388.

ASSESSING WASTE COLLECTORS' EXPOSURE TO BIOAEROSOLS. J. Lavoie, IRSST, Montréal, PQ, Canada

Published studies on waste collectors' exposure to bioaerosols do not indicate high exposures to these agents. However, these studies did not consider several factors. The objectives of this study was to characterize the exposure of waste collectors to bioaerosols in considering factors that may have an impact on working conditions, and to propose solutions to control exposures to these agents.

Personal exposures of waste collectors to bioaerosols (total bacteria, endotoxins and molds) were measured for seven types of collection during the summer, which represents the worst conditions. The effect of truck cleaning was also evaluated. The standard measuring methods of the IRSST (Quebec occupational health and safety research institute) were used. Bacterial exposures above the Scandinavian guideline of 10,000 CFU/m^3 of air for eight hours were measured during compost collection in the city and in a transfer station. Mean concentrations of bacteria were all in the order of 10^3-10^4 CFU/m^3 of air. The intervention threshold, when compared to his REL (Relative Exposure Limit proposed by the ACGIH), was exceeded for endotoxins during the collection of compost once every two weeks in the country. Mean concentrations varied from 8.5 to 100 endotoxin units (EU)/m^3 of air. Six times out of seven, the mean concentrations of molds were greater ($p \leq 0.05$) than the background levels. Measured mean concentrations of molds were between 8,300 and 98,170 CFU/m^3 of air. Also, the cleaning of an empty garbage truck does not improve the quality of the air.

The sources of these bioaerosols are leachate, particularly if the waste is of organic origin, as well as the garbage pails that contain this waste. Also, handling waste with bare hands is another risk. For bioaerosols, stringent personal hygiene measures remain one of the best means of prevention.

389.

CHARACTERIZATION OF LIPOPOLYSACCHARIDES IN SETTLED HOUSE DUST. J. Park, NIOSH, Morgantown, WV; B. Szponar, L. Larsson, University of Lund, Lund, Sweden; D. Gold, D. Milton, Brigham and Women's Hospital and Harvard University, Boston, MA

Chain-lengths of 3-hydroxy fatty acids (3-OHFAs) in the lipid-A portion of LPS vary with the type of bacteria. We used GC-MS to assay 190 house dust (HD) samples for 3-OHFAs to determine whether LPS in HD varies qualitatively and quantitatively within the home and between seasons. Dust samples from beds, bedroom floors, family rooms, and kitchen floors were collected as part of a birth-cohort study of childhood asthma (Study1), and a longitudinal study of home allergens/endotoxin (Study2). We also analyzed endotoxin activity (EA) by Limulus assay. Longer-chain 3-OHFAs (C16:0 and C18:0) comprised 64% (Study1) and 71% (Study2) of the 3-OHFAs in HD. However, in the pooled data, EA was significantly ($p<0.001$) and more strongly correlated with short-chain ($r=0.28$, 0.29, and 0.35 for C10:0, C12:0, and C14:0, respectively) than with long-chain 3-OHFAs. This implies that the Limulus assay responds preferentially to LPS containing short-chain 3-OHFAs, and is not sensitive to the presence of LPS composed of long-chain 3-OHFAs. In addition, for Study2, LPS in bed dust showed higher amounts of long-chain 3-OHFAs ($p<0.01$), and lower EA ($p<0.0001$) and lower potency (EU/nmole LPS: $p<0.0001$) than LPS in kitchen-floor dust; bed dust was not available from Study1. However, kitchen-floor dust had the lowest percentage of long-chain 3-OHFAs, was characterized by increased amounts of short-chain 3-OHFAs, and had the highest EA (p-values<0.02) and potency (p-values<0.005) among all sample types. In both studies, short-chain 3-OHFAs concentrations were lowest in winter and similar during the other seasons; the amount of long-chain 3-OHFAs was highest in the fall. Thus the distribution of different chain-length LPS may vary within the home and between seasons. The EA measured by Limulus assay may underestimate exposure, especially in bed dust where long chain 3-OHFAs predominate, if the LPS with long-chain 3-OHFAs have important biological effects in humans.

390.

BIOAEROSOLS IN THE BAKERY OF A HYPERMARKET. W. Lin, Y. Hsieh, P. Chen, Chung Shan Medical University, Taichung, Taiwan Republic of China

Bioaerosol concentrations were measured in the working area of the bakery in a hypermarket at central Taiwan to find the association between characteristics of bioaerosols and common worker activities. Activities were categorized as flour dumping and mixing, dough fermentation, dough cutting, and low activity. An Anderson six-stage impactor and a Merck MAS100 bioaerosol sampler were used to collect bacterial and fungal bioaerosols. The bacterial concentrations were found to be 191-1,066 CFU/m^3, and there were no significant difference between the bakery activities. In addition, the fungal concentrations were 164-871 CFU/m^3, and the predominant genera and group were *Penicillium* (66%), *Cladosporium* (26%), *Aspergillus* (3.6%), and the yeasts (2.6%). Moreover, the concentrations of *Penicillium* and *Cladosporium* spp. during flour dumping and mixing were significantly higher then those during other activities. It's indicated that the flour might be the principal source of fungal bioaerosols in the bakery.

