INITIAL COLLECTION EFFICIENCY COMPARISON BETWEEN THE AIRTRAP XL, AIRTRAP MINI, AND AIR-0-CELL CASSETTE SAMPLERS

Report date: December, 2024

Environmental Analysis Associates, Inc.

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An initial comparison of side-by-side collection performance for mold spores and other common indoor particles

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BACKGROUND

All slit impaction devices designed for microscopical mold and particle analysis on the market rely on a design that uses a calibrated air pump to draw an air sample through a tapered slit and deposit particles by inertial impaction onto a well-defined and precisely located area of a microscope slide or coverslip that is coated with an optically clear adhesive collection media. The optimal collection properties must produce a linear deposition trace on a microscope slide or coverslip that can be easily analyzed using an Optical Microscope equipped with an "X - Y" stage or optical image analysis system. This allows for the quantitative counting of known and repeatable cross-sectional areas of the visually deposited particles.

An advantage of slit impaction devices over filter collection methods (for particles larger than 2µm) is the ability to rapidly collect smaller air volumes than a filter sample and focus the particles into a greater than 25-fold smaller deposition area (~15mm^2) as compared to a 25mm diameter PCM filter cassette (~390mm^2). Particles larger than ~2µm can be rapidly identified and analyzed using Optical Microscopy with a lower limit of detection and less visual interferences from the accumulation of sub-micron background dust. These advantages are a trade-off recognizing the limitation that slit impaction devices have a lower collection efficiency of small respirable particles. The device collection efficiency is determined by the inertia of the particle (based on mass and aerodynamic size) air impaction velocity, slit geometry (jet to plate distance), media tackiness, media uniformity, shear forces, turbulence, and the bypass and non-collection of smaller respirable particles. At the same time the design must minimize the loss of larger particles through particle bounce, shear forces, and lack of sufficient adhesion. The design of all slit impaction devices inherently result in a non-uniform deposition from the center to the edge of the width of the particle deposition area, and an increasing loss of particles below a minimum size known as the D_{50} cut-point. The D_{50} cut-point is defined as the aerodynamic size at which 50% of particles at the stated aerodynamic size will be collected. The goal is to have a device that has the best performance envelope curve matched to the particles of interest and the collection and analysis parameters. At the same time the degradation in collection efficiency (determined by particle loading and loss of adhesion) needs to remain relatively constant over sampling times ranging from 5 to 20 minutes. This means that the best device will be a trade-off that is ultimately defined by:

1). An efficient collection method over the entire time of sampling for an average airborne particle loading and,

2). Maintaining uniform particle visibility for the optical microscopist and image analysis systems across the entirety of the visible deposition area.

3). Maintaining sufficient tacky collection area to retain the impacted particles.

In other words, the theoretical cut-point determined in a laboratory research study by itself will not accurately reflect the true or practical usefulness of one device over another device. The total capabilities and useability of the sampling cassette design is a balance of the ease of use in the field and laboratory, maintenance of collection efficiency and image analysis readability (a function of particle deposition uniformity and microscopical visibility) and shelf life of the product. These properties are simultaneously determined by the totality of the cassette design, media collection parameters (e.g., contamination control, adhesive uniformity,

deposition collection area uniformity, microscopical clarity during the analysis); and the negative impacts produced by increasing particle deposition density over the sample collection time period. The particle deposition patterns of the Air-O-Cell and APACOR devices (AirTrap XL and AirTrap Mini) are shown below.

DEPOSITION PATTERNS OF THE AIR-O-CELL AND APACOR (AIRTRAP XL AND MINI) SLIT IMPACTORS

The AIR-O-Cell, AirTrap XL, and AirTrap Mini slide cassettes all have similar inlet, taper, and final slit dimensions. The AirTrap XL, and AirTrap Mini have identical physical deposition and collection characteristics. The actual configuration of the deposited particles (collected at 15lpm) is slightly different than the physical dimensions and is shown for the Air-O-Cell and AirTrap XL (only) in Figures 1-3. All particle deposition dimensions were calibrated using a stage micrometer.

