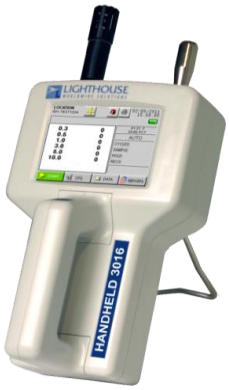
Introduction

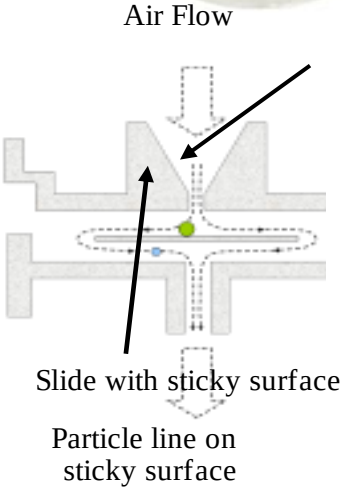
Indoor air quality sampling utilizes a wide verity of sampling methods to obtain information on the potential for indoor air quality. Indoor air quality can be impacted by off gassing of building materials, mold growth, airborne particles, carbon monoxide, dry air or too much humidity to name a few.
Based on an occupant's complaint and known building history an investigator may be able to determine the best sampling course of action. Odors can direct an investigator to suspect problem areas (perfumes, combustion odors, sewer odors, musty odors, etc.). If odors are not the issues but itchy water eyes, runny nose, coughing etc. are these can point to a different problem or issue.

Particle Counters
One of the quickest methods to determine possible IAQ problems is through the use of a particle counter. Particle counters employ a laser to count and size particles that are drawing into the collector. Depending on the counter, various particle sizes will be recorded. A standard particle counter will record 0.3, 0.5, 1.0, 2.5, 5 and 10 micro meter particles. The information is useful in determining potential particle generating activities. Elevated 10 micron particles may suggest that the buildings filters are not installed properly. Elevated 0.3-micron size particles could suggest a hidden mold growth area. Too much dust can overload the meter. Remember that all things are relative to a control area or outside sample location.



Spore Trap Sampling
Spore trap cassettes are single-use sampling devices designed for the rapid collection and analysis of a wide range of airborne particles. These include fungal spores (viable and nonviable), pollen, insect parts, skin cell fragments, fibers, and other inorganic particulates. Laboratory analysis can be completed the same day.

The cassettes are designed to operate at a specific flow rate. Decreasing or increasing the flow rates from manufacture requirements may result in a collection loss of some spores and the accumulation of others in a non-uniform manner. Therefore, it is critical to run the sampling pumps at the manufacturer's recommended air flow rate. Additionally, the cone of influence around the sampler is small so it is advisable to mount the sampling cassette upright when sampling. Air flows through the inlet of the cassette. Particles in the air will then stick to the sticky surface of the side as the air passes through the cassette. All but Cyclex D cassette will form a particle line on the sticky surface. Cyclex D forms a round spot on the sticky surface.



Spore Trap Cassettes and Flow Rates

Cassette Type	Flow Rate

MoldSnap/Micro-5 (not recommended)	5 LPM
AIR-O-Cell	15 LPM
Allergenco-D	15 LPM
Cyclex D	20 LPM

Depending on loading test should be run to collect at least 75 liters of air (the more air the better). However, no sampler should be run more than 15 minutes, otherwise the sticky surface of the slide will dry out. It is best or run the sampler between 5 and 10 minutes. Too heavy a loading will make it impossible to get a reliable reading of collected particles.

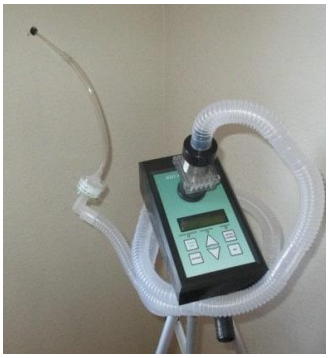
Environmental Dust Conditions	**Sampling Time 15lpm**
Outdoor sampling on a clean windless day	5.0 to 10.0 min.
"Clean" office environment or outdoors (no visible dust)	5.0 to 10.0 min.
"Indoor" environment, high activity personnel	5.0 min.
"Indoor" environment, evidence of drywall renovation, or industrial dust	1.0 min.
"Indoor" environment, visible dust emissions from point sources present	0.5 min.