391.

BIOAERSOL SAMPLING STRATEGY FOR NON-OPERATIONAL BUILDINGS. M. Castle, A. Routson, M. Howe, Colden Corporation, Philadelphia, PA

Insurers, renovation designers, and renovation contractors are becoming increasingly aware of the unique issues involving indoor air quality created in non-operational buildings. Once a building is closed for a period of time many conditions that facilitate bioaerosol build-up can occur. Central air-conditioning and ventilation systems that are either shutdown or not operating at designed capacity may result in an indoor environment that is conducive to microbial growth. For example, water damage, stagnant water in systems and visible microbial contamination are conditions that can facilitate bioaerosols.

Indoor air contamination is a serious problem that all stakeholders must effectively prevent or remediate to protect future occupants and to avoid potential financial consequences. A sampling strategy to assess indoor air quality was developed. The strategy consists primarily of the following components:

1.Initial walkthrough and visual inspection to familiarize oneself with the facility, assess current conditions in the building, and finalize a sampling plan.

2.Visual inspection of accessible representative portions of HVAC systems to identify sites of active and potential microbial growth.

3.Air sampling in representative areas to characterize airborne concentrations of environmental bacteria and fungi. Air sampling for endotoxins and fungal spore counts to be conducted in areas with significant water damage.

4.Bulk and surface wipe sampling of representative building surfaces and ventilation system components for environmental bacteria and fungi.

5.Water sampling for *Legionella* bacteria from domestic and other water systems.

6.Pigeon guano sampling in areas of the building with visible contamination.

This strategy was implemented in a non-operational hospital and bioaerosols were identified. The sampling strategy is important in maintaining a healthy indoor environment while a building is not in operation. The plan also describes preventive maintenance to be instituted while the building is shutdown to reduce or eliminate conditions that are conducive to bioaerosol accumulation.

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SIDE-BY-SIDE COMPARISON OF THREE SAMPLING METHODS FOR AEROSOLIZED ENDOTOXIN IN A WASTE-WATER TREATMENT FACILITY. F. DeRosso, University of Utah, Salt Lake City, UT; D. Greene, G. White, D. Stephenson, D. Lillquist, University of Utah, Salt Lake City, UT

Research studies have established the occurrence of adverse health effects in individuals exposed to organic dusts laden with endotoxin.

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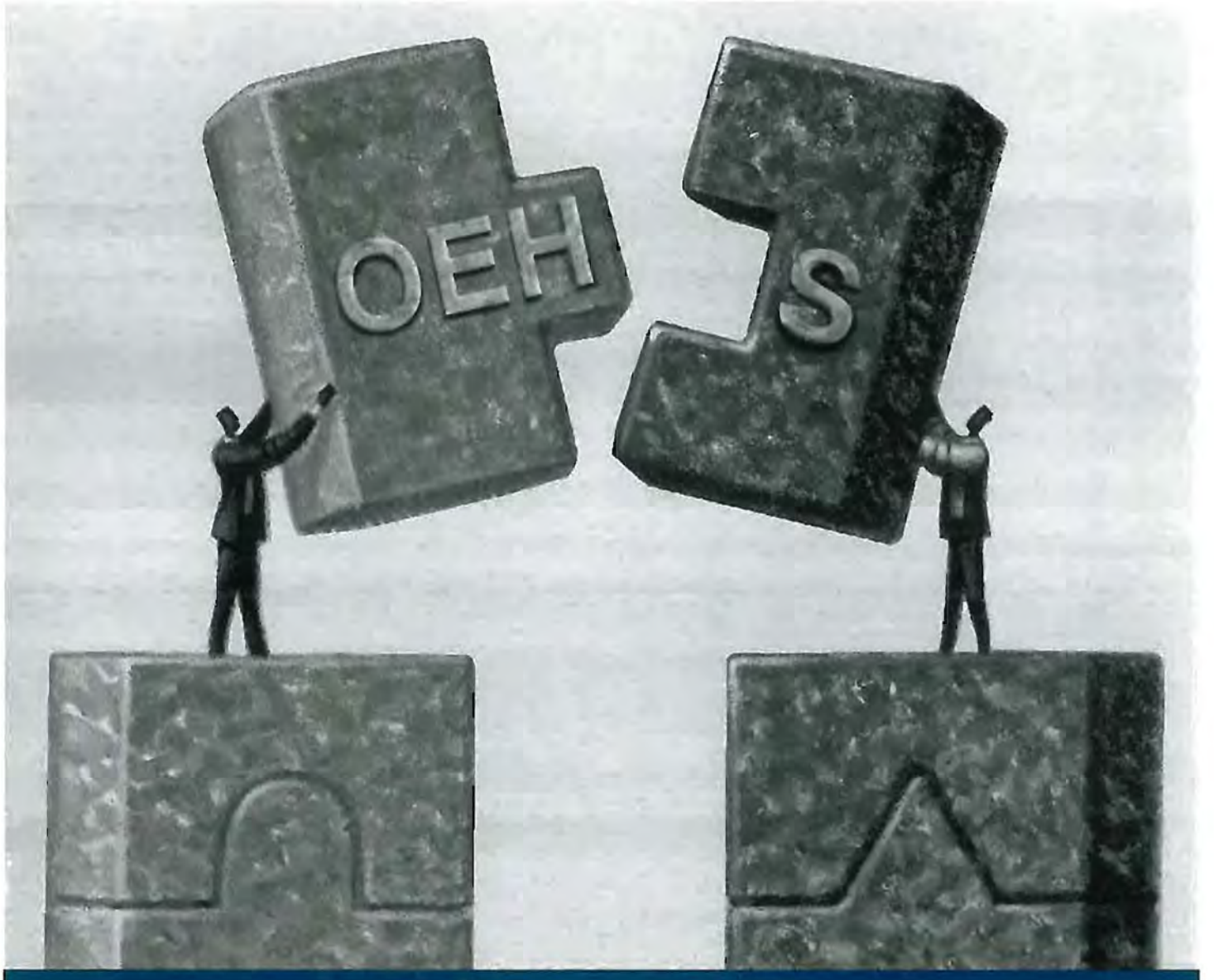