Figure 1. Air-O-Cell Slit Impaction length and particle distribution uniformity

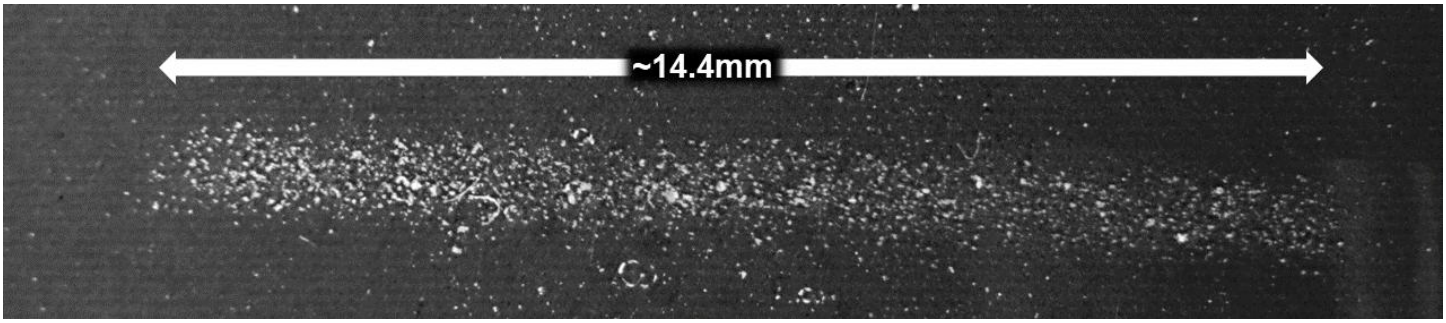


Figure 2. AirTrap XL Slit Impaction length and particle distribution uniformity

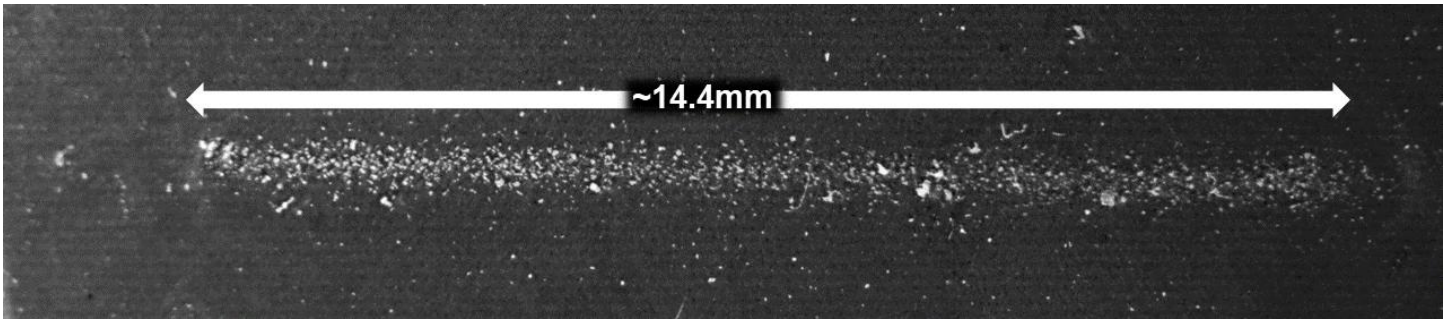
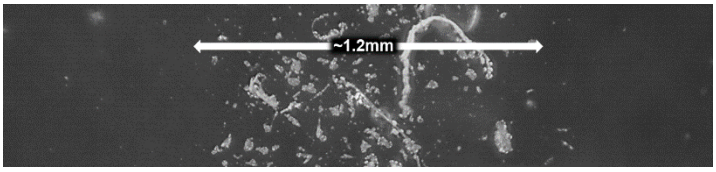
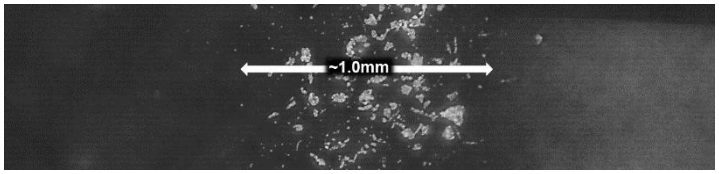


Figure 3. (a) Air-O-Cell particle distribution across the width, (b) AirTrap XL particle distribution across the width.



(a) Air-O-Cell representative deposition width



(b) AirTrap XL representative deposition width

SAMPLING DESIGN

In order to provide an initial evaluation of the relative collection efficiency between the AIR-O-Cell, AirTrap XL, and AirTrap Mini slide cassettes. Side-by-side air samples were collected by the Environmental Analysis Associates Michigan laboratory inside the basement of a home known to contain moderate mold spore concentrations.

Recent or "fresh" sample media lots were obtained from both vendors (Zefon and APACOR) to conduct the side-by-side comparison study. The sample analysis lots used for each device are provided below:

- Air-O-Cell - Sample lot# 39325 with an expiration date of September 2025.
- AirTrap XL - Sample Lot# 2441 with an expiration date of July 2025.
- AirTrap Mini – Recent lot received August, 2024 (same media composition as the AirTrap XL).

The study was performed in a Michigan home basement using five (5) side-by-side cross-comparison air sample sets collected on September 20th 2024, and then repeated again on and November 12th, 2024 (using the same media lots) to observe any potential comparative changes in relative collection efficiency over the 52-day period. Each sample was collected for 5 minutes at 15 lpm for a total sample volume of 75 liters.

The three different samplers were mounted on tripods approximately 1 foot apart at a 4-foot elevation with the slit facing vertically upward. The collected samples are representative of a typical basement condition with minor mold growth and low-moderate dust loading conditions under quiescent conditions. Identical Zefon® model# ZTHVO1 diaphragm pumps were connected to the cassettes using 5-feet of 3/8" tygon® tubing. The flow rate of each device was calibrated by connecting the sampler inlets using a Zefon reducing inlet to connect the rectangular sampling cassette inlet to a 5-foot section of tygon® tubing that was then connected to a Zefon secondary flow meter previously calibrated with a Zefon® bubble tube primary calibrator. Each sampling pump was calibrated to 15 ± 0.2 liters per minute. The sampling pump systems were then powered by the same digital timer to start and stop at the exact same elapsed time of 5 minutes with a total collection volume of 75 liters. The sample locations, time, and date information were recorded.

SAMPLE PREPARATION

Because the AirTrap XL has the adhesive media directly applied to a 1"x 3" microscope slide, only the addition of cotton blue stain and a coverslip is required in the preparation. The Air-O-Cell and the AirTrap Mini both contain a coverslip inside of a 37mm cassette with the adhesive media applied to the coverslip. Unlike the AirTrap XL, both the Air-O-Cell and the AirTrap Mini require the coverslip (with the adhesive media) to be flipped over with the particulate impaction surface faced upward, and the application of a clear coupling media between the collection coverslip and microscope slide. A drop of stain was placed onto the deposition trace and a coverslip applied. All samples were prepared with diluted cotton blue stain in glycerin and then covered using a #1 22 x 22 mm coverslip.

