# Ambient Air Testing

## Definition

Ambient air is atmospheric air within an enclosed food facility.

## Applicable Code Requirements

1. 11.7.1.2

## Review Glossary Terms

1. Purity
2. High Risk Area
3. High Risk Food
4. High Risk Food Processes

## Implementation & Audit Guidance

## What does it mean?

According to Nuno F. Soares, "Air Quality in the Food Industry" (1), air in food products facilities is a vector of contamination, moving from one place to another, and should be a concern to food safety practitioners. Contaminants can be dispersed by aerosols consisting of solid (e.g. dust) or liquid (e.g. condensation water) microscopic particles dispersed in air. These particles may carry microorganisms (bioaerosols) such as pathogenic bacteria or fungi or even viruses, spores or allergenic substances. Aerosols may enter food production areas by several ways:

- Drains
- Doorways and other openings
- Sanitation tunnels
- Compressed air supplies
- During cleaning and washing operations
- Packaging
- Poorly designed/maintained air handling systems
- Roof leaks
- Besides that, various processing operations such as dicing, chopping, mixing, etc., generate aerosols, increasing the risk of contamination.

Jeffrey L. Kornacki, Ph.D., (2) argues that liquid or solid particles size range from 5 to 20 µm. Particles smaller than 5 µm are expected to persist suspended in the air of a facility for an extended time and may be reduced by fogging with appropriate sanitizer. Particles larger than 20 µm are likely to settle quickly and can be removed by adequate cleaning and sanitation techniques.

Bioaerosols are solid or liquid microscopic particles suspended in air (aerosols) that carry microbes,[2] hence the term "bioaerosols." A contaminated aerosol is likely to be comprised of injured cells (or spores), regardless of whether the aerosol is liquid (microscopic droplets) or dry (e.g., dust).

A bioaerosol may be created from foot and wheeled (e.g., forklifts, handcarts) vehicle traffic through standing water in which microorganisms have grown, application of high-pressure washers to contaminated surfaces, or the use of compressed air lines that do not have appropriate point-of-use filters in which condensate has accumulated Bioaerosols will be suspended in the air for various lengths of time.

There are a number of sampling and testing methods available commercially depending on the need, all of which can be applied by trained technicians within the site. The SQF requirement (11.7.1.2) is for annual air testing in high-risk processing areas, i.e., rooms or areas where food is subject to physical or microbiological contamination or growth.

**Microbial Air Sampling**

There are two primary methods for microbial air sampling: Active and Passive monitoring (3).

In active monitoring, a microbial air sampler is used to force air into, or onto its collection medium (e.g., petri dish with nutrient agar-based test media) over a specified period of time. The collected culture can then be incubated and analyzed (i.e., count bacterial and/or fungal colony forming units (CFU), and identify if required).

Active monitoring requires equipment purchases, additional training, device qualification, and most devices offer a shorter sampling period (e.g., 10-minutes). But active monitoring devices are more ideal for situations with low microbial concentration, which includes most clean rooms, since microbial contaminants will be less likely detected by passive monitoring.

In passive monitoring, settle plates (petri dishes) are opened and exposed to the air for specified periods of time to determine what microbiological particles may be present in the environment, as they may settle out of the ambient air, and onto the media surface of the petri dish. These plates are then incubated and analyzed.

**Total suspended particulate matter (TSP)**

Total suspended particulate matter (TSP) monitoring measures the total amount of particles suspended in the atmosphere.

TSP samples may also be used to determine the levels of chemical elements and compounds in the particles which may pose a risk to human health.

An instrument called a high-volume air sampler is used to collect TSP samples. The high-volume air sampler draws a large known volume of air through a pre-weighed filter for 24 hours.

## Why is it in the Code & why is it important?

High-risk areas require a higher level of hygienic practice to prevent contamination of exposed food by pathogenic organisms or airborne allergens. These are rooms where food is post-process and may be subject to contamination. (1) air in food products facilities is a vector of contamination, moving from one place to another. Contaminants can be dispersed by aerosols consisting of solid (e.g., dust) or liquid (e.g., condensation water) microscopic particles dispersed in air. These particles may carry microorganisms (bioaerosols) such as pathogenic bacteria or fungi or even viruses, spores or allergenic substances.

See RIO Chart on following page.

## RIO Road to Audits (Records, Interviews, and Observations)

| Records | Interviews | Observations |
|---|---|---|
| The following are examples of records and/or documents to assist in the implementation and review of this topic:<br>▪ Ambient air test. equipment, procedure and schedule.<br>▪ Training records for technical staff conducting ambient air testing.<br>▪ Ambient air test records.<br>▪ Corrective actions | The following are examples of people to interview to assist in the implementation and review of this topic:<br>▪ Quality/Technical manager.<br>▪ Technical staff responsible for conducting ambient air tests.<br>The following are examples of questions to ask to assist in the implementation and review of this topic:<br>▪ Can you show me how, when and where the last test was conducted?<br>▪ What action was taken on the results of the last test?<br>▪ How/ when was the person conducting the test trained?<br>▪ For sites not performing ambient air testing, how was the decision made that this was not applicable? | The following are examples of observations to assist in the implementation and review of this topic:<br>▪ High-risk areas for product exposure.<br>▪ Mock or actual air test, including the use of the equipment. |

## Additional References


- "Air Quality in the Food Industry", Nuno F. Soares, July 28, 2017, Linkedin; https://www.linkedin.com/pulse/air-quality-food-industry-how-brc-sqf-ifs-fssc-22000-manage-soares/
- "Airborne Contamination: A Microbiologist's Perspective", Jeffrey L. Kornacki, Ph.D., is president of Kornacki Microbiology Solutions Inc. in Madison, WI., Food Safety Magazine, June 2014 https://www.food-safety.com/articles/4272-airborne-contamination-a-microbiologiste28099s-perspective
- "Air Sampling – How to do it the right way", Erik Swenson, April 2013
- For general compressed air quality standards within a food plant, ISO 8573-1 standards are a very good reference. https://www.iso.org/standard/46418.html