

PF 133. Industrial Hygiene

General Practice

Papers 251-262

251.

RESPIRATORY EXPOSURES FROM MICROWAVE POPCORN PACKAGING.

G. Kullman, R. Boylstein, C. Piacitelli, W. Jones, S. Pendergrass, A. Hubbs, K. Kreiss, NIOSH, Morgantown, WV

In May 2000, eight former workers at a plant that mixes and packages microwave popcorn were reported to have bronchiolitis obliterans, a severe lung disease characterized by fixed airflow obstruction; four of these workers were placed on a lung transplant list. At the request of the Missouri Department of Health, NIOSH staff investigated exposures and respiratory health outcomes at the plant. Subsequent clinical study indicated that current plant employees have 3.3 times the rate of obstructive spirometry abnormalities compared to national adjusted rates and never smokers had 10.8 times the national expected rate.

NIOSH initiated industrial hygiene study at this plant in August of 2000. Sampling was conducted for a number of analytes including airborne total and respirable dusts, particle size distributions, volatile organic compounds, ketones, acetaldehyde, acetic acid, and microbiological contaminants in bulk materials. Respirator training and fit testing were provided for workers in the ingredients mixing where the highest exposures were found; engineering control recommendations were also provided. Animal exposure studies were begun at NIOSH using flavoring agents from this plant.

Qualitative sampling for volatile organic compounds (VOCs) in air detected over 100 different compounds; the predominant VOCs identified included the ketones diacetyl, acetoin, methyl ethyl ketone (MEK), and 2-nonanone. Diacetyl was predominant and concentrations ranged from below detectable limits to 98 parts per million (ppm), with a mean of 8.1 ppm (STD 19 ppm). The average ketone concentrations were highest in the microwave mixing room with a mean diacetyl concentration of 38 ppm (STD 28 ppm). Strong exposure-response relationships existed between quartile of estimated cumulative exposures to diacetyl and respirable dust and frequency and degree of airway obstruction. Longitudinal medical and environmental study are ongoing at this plant to ensure that exposure control steps are effective.

252.

FORMALDEHYDE & CARBON MONOXIDE EXPOSURES DURING LADLE CURING CYCLES IN AN ELECTRIC ARC FURNACE STEEL MILL.

I. Sabesky, Manitoba Labour & Immigration, Winnipeg, MB, Canada; W. James, Gerdau MRM Steel, Winnipeg, MB, Canada; S. Collin, Enviro-Test Laboratories, Winnipeg, MB, Canada; R. Downey, LWB Refractories, York, PA

Concerns regarding eye, nose & throat irritation from the ladle's off-gas while in the natural gas curing cycle had been raised by melt shop workers for over 9 years in Manitoba's largest steel mill. Preliminary monitoring with the Gastech air pump and sensory tubes isolated formaldehyde levels on the catwalk above the ladle that ranged from 5-6 ppm (N=12). Elevated formaldehyde levels, a product of incomplete combustion, was not expected. Pursuant investigations determined that the off-gas composition was dependent on the ladle lining material, ramping rate and natural gas burning conditions. Immediate action was taken by the company to restrict worker access during curing. Workers entering the curing area including crane operators were issued respiratory protection. The combined efforts of Gerdau MRM Steel, Enviro-Test Laboratories, LWB Refractories Company and the Workplace Safety Health Division resulted in a program that defined exposure and further corrective actions. Testing was conducted on a complete ladle, spent ladle and ladle shell. Area monitoring for formaldehyde & carbon monoxide utilized direct reading instrumentation. Further formaldehyde monitoring used NIOSH Methods 3500 & 2016 and EPA Method TO11. Interference with other organics and heat warranted several methodologies. The ACGIH TLV-C for formaldehyde is 0.3 ppm & TLV-TWA for carbon monoxide is 25 ppm. Complete ladle results: formaldehyde ranged from 0 - 2 ppm (N=30) & carbon monoxide from 5 - 182 ppm (N=35). Cold ladle results: formaldehyde ranged from 0.4 - 0.7 ppm (N=22) & carbon monoxide from 5 - 31.3 ppm (N=35). Further corrective actions included: reduced ramping rate, burner combustion adjustments & doubling the roof exhaust. Long-term engineering solution is a local exhaust ventilation system and is pending installation.

253.

NITROUS OXIDE EXPOSURE OF EMERGENCY MEDICAL SERVICES PERSONNEL & DRIVERS IN AMBULANCES.

R. Korczynski, Manitoba Labour & Immigration, Winnipeg, MB, Canada

Manitoba Health, Emergency Medical Services, requested the assistance of the Workplace Safety & Health Division to determine exposure of ambulance medical personnel and drivers to nitrous oxide. This concern was prompted by the suspension (2001) of nitrous oxide by Ambulance Services in New South Wales, due to exposures in excess of their standard (25 ppm). In the enclosed space of the ambulance, the concern was sedative and other health effects from possible over-exposure to waste anesthetic gases. Entonox (nitrous oxide (50%)/oxygen (50%)) is delivered to ambulatory patients. It is standard issue in Manitoba ambulances for pain relief and use is increasing. The unit is a pressure demand delivery system with no scavenging of exhaled waste gases. In Manitoba ambulances, sixty