SAMPLE ANALYSIS AND DATA REPORTING

The analyses were performed at a magnification of 500x using an Olympus BX53M Microscope in transmitted bright field and polarized light. The data analysis from five (5) simultaneous cross-comparison of the devices was performed by EAA using their standard particle analysis that included the reporting of mold spores and other common environmental particulates. The actual analysis reports are available under separate cover. The data summarized in Figures 4 and 5 provides initial data representing recent media provided on September 20th, and then re-sampled on November 12, 2024 from the same lots of sampling media.

The mold spore and particle data (i.e., skin cell fragments, cellulosic fibers, and unidentified opaque, mineral, and soil particles) is graphically summarized in (Figures 4 and 5) for each particle classification in cts/m^3. Each of the five (5) sample cross-comparisons (a total of 10) is individually shown. Pollen analysis data was collected; however, the concentrations were too low to provide meaningful cross-comparisons.

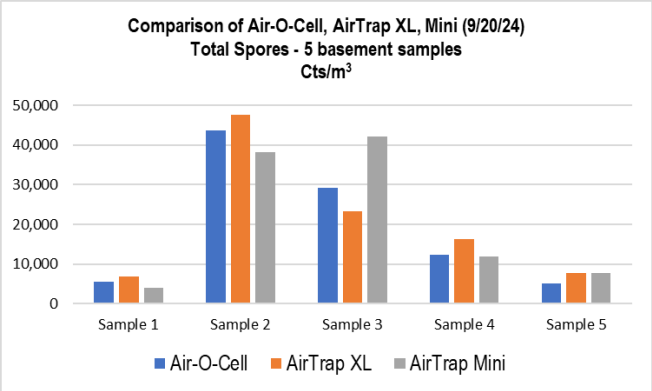
The data also provides an indication of any potential differences in the particle classifications as a function of their size and potential collection efficiency between sampling devices (if any). Although there can be wide range, approximate sizes are given below in Table 1.

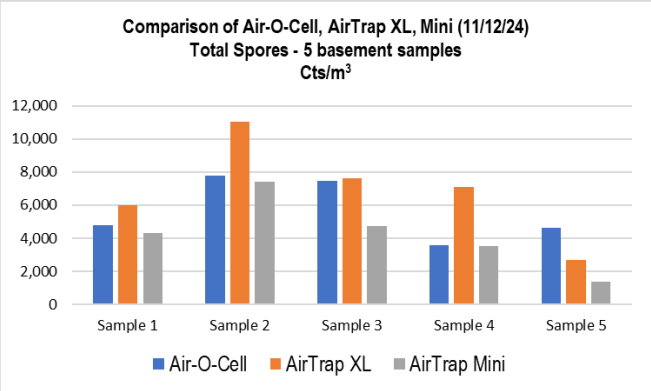
Table 1. Approximate Aerodynamic Size Range of Typical Particle Classifications.

Classification	Approximate size range (µm)
Aspergillus / Penicillium genera	2-5µm
Ascospores / Basidiospores	2-10µm
Cladosporium	5-20µm
Skin cell fragments	10-30µm
Cellulosic fibers	10-50µm
Opaque decayed debris / mineral particles	5-50µm

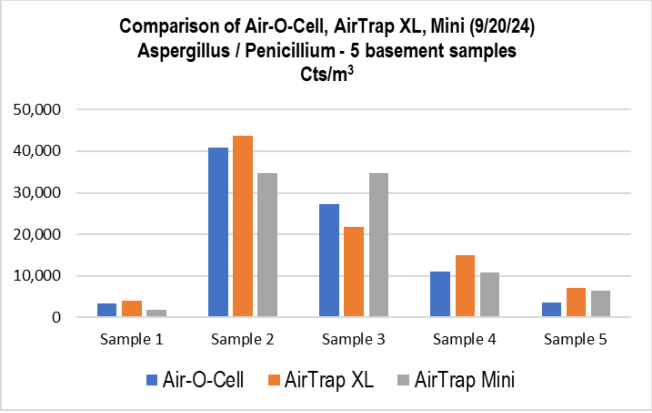
The sample side-by-side variability for each sampler (Air-O-Cell, AirTrap XL, and AirTrap Mini) is shown for each mold genera / classification between the sampling collection dates of September 20th and November 12th in Figures 4 (a-d). The side-by-side variability for each sampler (Air-O-Cell, AirTrap XL, and AirTrap Mini) is shown for other common particle classifications in Figures 5 (a-c).

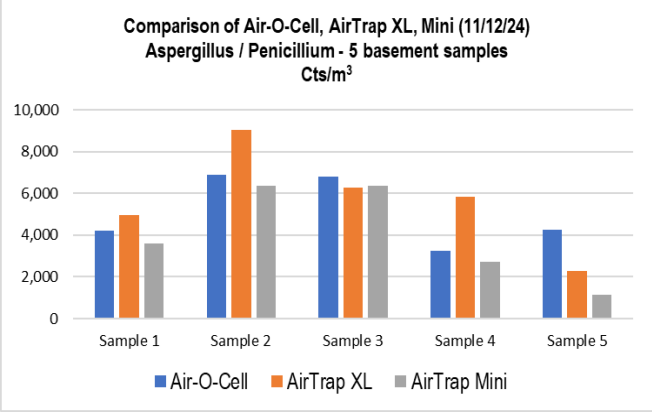
Figure 4. Individual Sample Comparisons (total of 10) of the Air-O-Cell, AirTrap XL, and AirTrap Mini. for (2a.) Totals Mold Spores, (2b.) Aspergillus / Penicillium, (2c.) Cladosporium, and (2d.) Asco/Basidiospores, for September 20th and November 12th 2024.



