

protective equipment (RPE) to assess their workplace effectiveness. The talk will discuss recent work to evaluate the potential of Raman spectroscopy and cold IR to measure low mass levels of RCS (< 20 µg) for routine or specialist applications.

<sup>1</sup> Stacey P (2007); J Occup & Env Hyg 4: D1 - D4

<sup>2</sup> Stacey P et al (2014); Ann Occup Hyg doi:10.1093/annhyg/met075

<sup>3</sup> Coggins M et al, ASTM International, DOI: 10.1520/STP156520130141

## A New Miniature Sampler for In-mask Leakage Measurement in Workplace Conditions: Sampling Techniques\*

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The UK Health and Safety Laboratory has developed a miniature respirable sampler to help gain a better understanding of the exposure of workers to hazardous substances when wearing respiratory protective equipment or helmets with visors in the workplace. This presentation reports results from a multidisciplinary and international study to characterise the performance of the sampler designed to fit within a face filtering particulate (FFP) type 2 or 3 mask. The light weight (4.5 g) miniature sampler (15 mm in length) has an omnidirectional inlet and is designed to collect the respirable fraction using a 90 pores per inch (PPI) polyurethane foam insert. Tests in a calm air chamber show that it meets the respirable convention and has a performance, when challenged with Arizona Road Dust, that is similar to the reference Safety In Mines Respirable Dust Sampler (SIMPEDS), commonly used in Great Britain. Manikin tests show that, when challenged to a sodium chloride aerosol, the sampler has a linear relationship with the photometric measurement traditionally used for inward leakage tests in both ambient and humid conditions. Volunteer tests demonstrated that it does not affect the protection provided by the FFP type mask and that it can fit comfortably within the three FFP 3 type masks tested. The talk will discuss the opportunities and measurement limitations for in-mask sampling in the workplace.

## Laboratory Measurement of Gaseous Emissions from Wood Pellets and Wood Chips: Sampling Techniques\*

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Health & Safety Laboratory, Buxton, Derbyshire, UK

**Objectives:** Domestic, commercial and industrial use of wood pellet boilers in the UK is increasing, but this is still a comparatively new industry. There are concerns that the risks associated with wood pellets and wood chips, particularly the factors affecting the emission of carbon monoxide and carbon dioxide, during storage, are not understood; and consequently the health and safety information provided by suppliers to control the risks may be inadequate.

**Methodology:** Bulk samples of fresh wood pellets and chips were obtained from commercial companies. Carbon monoxide, carbon dioxide, volatile organic compounds (VOCs) and oxygen, together with temperature and humidity, were measured in the headspace of sealed containers packed with the fuels using direct-reading instruments over periods of several weeks.

**Results:** The emissions of gases from wood pellets followed a similar pattern to that found in other studies: the carbon dioxide concentration steadily increased to 15000 ppm, the carbon monoxide concentration increased beyond 1042 ppm, the oxygen concentration fell to 0.1%, and the VOC concentration increased to 47 ppm. Relative humidity was ~42%.

Wood chips behaved differently to pellets, e.g. carbon dioxide emissions are higher while carbon monoxide emissions are lower; and some differences were observed between dried wood chip emissions and those from undried wood chip. Relative humidity was ~90%.

**Conclusions:** Both wood pellet and wood chip biofuels can produce dangerous atmospheres when stored in an unventilated enclosed space. Both fuels can produce carbon monoxide and carbon dioxide and significantly deplete the air of oxygen.

## Practical Application of Real Time Monitors: Sampling Techniques\*

PETER BALDWIN, HELEN BEATTIE, RUSSELL ATKINSON

Health & Safety Laboratory, Buxton, Derbyshire, UK

**Objectives:** The objective of this presentation is to illustrate how real time direct reading monitors can provide valuable information on long term, short term and peak exposures to various gases in a wide variety of workplaces.

**Methods:** Various monitors, fitted with a variety of detectors, were used to assess exposure potential and associated controls in three situations: ammonia at a maggot farm, decomposition gases at a composting site, and carbon dioxide during dry ice blasting.

Measurements were taken for up to a week using personal or static monitoring.

**Results:** At the maggot farm, measurements indicated that high the short term exposures occur when feeding maggots. A risk of build-up of gases in the storage and mincing areas was also found.

At the composting site, peaks of exposure from gases during particular hours were found, indicating specific activities which give rise to greater exposure.

Results for dry ice blasting found low carbon dioxide levels and minimal oxygen depletion, confirming that this process can be conducted safely providing suitable controls and working procedures are in place.

**Conclusion:** The results provided useful information of levels of gases within ongoing processes over periods of time, and valuable insight into processes where little information was previously available.

## Compliance Auditing: Exposure Control\*

PETER BALDWIN, CHRIS KEEN

Health & Safety Laboratory, Buxton, Derbyshire, UK

**Objectives:** The objective of this presentation is to examine various audit approaches to multi-site or multinational business.

**Methods:** The UK Health & Safety Laboratory has performed numerous occupational hygiene audits and these have taken the form of postal questionnaires and onsite audits. Some of these have been with multi-site and multinational organisations. The advantages and disadvantages of the approaches will be discussed.

