carrying known charge ranges. By comparing their concentrations with those entering the analyzer, we obtained the electrical charge distributions on the bacteria.

Our tests with *Pseudomonas fluorescens* bacteria, commonly found in air environments, have shown that airborne bacteria have a net negative charge, but the individual bacteria can be charged either negatively or positively. When the bacterial suspension was aerosolized with compressed air, the bacteria acquired up to ?14,000 elementary charges per bacterium; 50% of these bacteria carried between -1000 and +400 elementary charges.

When the same bacterial suspension was aerosolized using bursting bubbles, the bacteria acquired maximum charges of ?1500 and 50% of the bacteria had between -200 and +150 electrical charges. Thus, aerosolized bacteria have sufficiently high electric charges to be collected by an electrostatic field without prior charging.

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EXPOSURE ASSESSMENT OF EMPLOYEES LAND-APPLYING BIOSOLIDS. N. Burton, D. Trout, NIOSH, Cincinnati, OH

In response to a management request for assistance, NIOSH investigators conducted an evaluation of worker exposure during the land application of biosolids (treated sewage sludge). At the wastewater plant, biosolids were loaded into large dump trucks with a front-end loader, transported to a farm field, and dumped. The biosolids were then loaded into a side discharge sludge spreader and sprayed on the field. A tractor was used to disk the sludge into the soil.

All five employees reported at least one episode of gastrointestinal illness occurring soon after performing this work. Environmental monitoring was conducted, which included the collection of area and/or personal breathing zone air samples for culturable bacteria, endotoxins, volatile organic compounds (VOCs), and metals. Bulk samples of sewage sludge were analyzed for coliform bacteria. The geometric mean bacterial area air concentrations ranged from 412 to 2356 colony forming units per cubic meter of air (CFU/m³).

All bacterial genera identified in these samples are associated with outdoor environments or mammals; some are considered opportunistic human pathogens. Airborne endotoxin levels ranged from 20 to 39 endotoxin units per cubic meter (EU/m³), which are similar or below levels found in wastewater treatment plants. The geometric mean concentrations of coliform bacteria and *Escherichia coli* in the bulk sewage sludge samples were 2.7×10^4 CFU and 2.2×10^4 CFU per gram of sample, respectively. The concentrations of metals and VOCs, including toluene, were low and well below current occupational exposure limits.

The nature and timing of the employees' reported symptoms suggest occupational exposure by direct contact with the biosolids as a probable cause of these symptoms. Recommendations were made for minimizing the growth of microorganisms during the storage process, increasing hand washing, adding filtration to the air-conditioning units on the tractor and front-end loaders, and improving the use of personal protective equipment.

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AN INVESTIGATION OF FUNGAL CONTAMINATION UNDERNEATH CARPET TILES IN AN OFFICE FACILITY. L. Hung, U.S. Public Health Service, Federal Occupational Health, Philadelphia, PA

Fungal proliferation was detected on the rubber backing of carpet tiles in a facility that had resulted in loosing of carpet tiles and employee health complaints. Elevated airborne fungal levels (10^3 CFU/m³) — with *Aspergillus* species as the predominant fungi — were detected at the floor level of fungi-proliferated areas.

The facility went through a decontamination and carpet replacement project. This included relocation of employees, removal of all furniture, full containment of the facility with negative air pressure, removal of carpets and vinyl tiles, decontamination of the concrete floor, sealing of the concrete floor, and carpet/vinyl tile replacement.

Microbiological samplings were conducted at different periods: 1) Before the initiation of the project; 2) after decontamination (clearance sampling); and 3) after reoccupancy of the facility. Andersen air samples, contact plate samples on wall and ceiling tile surfaces, swab and contact plate samples on concrete floor surfaces, and vacuum carpet dust samples were collected for fungal analysis.

Results showed a significant reduction of fungal levels on concrete floor surfaces underneath carpeting (from a mean of 9.5×10^5 CFU/in² to below the detection limits of 40 CFU/in²). The decontamination and carpet replacement did not significantly increase fungal loading on wall and ceiling tile surfaces. Before decontamination, the average indoor fungal level was higher than that of outdoors. Moreover, *Aspergillus* species (*Aspergillus versicolor* included) were the predominant fungi detected indoors while *Basidiomycetes* dominated outdoor fungal flora. After decontamination and facility reoccupancy, the mean indoor airborne fungal level was lower than that of outdoors (1726 CFU/m³ vs. 160 CFU/m³) and fungi detected indoors were those of outdoors.