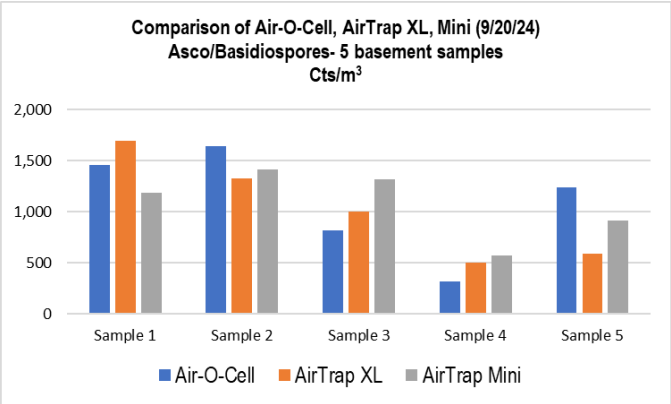


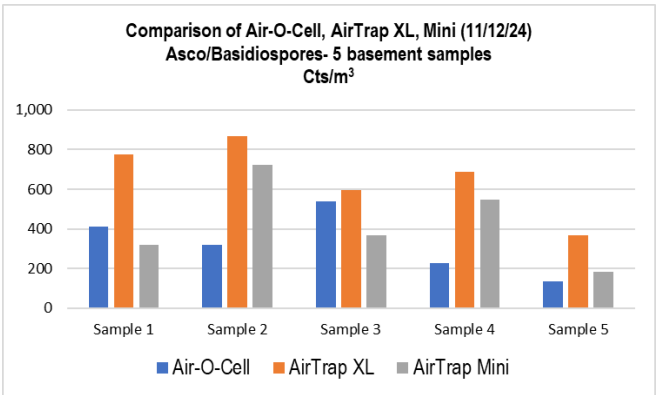
4a. Total Mold Spores



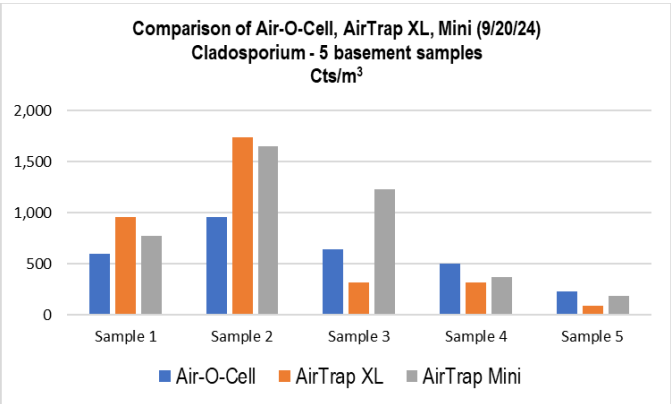


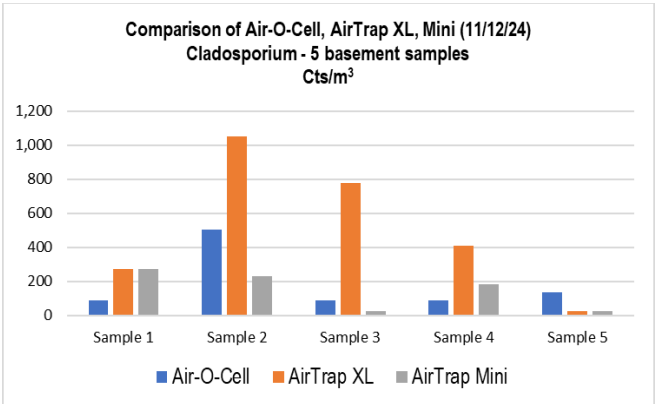
4b. Aspergillus / Penicillium mold spores





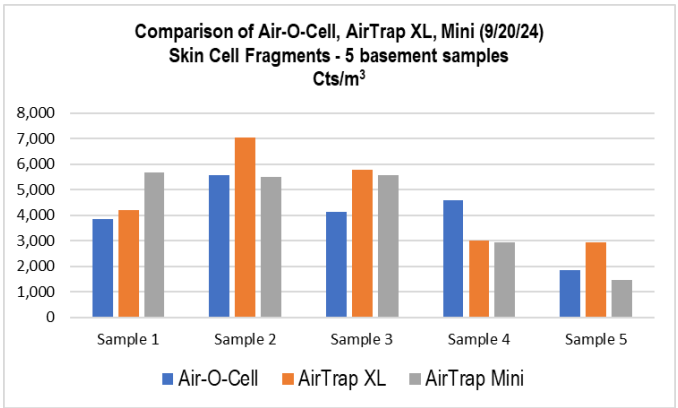
4c. Ascospores / Basidiospore mold spores

