Comparison of Indoor and Outdoor Sample Results for Microorganisms Using Viable Vs. Non-viable Sampling Methodologies

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Viable Sampling Method

- Malt Extract Agar (MEA)
- Aerotek 6 Viable Microbial Particle Sampler
- Pump calibrated to 28.3 liters per minute
- Three minute sampling time
- Two samples inside and two samples outside each residence
- One blank MEA plate per residence
Non-viable Sampling Method

- Spore Trap Cassettes
- Pump calibrated to 15 liters per minute
- Ten minute sampling time
- Same two sample locations inside and outside each residence
- One blank spore trap cassette per residence
Study Parameters

- All samples were submitted to the same AIHA accredited laboratory
- Viable samples were reported in colony forming units per cubic meter of air (CFU/M$^3$)
- Non-viable samples were reported in spores per cubic meter of air (S/M$^3$)
- Indoor/Outdoor comparisons and ratios were established for both viable and non-viable samples
Subject No. 1

Miami-Dade County, Florida
Subject No. 2

Flagler County, Florida
Subject No. 3

Flagler County, Florida
Subject No. 4

Seminole County, Florida
Subject No. 5

Flagler County, Florida
Subject No. 6

Hendry County, Florida
## Results

<table>
<thead>
<tr>
<th>Residence</th>
<th>Viable I/O ratio</th>
<th>Non-viable I/O ratio</th>
<th>Non-viable factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 1</td>
<td>0.22</td>
<td>0.48</td>
<td>+ 0.5</td>
</tr>
<tr>
<td>Subject 2</td>
<td>0.18</td>
<td>0.017</td>
<td>- 10</td>
</tr>
<tr>
<td>Subject 3</td>
<td>0.6</td>
<td>0.16</td>
<td>- 4</td>
</tr>
<tr>
<td>Subject 4</td>
<td>0.35</td>
<td>0.035</td>
<td>- 10</td>
</tr>
<tr>
<td>Subject 5</td>
<td>0.22</td>
<td>0.51</td>
<td>+ 0.4</td>
</tr>
<tr>
<td>Subject 6</td>
<td>0.14</td>
<td>0.0049</td>
<td>- 29</td>
</tr>
</tbody>
</table>
Results

• 4 out of 6 residences had a higher I/O ratio using viable sampling methods versus non-viable sampling methods by a minimum factor of 4, and up to a factor of 29

• The 2 remaining residences had a higher I/O ratio using non-viable sampling methods versus viable sampling methods by factor of 0.4 and 0.5
Outside Sampling Considerations

- Seasonal variations - pollen counts
- Recent rains or lawn service
- Horse Farms, or large numbers of outside domestic animals
- Coastline sampling
- Roof-top or multi-story deck sampling
- Amount of vegetation, wind speed and direction
Conclusions

• A higher volume of non-viable spores counted in the outside non-viable samples reduced the indoor/outdoor ratios
• Viable sampling methods more consistently challenge the indoor air quality environment with regard to fungal assessments
• Bacterial sampling and other diagnostic tools should also be used in performing a complete microbiological assessment
Thank you

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