An analysis of Outdoor Penicillium/Aspergillus concentrations

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The outdoor aerosol
The outdoor aerosol
Introduction

- Outdoor spore populations vary widely over short periods of time especially during changes in weather.
- Understanding this variability is crucial if indoor/outdoor ratios are to be used for data interpretation.
Example

- Penicillium type spore count zero outdoors
- 200 Penicillium type spores collected indoors
- Are the indoor spores from an indoor source?
- Given outdoor aerosol variability, how likely is it that there are no Penicillium spores outdoors?
- If they should be present outdoors, what is the likely concentration?
We have developed a database compiled from outdoor spore trap samples collected across the country and throughout the year. We have used the data to enable comparisons by spore type with individual outdoor spore trap samples.
Methods

- **All samples were**
  - collected by field investigators
  - analyzed in our lab following our standard protocols and subject to our quality control processes.
    - Spores were identified and tabulated by genus or higher grouping, and relative amounts of background debris were noted.
    - Tabulations were entered directly into a database, compiled by date and state, and analyzed for range and percentiles by state and by month.

- The database differentiates between sampler types and provides some information on local weather conditions during sampling.
MoldRange

- We have been collecting data for 5.5 years
- The database includes approximately 125,000 samples collected from 47 states, and for every month of the year.
Analyses to advance the science

- This presentation focuses on Penicillium/Aspergillus concentrations
- Analyses
  - Averages by month across all states
  - Averages by state across all months
  - Within-state averages by month
Penicillium types across all states

Penicillium/Aspergillus types By Month

- Frequency
- 2.5 Percentile
- 50 Percentile
- 97.5 Percentile

Frequency

Median
Arizona: Medians (green), means (red)
# Penicillium/Aspergillus

<table>
<thead>
<tr>
<th>State</th>
<th>N (all samples)</th>
<th>Median (spores/m³) (Pen+ samples)</th>
<th>Range (spores/m³) (Pen+ samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>15</td>
<td>214</td>
<td>53-533</td>
</tr>
<tr>
<td>Alaska</td>
<td>38</td>
<td>67</td>
<td>13-52,907</td>
</tr>
<tr>
<td>Arizona</td>
<td>12,754</td>
<td>267</td>
<td>13-373,387</td>
</tr>
<tr>
<td>Arkansas</td>
<td>19</td>
<td>160</td>
<td>53-1600</td>
</tr>
</tbody>
</table>
Conclusions

- MoldRangeTM data allows comparison of incident outdoor counts to the range and percentiles for the state and for the month.

- In a broader sense, the data can be used for investigations of the prevalence of specific spore types across the US, and seasonality of fungal aerosol populations by state.

- Ongoing data collection will enable studies of trends in spore populations related, for example, to global warming.

- MoldRangeTM is probably the largest outdoor spore database and the most consistently collected and analyzed. It should provide a valuable tool for increasing understanding of the outdoor fungal aerosol.