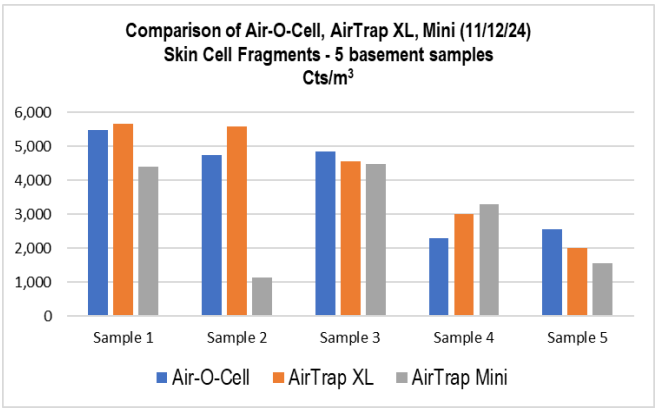




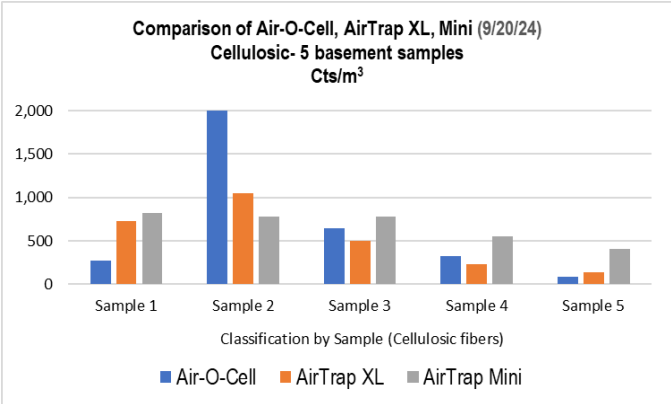
4d. Cladosporium mold spores

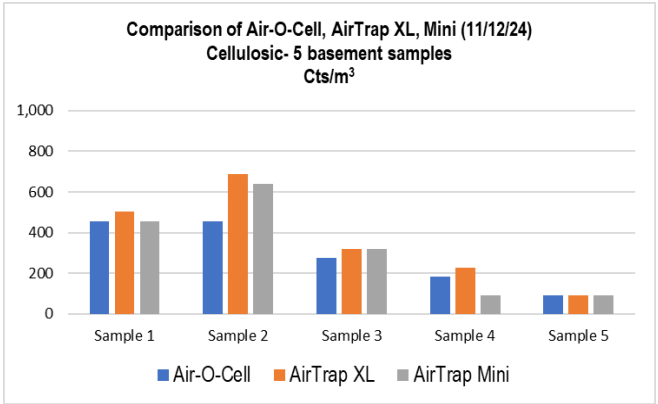
Figure 5. Individual Sample Comparisons (total of 10) of the Air-O-Cell, AirTrap XL, and AirTrap Mini. for (5a.) Skin cell fragments, (5b.) Cellulosic fibers, (5c.) Opaque, mineral, and soil-like particles, for September 20th and November 12th 2024.



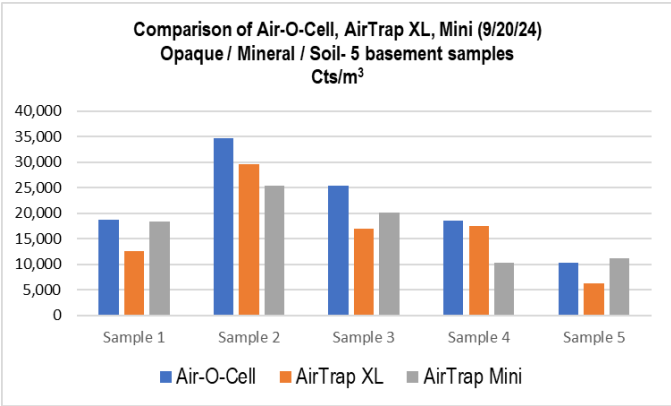


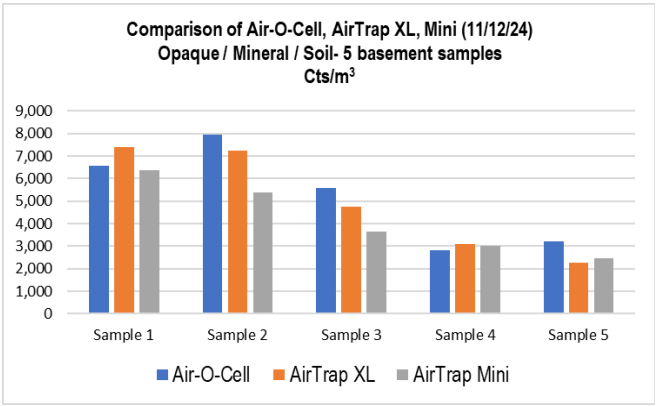
5a. Skin cell fragments





5b. Cellulosic / synthetic fibers





5c. Opaque / Mineral / soil particles

Additional statistical data analysis was performed on the sample data and summarized in Tables 2 and 3. An explanation of the data tables is described below.

The data for each particle category (e.g., Total mold spores, Aspergillus / Penicillium …..) and sample was first averaged and statistical trends calculated to look at the comparative variability (CV) based on the average of all three devices. The goal was to address the following questions regarding the performance of all three devices (i.e., Air-O-Cell, AirTrap XL, AirTrap Mini):

1. Is the CV between devices greater what would be expected for microscopical data collected on the same device?
2. Are there *trend* differences between one device routinely reporting lower or higher concentrations than the combined average for all three devices?
3. Are there statistically significant mold or particle concentration differences between devices?
4. Is there any significant difference in performance over time between the dates of sampling (i.e., September, 20th and November 12th).

