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GASTROINTESTINAL CANCER MORTALITY OF WORKERS IN OCCUPATIONS WITH HIGH ASBESTOS EXPOSURES. S. Kang, C.A. Burnett, E. Freund, J. Walker, N. Lalic, J. Sestito, NIOSH, Cincinnati, OH

Asbestos, which is a well-known risk factor for lung cancer and malignant mesothelioma, has also been suggested as a gastrointestinal (GI) carcinogen. This study was conducted to assess the relationship between high asbestos exposure occupations and the occurrence of GI cancer. Death certificate data were analyzed from 4,943,566 decedents with information on occupation and industry from 28 states from 1979 through 1990. Elevated proportionate mortality ratios (PMRs) for mesothelioma were used to identify occupations potentially having many workers exposed to asbestos. All PMRs were age-adjusted and sex and race-specific. The PMRs for GI cancers in white males were then calculated for these occupations after excluding mesothelioma, lung cancer, and non-malignant respiratory disease from all deaths. We identified 15,524 cases of GI cancer in the 12 occupations with elevated PMRs for mesothelioma. When these occupations were occupations were combined, the PMRs for esophageal, gastric and colorectal cancer were significantly elevated at 108 (95% confidence interval = 107-110), 110 (106-113), and 109 (107-110), respectively. Esophageal cancer was elevated in sheet metal workers and mechanical workers. Gastric cancer was elevated in supervisors in production managers. Colorectal cancer was elevated in mechanical and electrical and electronic engineers. However, high exposure occupations like insulation, construction painter supervisors, plumbers, furnace operators, and construction electricians showed no elevations of GI cancers. In conclusion, this death certificate study supports an association between asbestos exposure and some GI cancer, however the magnitude of this effect is very small.

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PHYSICAL AND BIOLOGICAL TEST METHODS TO EVALUATE THE CONTAINMENT OF BIOAEROSOLS WITHIN AN AEROSOL CHAMBER. P.A. Jensen, M. P. Schafer, NIOSH, Cincinnati, OH

In an aerosol chamber designed and built by NIOSH researchers, bioaerosols can be safely, uniformly generated, and easily sampled. The chamber is ducted through an auxiliary fan, into the main exhaust plenum for the laboratory and is always under negative pressure. To ensure the safety of laboratory personnel, and demonstrate the containment of bioaerosol within this chamber, a series of tests were performed. The supply and exhaust HEPA filters and gaskets were initially scanned and a leakage of less than 0.01 percent (NSF 49) was measured by a certified technician. To evaluate the integrity of the chamber construction (welds, connections, and access doors), a soap bubble test was performed. The HEPA filters were replaced with painted 1.9-cm (0.75-in) thick plywood blanks, and the chamber was pressurized to 500 Pa (2 in w.g.). After an initial failure, the gasket

material was replaced and the chamber passed the bubble test, a series of bioaerosol experiments was performed. A mixed suspension of *E. Coli* and *S. Marcescens* was aerosolized under normal operating conditions, resulting in a total concentration of approximately 2,000 CFU/m³. The aerodynamic diameter of this aerosol was approximately 2µm. Andersen six-stage bioaerosol samplers were used to collect bioaerosol inside the chamber and at each potential orifice (access doors, all gaskets, nebulizer opening, and chamber gasket). Subsequent tests were performed with a higher challenge bioaerosol concentration (20,000 CFU/m³). Tests were performed at a flow rate of 11.3 m³/min (400 cfm) and at zero flow. No *E. coli* or *S. Marcescens* CFUs were collected outside of the chamber under any of the three conditions. All penetrations into the chamber must be carefully checked prior to each use (e.g. proper sealing of all gaskets). In conclusion, following an evaluation protocol such as this will ensure the laboratory personnel of the integrity of the bioaerosol chamber when potentially infectious microorganisms are aerosolized.

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COLLECTION OF AIRBORNE MYCOTOXIN ON MEMBRANE FILTERS AND ANALYSIS USING HIGH-PRESSURE LIQUID CHROMATOGRAPHY WITH ULTRAVIOLET ABSORBANCE DETECTION. R. Salazar, Y. Hammad, P. Sherblom, University of South Florida, Tampa, FL

Mycotoxins produced by fungi in indoor environments may pose a significant health risk to building occupants. These toxins, which commonly contaminate food and feed products, are known to cause serious illness and disease in humans and animals upon ingestion. Toxin-producing fungi common to food and feed substrates are frequently detected indoors. The literature suggests inhalation of mycotoxins produced by fungal organisms growing on indoor building substrates may result in adverse health effects to those exposed. However, evaluation of indoor mycotoxin levels is typically not performed. Lack of standardized sample collection and analysis methods limit exposure determinations. Methods to allow characterization of indoor mycotoxin levels are needed.

The objectives of this study were to develop sampling and analytical methods for evaluation of airborne mycotoxins. The methods included collection of samples on Teflon membrane filters followed by analysis using high-pressure liquid chromatography (HPLC) with ultraviolet (UV) absorbance detection. Methods were developed for ochratoxin A, a toxin commonly produced by *Aspergillus* and *Penicillium* organisms. These organisms have a widespread presence in indoor environments.

