pre-work skin protectants are actually effective and necessary. Moreover the view is held in some circles that the efficacy of these products is not based on protecting the skin but on supporting the skin's natural regeneration.

Various methods are found in the literature for testing skin protectants. A modification of the repetitive irritation test first described by Frosch and Kurte in a German multicenter group enjoys recognition. In this model, the skin protectant is first put on areas of skin on the volar forearm and a model irritant then applied to these areas in chambers twice daily for a period of one week. By modifying this method and not applying the test product until after the irritation, the effect on skin regeneration can also be assessed.

A new kind of multiphase emulsion system described as water-in-oil-in-water was tested in comparison with petroleum jelly, a water-in-oil emulsion, and a lipogel. Testing was performed on their protective effect in this repetitive irritation test and their influence on skin regeneration where skin irritation had been induced by sodium lauryl sulphate.

In the repetitive irritation test the new protectant of the type water-in-oil-in-water demonstrated the best protective effect against SLS-induced skin damage. The tests carried out to determine the influence of the products on skin regeneration showed a considerable deterioration in barrier recovery in the case of petroleum jelly compared with the untreated reference area. Neither did the water-in-oil emulsion or the lipogel have any positive effect on restoring the impaired barrier function. The new skin protectant, however, showed significant results of being able to support the attainment of normal skin condition following SLS irritation.

PF 125. Respiratory Protection

Papers 185–195

185.

QUANTITATIVE FIT TESTING OF SUPPLIED AIR AND POWERED AIR-PURIFYING RESPIRATOR HOODS. J. Parker, Bullard, Cynthiana, KY

Quantitative fit testing of loose-fitting supplied-air or powered-air purifying respirator hoods and helmets in the positive pressure mode has the reputation of being difficult if not impossible to perform. The problems arise when quantitative fit testing of positive pressure respirators is attempted. Positive pressure tight fitting respirators are fit tested by conversion to the negative pressure mode. This conversion simplifies quantitative fit testing and also allows the use of qualitative methods. Such a conversion is not possible with loose-fitting hoods. Methods were evaluated to enhance the ease and simplicity of conducting quantitative fit testing on these devices in the positive pressure mode, using commercially available equipment that utilizes the generated aerosol method and the ambient aerosol method. Qualitative fit testing of hoods would also be possible using a new validated technique that utilizes a higher ambient concentration of test agent. Quantitative fit testing was performed on several models of supplied air and powered air purifying hoods after probing the respiratory inlet coverings with a probe that was extended towards the breathing zone. The basic procedures from the 1998 revision of the OSHA respiratory protection standard for generated and ambient aerosol methods were used. The breathing air for ambient aerosol testing was filtered with a high efficiency in-line filter. Compensatory accelerated aerosol production was used in the generated aerosol test by running the generator at a higher pressure than normal and using a higher air flow rate. Dilution compensation for the test chamber was performed by leaving a hood in the chamber during warm-up and between tests. Concentrations both inside and outside the respirators were measured during the testing to determine the fit factors. The initial and final ambient concentrations in the generated aerosol test differed by less than 1%. All fit factors measured exceeded 10,000.

186.

EVALUATION OF A QUANTITATIVE FIT TESTING METHOD FOR N95 FILTERING FACEPIECE RESPIRATORS. L. Janssen, H. Mullins, S. Danisch, M. Luinenburg, 3M, St. Paul, MN; T. Nelson, NIHS, Inc., Ardentown, DE

Approved N95 filters may allow up to 5% aerosol penetration under worst case conditions. This complicates quantitative fit testing (QNFT) of N95 filtering facepieces with ambient aerosols because permissible filter penetration contributes to total facepiece penetration. Since QNFT are intended to measure only faceseal leakage, this filter penetration typically results in erroneously low fit factors.

Earlier investigators developed a simple clamping device to measure N95 filter penetration. The measured value is subtracted from total penetration, with the assumption the remaining penetration came from faceseal leakage. The clamp's design and use rely on assumptions regarding filter surface area, the subject's breathing rate, and uniformity of the filter media. The developers used the clamp to assess respirator performance.

This study evaluated the clamp's ability to measure filter penetration and determine fit factors. Test subjects wore two brands of elastomeric half facepiece respirators. The facepieces were sealed to the face to eliminate faceseal leakage. A QNFT was performed using P100 filters, which allow essentially no penetration. Without disturbing the facepiece, the P100 filters were replaced with N95 filters and a second QNFT performed. The clamp was then used to measure average penetration for each pair of N95 filters. This value was subtracted from total penetration, and a corrected fit factor calculated. It was hypothesized that the corrected fit factor would equal the P100 fit factor. Repeated penetration measurements were made on one control filter of each brand to determine the reproducibility of the clamp measurements.

Corrected fit factors were approximately two orders of magnitude lower than corresponding P100 fit factors. The control filter penetration measurements fluctuated over a range of 400% - 500%. It was concluded that the clamp's measurements have little value. This device should not be used to fit test N95 filtering facepieces or otherwise assess respirator performance.

187.