The statistical analysis results are summarized and illustrated below (in color) in Tables 2 and 3 for the different sampling dates of September 20, 2024 and November 12, 2024.

Table 2. Statistical Data Trends For the September 20, 2024 Sampling Cross-Comparison for Mold Spores and Other Common Particle Classifications.

STATISTICAL SIDE-BY-SIDE COMPARISON FOR MOLD SPORE CONCENTRATIONS (Residential basement)							Date collected : 9/20/24		
	Cts/m^3			AOC / XL / Mini			Percentage (%) above or below Average		
Sample 1	Air-O-Cell	AirTrap XL	AirTrap Mini	Average	Std.Dev.	CV	Air-O-Cell	AirTrap XL	AirTrap Mini
Total Mold Spores	5446	6941	3988	5458	1477	0.27	0%	27%	-27%
Aspergillus / Penicillium	3290	4110	1870	3090	1133	0.37	6%	33%	-39%
Ascospores / Basidiospores	1461	1691	1189	1447	251	0.48	1%	17%	-18%
Cladosporium	594	960	777	777	183	0.24	-24%	24%	0%
Sample 2									
Total Mold Spores	43781	47667	38280	43243	4717	0.11	1%	10%	-11%
Aspergillus / Penicillium	40900	43800	34700	39800	4649	0.12	3%	10%	-13%
Ascospores / Basidiospores	1646	1327	1413	1462	165	0.11	13%	-9%	-3%
Cladosporium	960	1740	1650	1450	427	0.29	-34%	20%	14%
Sample 3									
Total Mold Spores	29155	23359	42165	31560	9631	0.31	-8%	-26%	34%
Aspergillus / Penicillium	27300	21700	34700	27900	6521	0.23	-2%	-22%	24%
Ascospores / Basidiospores	822	1005	1321	1049	252	0.24	-22%	-4%	26%
Cladosporium	640	320	1230	730	462	0.63	-12%	-56%	68%
Sample 4									
Total Mold Spores	12276	16315	11931	13507	2438	0.18	-9%	21%	-12%
Aspergillus / Penicillium	11000	15100	10900	12333	2397	0.19	-11%	22%	-12%
Ascospores / Basidiospores	320	502	574	465	131	0.28	-31%	8%	23%
Cladosporium	503	320	366	396	95	0.24	27%	-19%	-8%
Sample 5									
Total Mold Spores	5045	7842	7784	6890	1598	0.23	-27%	14%	13%
Aspergillus / Penicillium	3520	7040	6490	5683	1894	0.33	-38%	24%	14%
Ascospores / Basidiospores	1236	592	915	914	322	0.35	35%	-35%	0%
Cladosporium	229	91	183	168	70	0.42	37%	-46%	9%

STATISTICAL RANGE COLOR CODING (% above / below sampler average)				
No significant difference	Trending above ave.	Significantly above ave.	Trending below ave.	Significantly below ave.
±15	≥15-50	≥50	≤15 - 50	<50

	CV	Percentage above or below 5 sample average		
Total spores	0.22	-8%	9%	-1%
Aspergillus / Penicillium	0.25	-8%	13%	-5%
Ascospores / Basidiospores	0.29	-1%	-5%	6%
Cladosporium	0.36	-1%	-16%	17%

STATISTICAL SIDE-BY-SIDE COMPARISON FOR COMMON DUST CONCENTRATIONS (Residential basement)							Date collected : 9/20/24		
	Cts/m^3			AOC / XL / Mini			Percentage (%) above or below Average		
Sample 1	Air-O-Cell	AirTrap XL	AirTrap Mini	Average	Std.Dev.	CV	Air-O-Cell	AirTrap XL	AirTrap Mini
Skin cell fragments	3840	4210	5670	4573	968	0.21	-16%	-8%	24%
Cellulosic / synthetic fibers	274	731	823	609	294	0.48	-55%	20%	35%
Unidentified opaque	6220	2380	4570	4390	1926	0.44	42%	-46%	4%
Mineral / clay soil dust	12400	10100	13800	12100	1868	0.15	2%	-17%	14%
Sample 2									
Skin cell fragments	5580	7040	5490	6037	870	0.14	-8%	17%	-9%
Cellulosic / synthetic fibers	2010	1050	777	1279	648	0.51	57%	-18%	-39%
Unidentified opaque	12800	8410	8780	9997	2435	0.24	28%	-16%	-12%
Mineral / clay soil dust	21800	21200	16600	19867	2845	0.14	10%	7%	-16%
Sample 3									
Skin cell fragments	4110	5760	2930	4267	1421	0.33	-4%	35%	-31%
Cellulosic / synthetic fibers	640	503	777	640	137	0.21	0%	-21%	21%
Unidentified opaque	8870	5850	4570	6430	2208	0.34	38%	-9%	-29%
Mineral / clay soil dust	16500	11100	15500	14367	2873	0.20	15%	-23%	8%
Sample 4									
Skin cell fragments	4570	3020	2930	3507	922	0.26	30%	-14%	-16%
Cellulosic / synthetic fibers	320	229	549	366	165	0.45	-13%	-37%	50%
Unidentified opaque	4850	2830	3200	3627	1075	0.30	34%	-22%	-12%
Mineral / clay soil dust	13600	14700	7130	11810	4090	0.35	15%	24%	-40%
Sample 5									
Skin cell fragments	1830	2930	1460	2073	765	0.37	-12%	41%	-30%
Cellulosic / synthetic fibers	91	137	411	213	173	0.81	-57%	-36%	93%
Unidentified opaque	3200	2100	1280	2193	963	0.44	46%	-4%	-42%
Mineral / clay soil dust	7130	4210	9870	7070	2830	0.40	1%	-40%	40%