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SEVERE FUNGAL CONTAMINATION OF A HOTEL RESULTING FROM AN EFIS SYSTEM FAILURE: ENVIRONMENTAL CHARACTERIZATION AND CLINICAL OUTCOMES. K. Martinez, K. Wallingford, D. Trout, NIOSH, Cincinnati, OH

In the fall of 1998, NIOSH responded to a request for technical assistance from a municipal health department to evaluate a hotel following identification of significant fungal contamination on interior surfaces of outdoor-facing walls of the structure. The fungi were suspected to have proliferated following extensive water incursion at the seams of the external building insulating and protective facing panels.

Specifically, NIOSH was asked to assess the fungal contamination, including testing hypotheses for the existence of fungal reservoirs, consultation regarding the ongoing remediation work, and the evaluation of the potential for occupational exposures to hotel employees and to the remediation workers, including environmental and medical components.

Surveys were conducted to collect microbiological bulk and air samples (using culturable and nonculturable methods) and to collect bulk samples from contaminated wallboard to be analyzed for mycotoxin content. The results of the NIOSH investigation clearly documented the presence of active fungal reservoirs behind vinyl wall-covering of exterior hotel walls; bulk sample results ranged from 8.8 $\times 10^4$ to 5.2×10^7 colony forming units per gram of material (CFU/gm).

Mycotoxins specific to *Stachybotrys chartarum* (i.e., complex trichothecenes, satratoxin and roridin, and atranones) and *Memmoniella echinata* (i.e., griseofulvins) were identified on 8 of 18 bulk wallboard samples. In addition, air sampling indicated the dissemination of fungal spores and hyphae into the rooms of the hotel, with geometric mean concentrations indoors ranging from 294 CFU/m³ to 2690 CFU/m³. The identified fungal genera included *Acremonium, Alternaria, Aspergillus, Cladosporium, Penicillium, Phoma, Stachybotrys*, and *Ulocladium*.

The results indicate that inhalation exposures to various fungal structures, and consequently their mycotoxins, were possible at the time of the NIOSH investigation. It is not clear what impact these exposures may have had on the workers in the hotel. Two of the hotel employees who might have been the most highly exposed are being clinically evaluated for health conditions potentially related to their exposures.

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MICROANATOMICAL CHANGES IN ALVEOLAR TYPE II CELLS IN JUVENILE MICE INOCULATED INTRACHEALLY WITH *STACHYBOTRYS CHARTARUM* SPORES. T. Rand, M. Mahoney, K. White, Saint Mary's University, Halifax, Nova Scotia, Canada; M. Oulton, Dalhousie University, Halifax, Nova Scotia, Canada

We recently showed that alveolar Type II cells in young mice are sensitive to exposure to *Stachybotrys chartarum* spores and to the *trichothecene, isosatratoxin F*. This sensitivity is manifested by alterations in the normal metabolic processing of pulmonary surfactant. It is unclear from our previous studies, however, whether there are concurrent morphological and dimensional changes in the alveolar Type II cells that reflect these metabolic alterations.

The objectives of this study were to document ultrastructural and morphometric changes developing in alveolar Type II cells of juvenile mice exposed to a single intratracheal instillation of *S. chartarum* spores for 24 and 48 hours. Within these times, marked ultrastructural changes were associated with the alveolar Type II cells in *S. chartarum*-inoculated mice compared with those in saline-treated and untreated control mice. These changes included swollen mitochondria, cisternal dilation of endoplasmic reticulum, and membranal figures in lamellar bodies and alveolar spaces.

Point-count stereological analysis revealed a significant decrease in alveolar Type II cell volume compared with the control animals. In addition, lamellar body volume density and volume were also significantly decreased in the *S. chartarum*-treated animals. These results further support our position that alveolar Type II cells show high sensitivity toward *S. chartarum* spores, which is manifested by metabolic and concurrent microanatomical changes.

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CHANGES OVER TIME IN AUDIOMETRIC THRESHOLDS IN A GROUP OF AUTOMOBILE STAMPING AND ASSEMBLY WORKERSWITHIN A HEARING CONSERVATION PROGRAM. L. Gibson, Concurrent Technologies Corporation, Largo, FL; E. Talbott, J. Burks, University of Pittsburgh, Pittsburgh, PA

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