contaminants (both bacteria and fungi). Findings of this study suggest that < 250 CFU/m^3 should be considered as normal airborne bacteria population, whereas in the case of fungi, < 350 CFU/m^3. Building temperature and relative humidity besides other environmental factors influenced microbial growth during the course of this study. These baseline IEQ guidelines have been peer reviewed in legal depositions and court cases. **Conclusion.** Due to the absence of regulated bioaerosol contaminant levels and a more recent influx of proactive indoor environmental sampling, much has been initiated towards development of standard facility indoor environmental guidelines for microbial contaminants. The results of this study can be employed to better manage the quality of the indoor environment and be used in commercial applications.

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A METHOD FOR INTERPRETING AIRBORNE CONCENTRATIONS OF MOLD. J. Spurgeon, Bayshore Environmental Inc., Placentia, CA.

Hypothesis. The concentration distributions of indoor airborne spores can be used to classify site-specific exposures as low, moderate, or high. This concept has achieved general acceptance within the exposure assessment community, but limited acceptance within the IEQ community. For example, what is the significance of an airborne concentration of 2000 s/m^3 of *Aspergillus/Penicillium*-type spores measured in an indoor environment? Are exposures low, moderate, or high? It's difficult to even guess, because there isn't any point of reference other than professional judgment. However, if a number of sample results are available from a broad selection of similar indoor environments (residential, commercial, school), a distribution of concentrations can be estimated for each type of space. As an example, *Asp/Pen* type spores were detected in 40 of 51 residential indoor samples. The GM concentration was 365 s/m^3, the average concentration was 598 s/m^3, and the 95th percentile concentration was 1932 s/m^3. This information reveals that the *Asp/Pen* concentration of 2000 s/m^3 exceeded 95% of all the past exposures included in the database. This might encourage the consultant to classify the site-specific exposure as "high." The distributions of airborne concentrations for several fungal types are presented. Although based on limited sample sizes, they illustrate the utility of this approach.

A second advantage of characterizing the distribution of concentrations is that extreme concentrations are reported as well as average concentrations (although with less confidence). This is important because adverse health effects are typically associated with exposures to extreme concentrations, not average concentrations. A large-scale, multiweek investigation is discussed in which the average indoor and outdoor concentrations of *Asp/Pen* were similar, but the 95th percentile indoor concentration significantly exceeded the outdoor concentration. If the concentration distributions had not been constructed, then the difference between indoor and outdoor concentrations would not have been reported.

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EVALUATING AIRBORNE CULTURABLE FUNGAL CONCENTRATIONS ON WIDE-BODY COMMERCIAL PASSENGER AIRCRAFT. L. Taylor, CDC/NIOSH/Harvard University, Cincinnati, OH; M. Hein, K. Wallingford, CDC/NIOSH, Cincinnati, OH.

Despite the media attention that cabin air quality receives, little research has been conducted to determine the magnitude of fungal concentrations on aircraft. The primary objective of this study was to compare aircraft fungal concentrations at various in-flight times to concentrations collected inside and outside airport terminals. Sixteen flights with durations between 4.5 and 6.5 hours were evaluated on twin aisle wide-body aircraft. Using N-6 impactors and DG18 agar media, triplicate samples were collected in the front and rear of coach class during six sampling intervals throughout each flight: boarding, post-takeoff, mid-flight 1, mid-flight 2, mid-flight 3, and deplaning. Comparison samples were collected inside and outside airport terminals at the origin and destination cities. The MIXED procedure in SAS was used to model the mean and the variance-covariance matrix of the natural log-transformed fungal concentrations. Fixed effects considered included the sampling interval and the location of samples (front of coach section, rear of coach section) collected inside the aircraft. Descriptive statistics indicate that fungal concentrations on the aircraft were highest during deplaning (geometric mean (GM): 77.5 colony forming units per cubic meter (cfu/m^3), geometric standard deviation (GSD): 2.8) followed by the boarding interval (GM: 65.7 cfu/m^3, GSD: 3.8). The front and rear locations within the coach section of the aircraft were not significantly different (p-value > 0.2). Fungal concentrations inside the aircraft during mid-flight (GM: 9.7 cfu/m^3, GSD: 2.1) were lower than concentrations observed inside the airport terminals (GM: 44.2 cfu/m^3, GSD: 3.3) and appreciably lower than concentrations observed outside the airport terminals (GM: 449.4 cfu/m^3, GSD: 2.4). Study results consistently demonstrate that fungal concentrations are higher outside the airport terminals than those observed in-flight on wide-body aircraft. Additional analysis regarding the specific genus and species of fungi observed should be completed to elucidate differences between the sampling environments.

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THE EFFECT OF DISTURBING COLONIZED MOLD ON AIRBORNE SPORE CONCENTRATIONS. S. Evans, MDE Inc., Seattle, WA.