STATISTICAL RANGE COLOR CODING (% above / below sampler average)				
No significant difference	Trending above ave.	Significantly above ave.	Trending below ave.	Significantly below ave.
±15	≥15-50	≥50	≤15 - 50	<50

	CV	Percentage above or below 5 sample average		
Skin cell fragments	0.26	-2%	14%	-12%
Cellulosic / synthetic fibers	0.49	-14%	-18%	32%
Unidentified opaque	0.35	37%	-19%	-18%
Mineral / clay soil dust	0.25	9%	-10%	1%

Table 3. Statistical Data Trends For the November 12, 2024 Sampling Cross-Comparison for Mold Spores and Other Common Particle Classifications.

STATISTICAL SIDE-BY-SIDE COMPARISON FOR MOLD SPORE CONCENTRATIONS (Residential basement) — Date collected : 11/12/24

	Cts/m³			AOC / XL / Mini			Percentage (%) above or below Average		
Sample 1	Air-O-Cell	AirTrap XL	AirTrap Mini	Average	Std.Dev.	CV	Air-O-Cell	AirTrap XL	AirTrap Mini
Total Mold Spores	4772	5991	4310	5024	868	0.17	-5%	19%	-14%
Aspergillus / Penicillium	4210	4940	3610	4253	666	0.16	-1%	16%	-15%
Ascospores / Basidiospores	411	777	320	503	242	0.48	-18%	55%	-36%
Cladosporium	91	274	274	213	106	0.50	-57%	29%	29%
Sample 2									
Total Mold Spores	7783	11061	7394	8746	2014	0.23	-11%	26%	-15%
Aspergillus / Penicillium	6900	9050	6350	7433	1427	0.19	-7%	22%	-15%
Ascospores / Basidiospores	320	869	723	637	284	0.45	-50%	36%	13%
Cladosporium	503	1050	229	594	418	0.70	-15%	77%	-61%
Sample 3									
Total Mold Spores	7487	7632	4731	6617	1635	0.25	13%	15%	-28%
Aspergillus / Penicillium	6810	6260	6350	6473	295	0.05	5%	-3%	-2%
Ascospores / Basidiospores	540	595	366	500	120	0.24	8%	19%	-27%
Cladosporium	91	777	23	297	417	1.40	-69%	162%	-92%
Sample 4									
Total Mold Spores	3570	7084	3518	4724	2044	0.43	-24%	50%	-26%
Aspergillus / Penicillium	3250	5850	2740	3947	1668	0.42	-18%	48%	-31%
Ascospores / Basidiospores	229	686	549	488	235	0.48	-53%	41%	13%
Cladosporium	91	411	183	228	165	0.72	-60%	80%	-20%
Sample 5									
Total Mold Spores	4616	2679	1346	2880	1644	0.57	60%	-7%	-53%
Aspergillus / Penicillium	4250	2290	1140	2560	1572	0.61	66%	-11%	-55%
Ascospores / Basidiospores	137	366	183	229	121	0.53	-40%	60%	-20%
Cladosporium	137	23	23	61	66	1.08	125%	-62%	-62%

STATISTICAL RANGE COLOR CODING (% above / below sampler average)

No significant difference	Trending above ave.	Significantly above ave.	Trending below ave.	Significantly below ave.
±15	≥15-50	≥50	≤15 - 50	<50

	CV	Percentage above or below 5 sample average		
Total spores	0.33	7%	21%	-27%
Aspergillus / Penicillium	0.29	9%	14%	-24%
Ascospores / Basidiospores	0.44	-31%	42%	-11%
Cladosporium	0.88	-16%	57%	-41%

STATISTICAL SIDE-BY-SIDE COMPARISON FOR COMMON DUST CONCENTRATIONS (Residential basement) — Date collected : 11/12/24

	Cts/m³			AOC / XL / Mini			Percentage (%) above or below Average		
Sample 1	Air-O-Cell	AirTrap XL	AirTrap Mini	Average	Std.Dev.	CV	Air-O-Cell	AirTrap XL	AirTrap Mini
Skin cell fragments	5490	5670	4390	5183	693	0.13	6%	9%	-15%
Cellulosic / synthetic fibers	457	503	457	472	27	0.06	-3%	6%	-3%
Unidentified opaque	1280	2100	1920	1767	431	0.24	-28%	19%	9%
Mineral / clay soil dust	5300	5300	4460	5020	485	0.10	6%	6%	-11%
Sample 2									
Skin cell fragments	4750	5580	1140	3823	2361	0.62	24%	46%	-70%
Cellulosic / synthetic fibers	457	686	640	594	121	0.20	-23%	15%	8%
Unidentified opaque	2010	1740	1830	1860	137	0.07	8%	-6%	-2%
Mineral / clay soil dust	5940	5490	3570	5000	1259	0.25	19%	10%	-29%
Sample 3									
Skin cell fragments	4850	4570	3290	4237	832	0.20	14%	8%	-22%
Cellulosic / synthetic fibers	274	320	320	305	27	0.09	-10%	5%	5%
Unidentified opaque	1460	1460	914	1278	315	0.25	14%	14%	-28%
Mineral / clay soil dust	4110	3290	2740	3380	689	0.20	22%	-3%	-19%
Sample 4									
Skin cell fragments	2290	3020	3290	2867	517	0.18	-20%	5%	15%
Cellulosic / synthetic fibers	183	229	91	168	70	0.42	9%	37%	-46%
Unidentified opaque	1370	640	1190	1067	380	0.36	28%	-40%	12%
Mineral / clay soil dust	1460	2470	1830	1920	511	0.27	-24%	29%	-5%
Sample 5									
Skin cell fragments	2560	2010	1550	2040	506	0.25	25%	-1%	-24%
Cellulosic / synthetic fibers	91	91	91	91	0	0.00	0%	0%	0%
Unidentified opaque	549	73	640	421	305	0.72	31%	-83%	52%
Mineral / clay soil dust	2650	2190	1830	2223	411	0.18	19%	-1%	-18%

