination.

## References

Dairy Food Safety Victoria, **Technical Information Note: Listeria monocytogenes – management in dairy factories**, DFSV, Melbourne, February 2013.

Dairy Food Safety Victoria, **Dairy Pathogen Manual**, DFSV, Melbourne 2016.

## Further information

Further food safety technical information is available at [www.dairysafe.vic.gov.au](http://www.dairysafe.vic.gov.au)

Or contact Dairy Food Safety Victoria on (03) 9810 5900 or [info@dairysafe.vic.gov.au](mailto:info@dairysafe.vic.gov.au)

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