PERFORMANCE OF EIGHTEEN N95 FILTERING-FACEPIECE MODELS. C. Coffey, R. Lawrence, D. Campbell, P. Jensen, NIOSH, Morgantown, WV; Z. Zhuang, NIOSH, Pittsburgh, PA

A panel of 25 subjects with varying face sizes tested 18 models of N95 filtering facepiece respirators. The performance of the respirators was determined with and without fit-testing using the 5th percentile simulated workplace protection factor (SWPF) tests determined from the total penetration (face seal leakage plus filter penetration) of six tests using the PortaCount Plus with redonning occurring between each test. The fit-tests used were: Bitrex, saccharin, generated aerosol, PortaCount Plus corrected for filter penetration, and the PortaCount Plus with the N95 Companion accessory. The 5th percentile SWPF for all models combined without fit-testing was 3.0. The 5th percentile SWPF without fit-testing for the individual models ranged from 1.3 to 48.0. Passing a fit-test resulted in the following 5th percentile SWPFs: saccharin - 2.0 to 8.1; Bitrex - 2.2 to 23.3; PortaCount -1.4 to 33.0; N95 Companion - 85.1 to 122; and generated aerosol - 2.9 to 34.6. To further describe the fitting characteristics of these respirators, the h-value (the fraction of a population who will obtain an adequate fit when a respirator is selected, donned, and fit-checked in accordance with the manufacturer's instructions before fit-testing) was computed. A donning was determined to have an adequate fit if the SWPF was ³10. The h-value for all models combined was 0.74 (74% of all donnings resulted in a SWPF of at least 10). The h-values for the individual models ranged from 0.50 to 0.99 with only 3 of the 18 models achieving 95% or more of the donnings with a SWPF of at least 10. This study demonstrates that although fit-testing can be used to increase the protection provided by N95 respirators, fit-test alone is not sufficient to assure protection factors of 10 or greater. It is also necessary to utilize respirator models with good fitting characteristics (i.e., high h-values).

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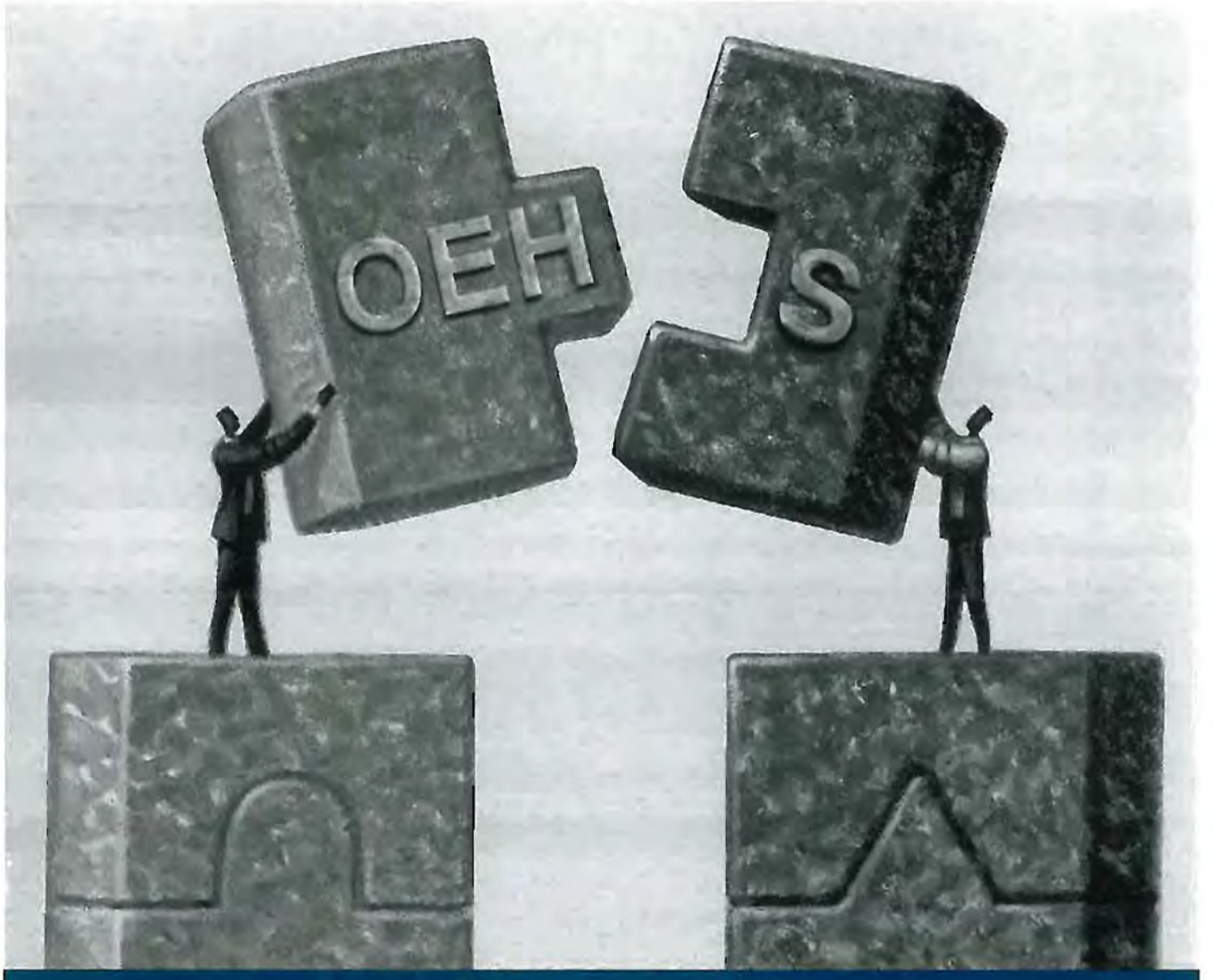

ABSTRACTS

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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