Point source dust or industrial dust may require different sampling. See MCEM sampling below.

Disadvantages to the sport trap method:

- Many mold spores cannot be identified to species level. Also viable vs non-viable spores cannot be differentiated.
- Sampling cannot be conducted below 37^0F due to hardening of the sticky surface of the slide.
- Outside samples can be affected by wind, rain and snow and under some conditions may not be able to be collected.

Other uses for Spore Trap Sampling
Using an Air-O-Cell or Cyclex-D cassette wall sampling for fungal growth can be accomplished. A small hole is drilled (must watch out for sheet rock dust contaminating the cassette or punched into a wall cavity. A tube is then placed on the cassette and tube is pushed into the wall. This allows for sampling air within the wall cavity.
This works well for dry mold but not so good for wet/damp mold.



Mixed cellulose ester membrane (MCEM) sampling
MCEM spore traps typically require a longer sampling period than slit-type collectors (e.g. 1–8 hr vs. 0.5–10 min, respectively). The longer-term collection however yields a more integrated, average sample, capturing transient fluxes over time. The flow rate will be between 2-15 L/min. Consult the specific test method for proper

flow and sample times/volumes. The spore catch in an MCEM sample tends also to be evenly distributed over the membrane surface, making the analysis of these samples less sensitive to sample overloading. Additionally, these cassettes can be used for asbestos and metals analysis as well as total dust loading analysis. For metals analysis a blank should be submitted to confirm metal concentrations of the filter media itself.

Because filtration-based methods rely much less than slit impactors on particle momentum to capture and retain particles, filter samplers may be used over a wide range of flow rates without suffering appreciable changes in the collection yield. Typically, a 25 mm MCEM filter with 0.8 µm pore size is used for collection. Suitable filters include asbestos PCM cassettes, that are available pre-loaded in 3-piece electrically conductive cassette outfitted with a 50 mm extension cowl that reduces the dispersion of collected particles due to static electric effects. The laboratory analysis of MCEM filter samples involves the use of a "hot block" vaporizer to generate acetone vapor for clearing the filter, followed by application of a microscopic mounting fluid to the cleared surface of the membrane and examination under the compound microscope.

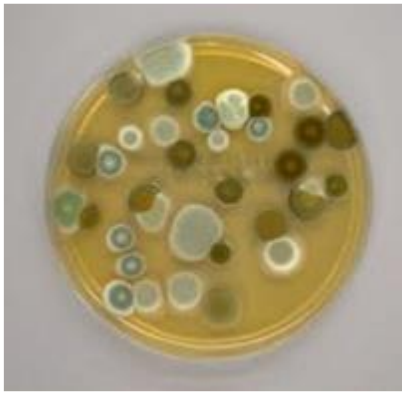
In highly dusty areas the filters may need to be changed out often.

Carpet sampling using MCEM cassettes

Viable bioaerosol sampling

Anderson and Biostage

The Anderson and Biostage single-stage bioaerosol impactor operates on the principle of inertial impaction for sampling indoor and outdoor air for viable micro-organisms including bacteria, fungi and actinomycetes. The impactor stage contains 400 precision-drilled holes. Air is drawn through the impactor and accelerated to direct airborne particles toward the surface of the agar collection medium (growth media). The BioStage is used with a sample pump capable of 28.3 L/min (1ft^3 per minute). Andersen and BioStage air samplers require disassembly, cleaning, and reassembly with every sample. Like with Sport trap samples cold temperatures will harden the agar resulting in bouncing of particles off of the plate. Wind, rain and snow will affect outdoor air samples. Heat can melt the agar and destroy the sample.



Samples must be shipped cool. Growth and analysis can take three to seven days.

BioCassette

The BioCassette™ combines the agar plate and sampling device into a

single disposable cassette and is equivalent to the size of a standard 90mm petri dish. As with the Anderson/BioStage sample velocities are 28.3 L/min which is drawn through 400 small holes. The advantage is fast sampling since there is no cleaning between samples as there is with the Anderson type of sampler.