Comparison of CFU/ g and CFU/ cm² as a Measure of Fungal Load in Collected Carpet Dust Samples

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Sampling and Measurement

- Samples were collected from both water-damaged and non-water-damaged carpet using both open-face and closed-face cassette sampling methods.

- Measurements of both CFU/g and CFU/cm² were obtained from each carpet sampled.
Correlation Analysis

- Examined two sets of correlations
  - Fungal load (CFU/cm$^2$) vs. dust load (gm/cm$^2$)
  - CFU/cm$^2$ vs. CFU/gm
## Correlation of Fungal Load (CFU/cm²) vs. Dust Load (gm/cm²)

<table>
<thead>
<tr>
<th>Carpet Type</th>
<th>Correlation</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Carpet – open face</td>
<td>0.42</td>
<td>43</td>
</tr>
<tr>
<td>Dry Carpet – closed face</td>
<td>0.32</td>
<td>17</td>
</tr>
<tr>
<td>Wet Carpet – open face</td>
<td>0.73</td>
<td>8</td>
</tr>
<tr>
<td>Wet Carpet – closed face</td>
<td>0.38</td>
<td>23</td>
</tr>
</tbody>
</table>

Observation: Other than Wet Carpet – open face (with a small sample size), correlations were weak, suggesting further study.
## Correlation Analysis of CFU/cm² vs. CFU/gm

<table>
<thead>
<tr>
<th></th>
<th>Correlation</th>
<th>( n )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Carpet – open face</td>
<td>0.59</td>
<td>43</td>
</tr>
<tr>
<td>Dry Carpet – closed face</td>
<td>0.93</td>
<td>17</td>
</tr>
<tr>
<td>Wet Carpet – open face</td>
<td>0.47</td>
<td>8</td>
</tr>
<tr>
<td>Wet Carpet – closed face</td>
<td>0.47</td>
<td>23</td>
</tr>
</tbody>
</table>

**Observation:** These results did not offer further explanation, so a linear regression analysis was performed.
Linear Regression Analysis

- Null Hypothesis: CFU/cm² has no predictive relationship with CFU/gm

- Research Hypothesis: CFU/cm² has a predictive relationship with CFU/gm
Linear Regression Testing

Data samples used were from the following:

- Water-damaged carpet using the open-face sampling method
- Water-damaged carpet using the closed-face sampling method
- Non-water-damaged carpet using the open-face sampling method
- Non-water-damaged carpet using the closed-face sampling method
Adjustments to Raw Data

- Samples with grams of dust mass < 0.06 were dropped.

- Both measurements displayed non-linear distributions, so the natural log of each was used to transform the data so that linear regression would be applicable.
## Results

<table>
<thead>
<tr>
<th>Sample</th>
<th>Water Damaged?</th>
<th>Open Face vs. Closed Face</th>
<th>Sample Size</th>
<th>Linear Equation CFU/ cm² =</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Open</td>
<td>7</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
<td>Closed</td>
<td>23</td>
<td>(-8.32 + 0.97 \ln (\text{CFU/g}))</td>
<td>0.854</td>
</tr>
<tr>
<td>3</td>
<td>No</td>
<td>Open</td>
<td>43</td>
<td>(-10.11 + 1.02 \ln (\text{CFU/g}))</td>
<td>0.668</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
<td>Closed</td>
<td>17</td>
<td>(-10.32 + 1.08 \ln (\text{CFU/g}))</td>
<td>0.695</td>
</tr>
</tbody>
</table>

- $R^2$ indicates the portion of the variation observed in CFU/cm² that are explained by the change in the CFU/g (e.g., 85% of the variation observed in the CFU/cm² measured in sample 2 can be explained by the change in the measured CFU/g).

- Coefficients for CFU/gm variables for samples 2-4 were statistically significant with p-values = 0.000
Ln CFU/g Water Damaged Line Fit Plot
Open Face (n = 7)

\[ y = 1.1703x - 12.069 \]

\[ R^2 = 0.8009 \]

Not Used
Ln CFU/g Water Damaged Line Fit Plot
Closed Face (n = 23)

\[ y = 0.9678x - 8.3206 \]

\[ R^2 = 0.8541 \]
y = 1.0159x - 10.105
$R^2 = 0.6678$
Ln CFU/g  No Water Damage  Line Fit Plot
Closed Face  (n = 17)

\[ y = 1.0804x - 10.326 \]

\[ R^2 = 0.695 \]
Conclusions

- The data from water-damaged carpet with open face sampling were too small to present a reasonable statistical sample. It was rejected.

- The remaining three regressions met the required conditions for the error term to suggest validity.

- The regression for the water-damaged carpet showed a stronger relationship between the CFU/cm² and the CFU/g data.
Implications

- CFU/cm$^2$ may possibly be used as a reasonable proxy for CFU/gm.

- Results suggest additional study is needed to address the small dust samples.