newer models are equipped with a general air supply & exhaust system. Remaining older ones (100) have only an exhaust system. To maintain comfort in transport, ventilation system(s) tend to be closed in colder/warmer months. In-city transport is of short duration. Monitoring focused on rural transport into the city. Exposure time ranged from 1-1.5 hr. Area and breathing zone monitoring in the ambulances (new & old) was conducted using the Miran 1B infrared analyzer. Four sets of data were collected over the duration of the transport. Nitrous oxide passive monitors were also provided. Exposure varied dependent on: ventilation system (on/off), transit time & frequency, and model (new/old). Exposures (N=96) generally exceeded the current NIOSH RTM of 25 ppm & ACGIH TLV-TWA of 50 ppm. Anesthetic equipment leaks were identified. Worker training protocols on the safe handling and administration of nitrous oxide were updated. Consideration is being given to an auxiliary local exhaust ventilation system and substitution to methoxyflurane or morphine.

254.

A USER-FRIENDLY TOOL FOR THE MANAGEMENT OF MULTIPLE CHEMICAL EXPOSURE IN WORKPLACES.

D. Drolet, F. Lemay, G. Truchon, M. Baril, IRSST, Montreal, PQ, Canada; A. Vyskocil, J. Brodeur, R. Tardif, C. Viau, M. Gerin, University of Montreal, Montreal, PQ, Canada; G. Lapointe, CSST, Montreal, PQ, Canada

Multiple exposure to chemical substances in workplaces is very common. The Quebec regulation (RROHS), similar to the ACGIH approach, states that when two or more substances are present and when they have similar effects on the same organs of the human body, their effects should be considered additive, unless it is established otherwise. This project was undertaken to build a toxicological database and a user-friendly tool allowing the identification of possible interactive effects of mixtures. Standard general literature references were used to compile critical data for each of the 668 substances in the RROHS: target organs, effects in target organs, mechanism of action and toxicokinetic characteristics. Only the health effects occurring at a concentration below 5 times the OEL for each substance were compiled. They were grouped in 32 classes of "similar health effects". When two or more substances are queried, the tool analyzes the health effects for each substance and its related classes, and then crosses the data in order to report any possible interaction. When the exposure concentrations are entered, the tool calculates, if applicable, the sum of the fractions of the OEL. Several preoccupations emerged among the toxicologists: 393 substances were in the "upper respiratory tract irritation" class and there is a debate whether all types of irritants should be considered as having additive effects. Also, when a substance is classified as a carcinogen based on animal studies, it cannot always be considered as a

The Premier Conference for Occupational and Environmental Health
and Safety Professionals

POWERFUL PARTNERSHIPS

Leveraging the power of collaboration to expand knowledge



ABSTRACTS



American Industrial Hygiene Conference & Expo

Cosponsored by AIHA and ACGIH®

June 1-6, 2002, San Diego Convention Center, San Diego, California

NIOSH LIBRARY SYSTEM

ALICE HAMILTON LIBRARY
4676 COLUMBIA PARKWAY
CINCINNATI, OH 45226

2002 Abstract Index by Session Topic



Platform Session Topic	Abstract No.	Platform Session Topic	Abstract No.
Aerosols	157-164	Management/Leadership	224-231
Agricultural Health and Safety	1-6	Occupational Epidemiology	25-31
Air Sampling Instrument Performance	79-86	Occupational Ergonomics: Training and Risk Assessment	7-12
Bioaerosols	165-173	Occupational Medicine/Occupational Epidemiology	148-156
Biological Monitoring	56-66	Personal Protective Clothing and Equipment	133-139
Community Environmental Health and Safety Issues and Social Concerns	121-126	Regulating the Right Hazards Rightly	19-24
Computer Applications in Industrial Hygiene	270-280	Respiratory Protection	185-195
Construction and Equipment	218-223	Risk Assessment in Industry and of Terrorism's Aftermath	196-202
Contaminant Control	140-147	Testing for Air Quality in the Garage	73-78
Current Topics in Noise and Hearing Loss	32-38	Toxicology and Toxicology Models (BPBK and QSAR)	47-53, 53,1-55
Dermal Exposures	174-184	Ventilation	95-102
Ergonomics Intervention	67-72		
Exposure Assessment Strategies I	39-46	Poster Sessions	Abstract No.
Exposure Assessment Strategies II	210-217	Poster Session 501	327-356
Gas & Vapor Detection	127-132	Poster Session 502	357-384
Health Care	112-120	Poster Session 503	385-413
Indoor Environmental Quality	242-250	Poster Session 504	414-442
Industrial Hygiene General Practice	251-262		
International Occupational Hygiene	232-241	Case Study Sessions	Abstract No.
Investigating Community Air Quality	203-209	Case Study 301	281-292
Ionizing and Nonionizing Radiation Risks: Measuring the Exposure	13-18	Case Study 302	293-303
Laboratory Health and Safety	87-94	Case Study 303	304-310
Lead I	103-111	Case Study 304	311-314, 317-318
Lead II	263-269	Case Study 305	319-326

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/m³, 10.01 ±8.84 mg/m³; endotoxin 6046±6089 EU/m³, 5457±5934 EU/m³ 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 FEV₁, 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