STATISTICAL RANGE COLOR CODING (% above / below sampler average)

No significant difference	Trending above ave.	Significantly above ave.	Trending below ave.	Significantly below ave.
±15	≥15-50	≥50	≤15 - 50	<50

	CV	Percentage above or below 5 sample average		
Skin cell fragments	0.28	10%	13%	-23%
Cellulosic / synthetic fibers	0.15	-5%	13%	-7%
Unidentified opaque	0.33	11%	-19%	8%
Mineral / clay soil dust	0.20	8%	8%	-16%

The color coding in Tables 2 and 3 is s explained below in Figure 6.

Figure 6. Color Coding Defining the Comparative Data Trends For Each Particle Classification

STATISTICAL RANGE COLOR CODING (% above / below sampler average)				
No significant difference	Trending above ave.	Significantly above ave.	Trending below ave.	Significantly below ave.
±15	≥15-50	≥50	≤15 - 50	<50

Based on historical comparative data involving microscopical analysis of mold spores and other particles, some basic assumptions were required to help interpret the available data. Based on our own laboratory's experience and quality control data, it is expected the CV for the re-analysis of the same sample by multiple trained analysts typically ranges from ~0.15 to 0.30 when there are approximately 100 or more particles of interest counted. Accounting for the fact these are side-by-side samples (not the re-analysis of the same sample) collected by different devices using limited data sets, it is logical to assume a variation of ±0.15 (15%) would indicate no significant difference (light green). It is also logical to assume that only a negative or positive *trend* can only be reported up to a CV of approximately -0.5 or +0.5 (as indicated by light red or light blue respectively). Based on the limited data, only when the CV values are less than -0.5 or greater than +0.5 (as indicated by dark red or dark blue respectively), would it be reasonable to assume there is a significant difference in the performance of one device over another.

DISCUSSION AND RESULTS

First of all, it is important not to over-analyze the results from limited data sets (10 side-by-side comparisons). It is more important to focus on the *trends* observed and described below. It should be recognized this is an initial study, and the analysis of larger data sets might provide more definitive results. The observed trend differences between the sampling devices are summarized below:

Visual Observation Trends

- The visual particle deposition trace of APACOR AirTrap XL and AirTrap Mini cassettes were observed to be slightly more uniform and narrower (comprised of ~95% of collected particles) than the Air-O-Cell (see Figures 1 and 2). This evaluation of deposition uniformity may require further investigation.

- A slightly higher concentration *trend* of "opaque and mineral debris" in the Air-O-Cell was microscopically observed as background "contamination" (an artifact) and likely not related to collection efficiency between devices. This background (or artifact) of mineral and opaque particles (only) in the <5µm size range was observed outside and inside of the deposition area. This could be partially responsible for the higher concentration *trend* measured in some of the Air-O-Cell results for the Opaque / Mineral / soil particle categories. This *trend* can be observed in Figure 5c. This observation needs to be accounted for as a part any further comparative quality control studies.

- The AirTrap Mini was observed to have a more "wavey and slightly uneven" media preparation than the AirTrap XL. The Air-O-Cell has a similar "wavey and uneven" media preparation in some of the samples.

These observations may be related to differential vendor preparation procedures between using a microscope slide and media application to a smaller (22 x 22mm) coverslip, and deserves further evaluation.

Statistical Trends

- The coefficient of variation (CV) for total mold spore concentrations (Table 2) between all three devices was ~0.22 for the September 20th comparison, and 0.33 for the November 12, 2024 comparison. Based on the limited sets of data, all three devices should be considered statistically equivalent.

- The AirTrap XL sampler showed a slightly higher collection (concentration) *trend* for all mold spore classifications in the November set of collected samples over the Air-O-Cell and the AirTrap Mini. Overall, the AirTrap XL *trend* was approximately 20% higher (CV >0.20) than the Air-O-Cell or the AirTrap Mini.

- The coefficient of variation (CV) for the other particle classifications (Table 3) between all three devices ranged from 0.15 to 0.49 across both sampling dates. The higher CV's are primarily associated with an expected higher variability in lower particle concentration range (i.e., in the 100 - 2,000 cts/m^3 or where fewer than 50 particles in a classification were counted in the analysis). As stated above, these measurements may also be impacted by an apparent background of other particulate contamination observed more frequently in the Air-O-Cell collection media.

The data should be considered preliminary and additional testing should be performed to confirm the initial results in this study. If you have any questions, you can contact Environmental Analysis Associates directly.

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