Filter samples spiked with standard solution of ochratoxin A were extracted using solvent solutions. Recoverabilities ranged from

87-94%. The HPLC-UV analytical method developed was sufficiently sensitive to detect toxin at concentrations as low as 0.15 ng/µL, limits typically reported with fluorescence detection.

The methods developed allow analysis of ochratoxin A from air samples collected on membrane filters. Similar methods may be developed for other mycotoxins which may contaminate indoor environments.

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BIOAEROSOL EXPOSURES IN MULTI-BUILDING APARTMENT COMPLEX WITH SIGNIFICANT WATER INFILTRATION. G.D. Boothe, Gobbell Hays Partners Nashville, TN

Water infiltration of building components has been associated with biological growth in occupied spaces. However, questions still exist concerning sampling methodologies for certain fungal contaminants such as *Stachybotrys chartarum*, and correlations between fungal growth and volatile organic compound (VOC) concentrations. A multi-building apartment complex with poor architectural design/construction provided an opportunity to investigate the relationship in a residential setting.

The apartment complex consisted of 10 buildings with over 1000 apartment units of varying size. Major water infiltration had occurred in approximately 70% of the units through the roof, window units and baseboards. Approximately 10% of the total units had water damage and visible growth of a magnitude that they had been removed from the active leasing inventory. The IAQ investigation involved airborne sampling for viable fungal spores and VOCs, and swab sampling to qualify visible growth.

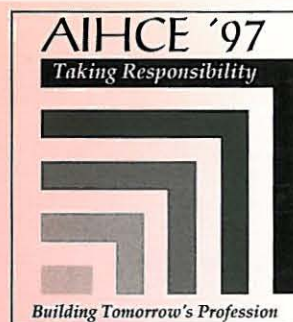
S. chartarum was a major constituent in many of the swab samples and was also detected in several air samples taken with a viable impactor sampler. Rose bengal agar (RBA) was the medium of choice for the air samples. VOC samples were taken on a triple sorbent bed tube and analyzed by gas chromatography-mass spectrometry. The resultant data were statistically analyzed for correlations between airborne fungal spore concentrations and VOC concentrations. Airborne fungal concentrations in units removed from the leasing inventory were elevated significantly above background concentrations, while concentrations in units still leased were not. A positive correlation existed for the presence of water damage and the amount of visible growth, and airborne concentrations of *S. chartarum*. There was not a statistically significant correlation between airborne fungal spore concentrations and overall VOC concentrations.

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AIRBORNE ENDOTOXIN AND FUNGAL CONCENTRATIONS IN DIFFERENT AREAS WITHIN TEXTILE PLANTS IN TAIWAN: A TWO-YEAR STUDY. H.J. Su, S.L. Chen, C.Y. Lin, P.J. Wu, Dept. of Environmental and Occupational Health National Cheng Kung University Medical College Tainan, Taiwan, ROC

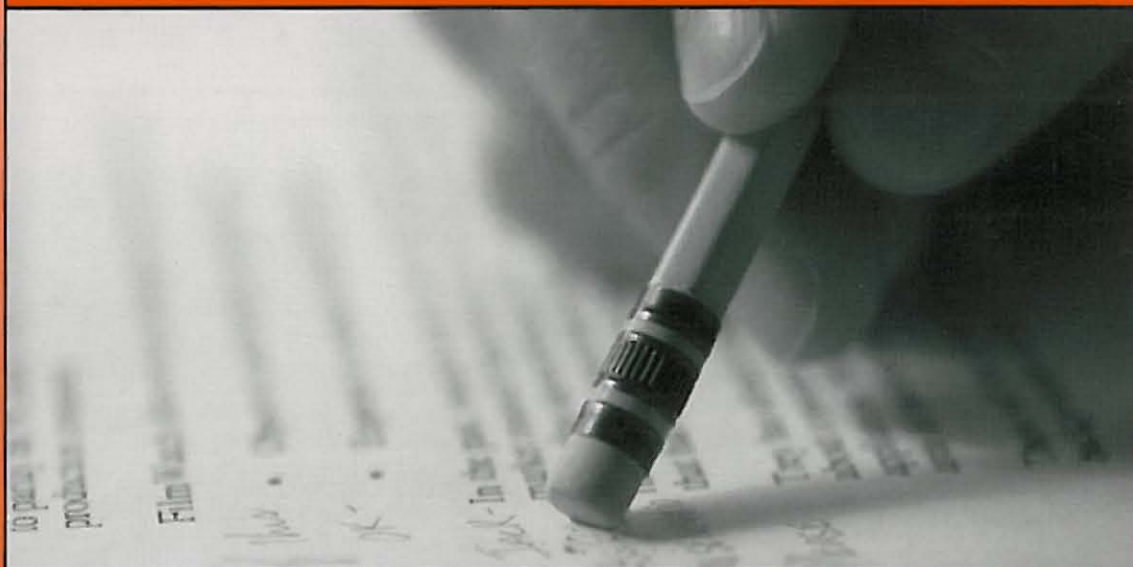
Previous studies have demonstrated that endotoxin exposure is one of the major occu-

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