ABSTRACTS

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2002 Abstract Index by Session Topic

PF 101 Agricultural Health and Safety

Papers 1–6

1.

RELATIONSHIPS BETWEEN WORK EXPOSURE AND RESPIRATORY OUTCOMES IN POULTRY WORKERS.

S. Kirychuk, J. Dosman, P. Willson, L. Dwernychuk, University of Saskatchewan, Saskatoon, SK, Canada; J. Feddes, A. Senthilselvan, C. Ouellette, University of Alberta, Edmonton, AB, Canada

A pilot study was conducted on 74 poultry barn workers in Western Canada during the winters of 1998–2000. General respiratory health, current, chronic and work related respiratory symptoms; general work duties, and work-site factors were ascertained, pre-exposure, by questionnaire. Personal airborne exposure levels and changes in symptoms and lung function were measured across the work-shift for all workers. Workers were classified according to the type of poultry operation (floor based, n=53; cage based, n=13) in which they worked. There was no significant difference in daily hours spent in the barn between those who worked with caged poultry (5.41±2.35 hours) and those who worked with floor-based poultry (4.42±2.48 hours). Age of birds was 47.10±58.36 days for floor based versus 155.91±63.01 days for cage based facilities. There were no significant differences in personal environmental measurements between cage-based and floor-based facilities (ammonia 13.22±13.70 ppm, 17.34±16.35 ppm; total dust 5.74±4.85mg/m^3, 10.01 ±8.84 mg/m^3; endotoxin 6046±6089 EU/m^3, 5457±5934 EU/m^3 respectively). There were no significant differences in across work-shift change in pulmonary function indices between workers from cage and floor-based operations. For the entire sample total dust dose (work hours/day x total dust) significantly correlated with across-shift change in FEV_1, whereas endotoxin dose and ammonia dose did not. Stocking density was significantly correlated with average ammonia (ppm, p=0.002) and ammonia dose (ppm x work hours/day; p=0.004) in floor based operations and with total dust (particles/ml, p=0.002) in cage based populations. Stocking density was also significantly correlated with chronic cough (p=0.003) and across work-shift cough (p=0.05) and chest tightness (p=0.06) for workers from floor based operations; and with phlegm when working (p=0.018) and chest tightness across the work-shift (p=0.004) for workers from cage based operations. Type of poultry production operation and therefore type of work exposures appear to significantly impact symptoms experienced by workers exposed to these atmospheres.

2.

DUST GENERATION SYSTEM FOR AGRICULTURAL SOIL DUST.

K. Lee, R. Domingo-Neumann, R. Southard, UC Davis, Davis, CA

Agricultural workers are prone to exposure to mixed dust of inorganic and organic compounds. Diverse working conditions and operations in agriculture make direct measurements of the mixed dust exposure difficult. This study was conducted to develop a new dust generation system to determine possible exposure potency indicators of soil samples. The dust generator consists of a blower, a rotating chamber and a settling chamber. The rotating chamber has inner baffles to provide sufficient agitation of the samples while the chamber is rotating. A blower provides air into the rotating chamber, and the suspended dust is moved to the settling chamber through a perforated pipe. A small fan inside the settling chamber helps maintain suspension of the dust. Various size fractions of dust are sampled on filters suspended in the chamber via outlet ports and attached pumps. Air pressure is released through a filter plate mounted on the wall of the settling chamber. Various operating conditions were evaluated: air intake from blower, speed of rotation, soil mass and sampling time. To evaluate the characteristics of dust from the system, we collected dust samples from agricultural fields while the soil was prepared for