**Results:** Postal questionnaires were used to gain information from multiple companies at minimal cost. The questionnaire design should ensure questions cross-reference each other. Questionnaires rely on a competent person to complete them. Consistency can be improved using multiple-choice answers, with descriptors for each answer.

Multinational audits have been undertaken using site visits to examine the risk management system of companies. These have been used to:

- Improve health and safety standards;
- Examine compliance with high level health and safety policies;
- Promulgate good health and safety practises.

The standards audited against should be clear and be based on good occupational hygiene practise.

**Conclusion:** Auditing can drive improvements in individual companies. A multi-choice answering regime can indicate to companies where improvements maybe needed.

Multinational audits can ensure a standard approach is applied. Their effectiveness can be hindered by communication issues, and requirements of national legal systems.



## ABSTRACTS

### Health Effects on Canteen Staff Working in a University Canteen

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**Background:** Working in a canteen will involve more than one activity e.g. cutting, grinding, washing. These activities may lead to stress and muscle fatigue.

**Objective:** To analyse health effects in canteen staff working at the university.

**Methods:** A cross-sectional study was conducted in canteen staff. A questionnaire was used to compare the level of feeling e.g. strength, force, interest before and after work between canteen staff using a subjective judgment scale from 1–10, together with assessing muscles; extensor of the wrist, biceps, triceps at different times by using surface electromyography (EMG). A paired t-test was used to analyse data.

**Results:** 23 canteen staff participated the project (100%). Canteen staff did not report any significant difference in feeling e.g. freshness, keenness, force or strength that differentiated before work and after work. Extensor of the wrist seems to be the most muscle using part in a canteen activity.

**Conclusions:** Stress levels related to working in a university canteen are low as is muscle fatigue measured by EMG. However, performing repetitive work in a canteen could lead to muscle fatigue or stress so break interval time may be important for preventing muscle fatigue and reducing stress.

### Prevalence and Correlates of Noise Induced Hearing Loss among Traffic Policemen in the City of Colombo

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**Background and objective:** Noise induced hearing loss (NIHL) is a high frequency sensory-neural hearing loss in subjects who are exposed to environmental noise. Traffic policemen are exposed to environmental noise due to the nature of their duty and are susceptible to develop NIHL.

The objective of this study was to determine the prevalence and correlates of NIHL among traffic policemen in the city of Colombo.

**Methods:** A cross sectional study was carried out among traffic policemen in the city of Colombo. 350 participants were selected by cluster sampling. Pure-tone audiometry test was performed to assess the level of NIHL. Hearing levels of participants were classified using a classification obtained by modifying the Clark's classification. Correlates of NIHL were assessed using an Interviewer Administered Questionnaire (IAQ).

**Results:** Seventy nine participants (27.5%) had minor NIHL and 39 participants (13.6%) had major NIHL. In bivariate analysis 23 variables showed statistically significant association with mild and major NIHL while multi-variate analysis showed only age had statistically significant association with major NIHL with odds-ratio (OR) of 1.088 and only 'duration of work as a policeman' had statistically significant association with any NIHL (major or minor) with OR of 1.007.

**Conclusions:** Prevalence of NIHL among traffic policemen working in the city of Colombo was 41.1% (95% CI=35.5%–46.9%). A third of those having NIHL had major NIHL.

Traffic policemen should undergo periodic hearing assessment. The police department should explore the feasibility of reducing the number of hours per day spent on the road by traffic policemen.

### Occupational and Prostate Cancer Risk

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**Objectives:** To assess occupation's exposure as risk for prostate cancer.

**Methods:** A population-based case-control study recruited 237 men with a diagnosis of confirmed prostate Cancer and 237 controls randomly selected from the community between 1/Jan/2009 to 30/December/2012 in Gezira state-Central of Sudan. Thirteen occupations and 8 industries were selected for analyses to estimate the odds ratio between each occupational circumstance and prostate cancer with control for potential confounders.

**Results:** History of farmer was associated with a highly significant increased the risk for prostate cancer OR (3.711; 95% CI, 2.722–5.058), as was exposure to pesticides was associated with a highly significant increased OR (3.512; 95% CI, 2.611–4.725, P < 0.000).

Agriculture industry were strongly significantly elevated the risk for prostate cancer, as well as miscellaneous services wasn't associated but it had significant affected OR (3.439 and 0.506; respectively, P < 0.000). Farmer and Horticulturalists, mixable workers and Businessmen are relatively high odds ratios; also these are high statistically significant (P < 0.000).

**Conclusions:** These results suggest positive associated was appeared between some occupations, industries and increased the risk for prostate cancer in Sudan. Furthermore it needs more attention to preventing and curing the agriculture community.

### Effects of Carpet and on Human Health and Wellbeing in Health Care Facilities

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Flooring materials may have a broad impact on the health, safety, comfort, and confidence level of patients, visitors, and employees in health care facilities (HCFs). We reviewed scientific research related to the effects of carpet on human health and wellbeing in HCFs, using Google and Pubmed in our literature search. According to the literature, using carpet has some