Dust control and dust suppression are identified components of mold remediation methods in guidance documents such as the New York City Guidelines, and for class I projects, dust suppression is the only control utilized to minimize mold spore aerosolization. Dust control methods are typically specified by an industrial hygienist in mold remediation specifications. However, little data is commonly available showing the effect of movement of mold colonized materials on airborne mold concentrations after disturbance.

A study of the effect of disturbance of mold colonization on airborne spore concentrations was conducted in a building with limited air movement or other disturbance. Data was collected in a relatively small, two-room standalone building in the Puget Sound area that was built to research the hygrothermal performance of different building envelope assemblies. Wall assemblies consisted of insulated wood frame systems, with the interior of all test walls clay in gypsum wallboard fastened to the frame with screws. The panels remained in place for extended periods of time, and were opened only for occasional inspection, or when test wall assemblies were being removed at the end of a research phase. During the gypsum wallboard and panel removals, no formal dust suppression was utilized. Work practices, however, tended to minimize disturbance; the attachment screws were backed out of the wallboard, the wallboard was slowly and gently angled away from the wall section and supported at approximately a 45 degree angle, the air was not mechanically ventilated, and there was limited people movement.

Airborne spore concentrations were collected in the building before and after the panel removals. Visible mold colonization inside the opened wall panels was sampled to correlate to the air samples. Airborne spore concentrations became slightly elevated in at least some of the mold types found on the panel interior, as identified by cellotape samples.

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INVASIVE AND NONINVASIVE INVESTIGATION TECHNIQUES FOR MOLD INFECTED WALL CAVITIES. D. Regelbrugge, F. Norlock, J. Ruhl, G. Crawford, Boelter & Yates Inc., Park Ridge, IL; C. Yang, P&K Microbology Services Inc., Cherry Hill, NJ.

Air sampling for mold is often used as a noninvasive screening tool for potential hidden mold conditions in a structure. Techniques for specifically locating hidden mold in wall cavities can involve either drilling holes for insertion of a borescope probe or cutting out a wall section for direct inspection. Questions were posed as to whether culturable air sampling is a more effective technique than spore traps for screening tests and whether disturbance of walls by removal of base trim, peeling back wallpaper, and drilling and cutting wallboard have any significant impact on indoor air quality. An experiment was developed to gather information on these questions. A chamber was built to enclose wall sections that were constructed to simulate both exterior insulated and

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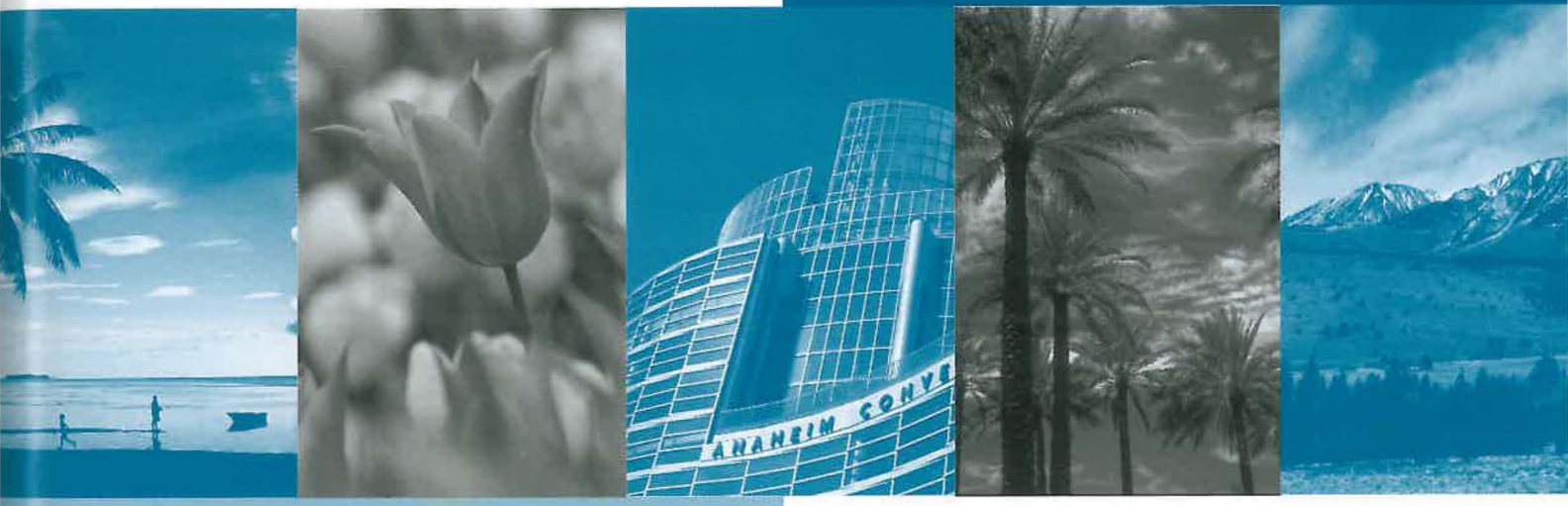

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