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Criminal liability: negligence and environmental health

Occupational noise-induced hearing loss prevalence and noise abatement techniques in a steel-making plant

Occupational injuries among workers in a welding company within Mangaung Metropolitan Municipality

Official Journal of The SA Society of Occupational Health Nursing Practitioners, The SA Society of Occupational Medicine, The Southern African Institute for Occupational Hygiene and The Mine Medical Professionals' Association.

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From the Editor . . .

Gill Nelson, Editor

The research papers in this issue deal with injuries in a welding company, and noise in a steel company. Work-related injuries remain a problem and we hope to be able to report some trends over time in the near future, from the Rand Mutual Assurance Ltd. Compensation for occupational injuries is covered by the Compensation for Occupational Injuries and Diseases Act of 1993. However, there are many problems with the administration and other aspects of this Act, and the Occupational Diseases in Mines and Works Act of 1973. We hope to address some of these issues in the Journal early next year, as we have a few relevant papers in the pipeline.

Both injuries and noise-induced hearing loss remain two of the priority areas for the Mine Health and Safety Council, as seen in the updated health and safety milestones that were published in the May/June 2015 issue of the Journal, courtesy of the MMPA. Encouragingly, this steel company appears to be addressing the problem of noise. However, the report that fitting of hearing protection devices is a problem echoes previous findings by Mizan et al. published in this journal last year, from an audit of noise exposure levels and hearing conservation practices in eight major iron and steel companies.[1] We all know that personal protective equipment (PPE) is the last choice for preventing exposure to occupational hazards, and that control of exposure at source should be prioritised. However, PPE of all types continues to be used and it is essential that workers are trained correctly on the use of PPE, and are supplied with devices that fit properly.

We have several opinion pieces in this issue of the Journal, which are always welcome. They deal with very different issues: legislation and liability with regard to water quality, and the future of the National Institute for Occupational Health. The quality of our water is regularly a news item in the media. Encouragingly, Afriforum reported earlier this year that the quality of water in South Africa has improved since last year.[2] We await the legislation for the National Public Health Institutes of South Africa (NAPHISA) to be gazetted. In response to a question during the National Assembly in late 2014, the Minister of Health responded that "NAPHISA will comprise the two existing Institutes: NICD (National Institute for Communicable Disease) and the NCR (National Cancer Registry). Two additional institutes will be developed – the National Institute for Non-Communicable Diseases (NINCD) and the National Institute for Injury and Violence Prevention (NIIVP)."[3] There was no mention of the NIOH, the third of the trio of institutes that is currently still part of the NHLS (National Health Laboratory Service). Two opinion pieces discuss the potential implications of the omission of the NIOH from NAPHISA.

Meanwhile, research continues at the NIOH, and we are very pleased to be able to publish the abstracts from the 2015 Research Day. SAIOH set the precedent for this; please view this platform as an opportunity for disseminating your research findings. One of the presentations, by Jeanneth Manganyi and colleagues, brings us back to the issue of poor fitting PPE – respirators, in this case.

On a positive note, in August 2015, The Southern African Trust reported that there has been progress in the payment of financial compensation to ex-miners from the Compensation Commissioner for Occupational Diseases, with more to come: "…as of April 2015 the Medical Bureau of Occupational Diseases and Compensation Commission for Occupational Diseases committed to paying successful claimants within three months of them submitting claims."[4]

The MMPA held their Annual Congress last month, and judging from the report, it was a great success. SAIOH members have been busy strengthening their international collaborations, especially with the International Occupational Hygiene Association (IOHA). I wish SASOHN, SAIOH and SASOM well for their upcoming conferences, and hope to receive some papers from the presenters in the very near future.

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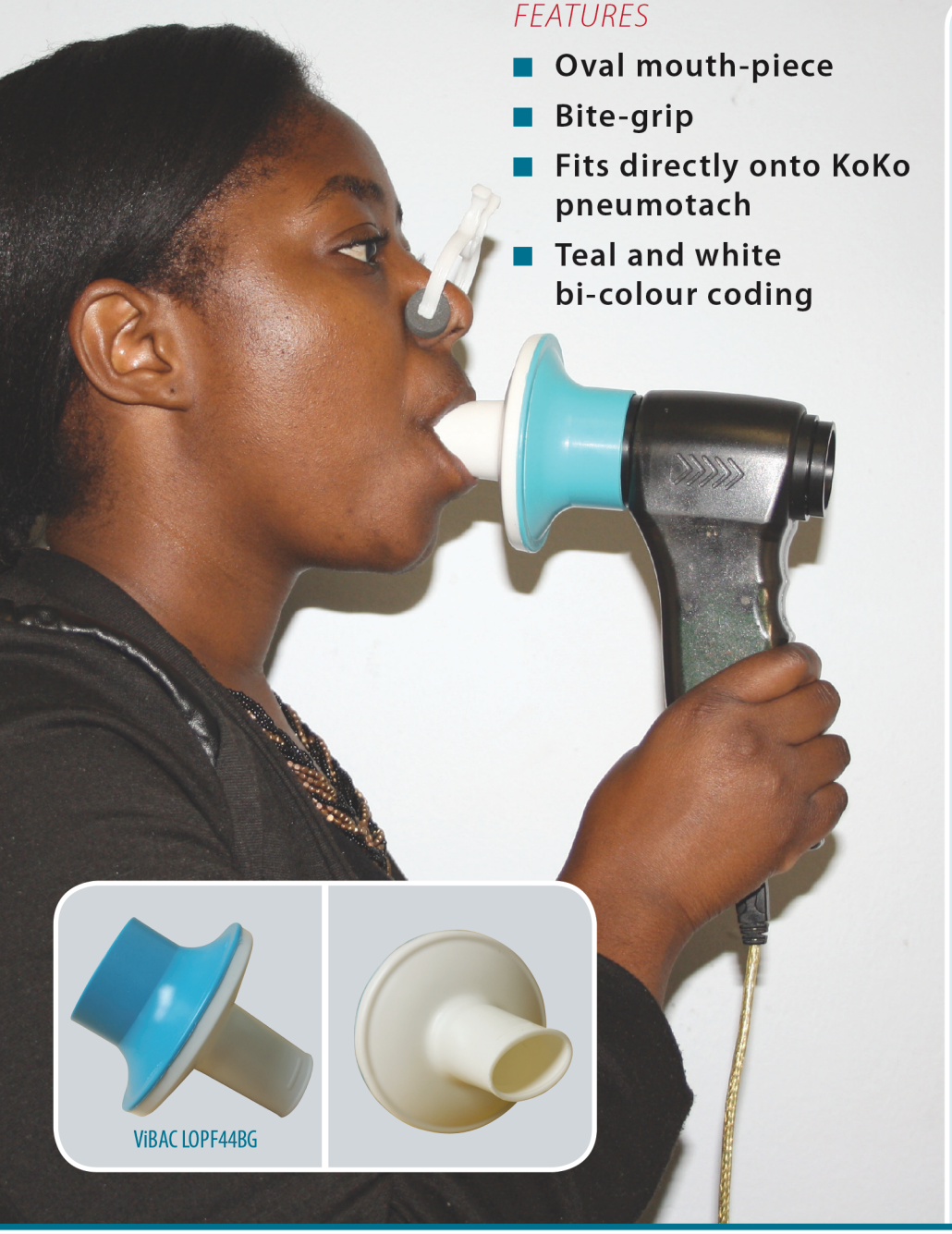

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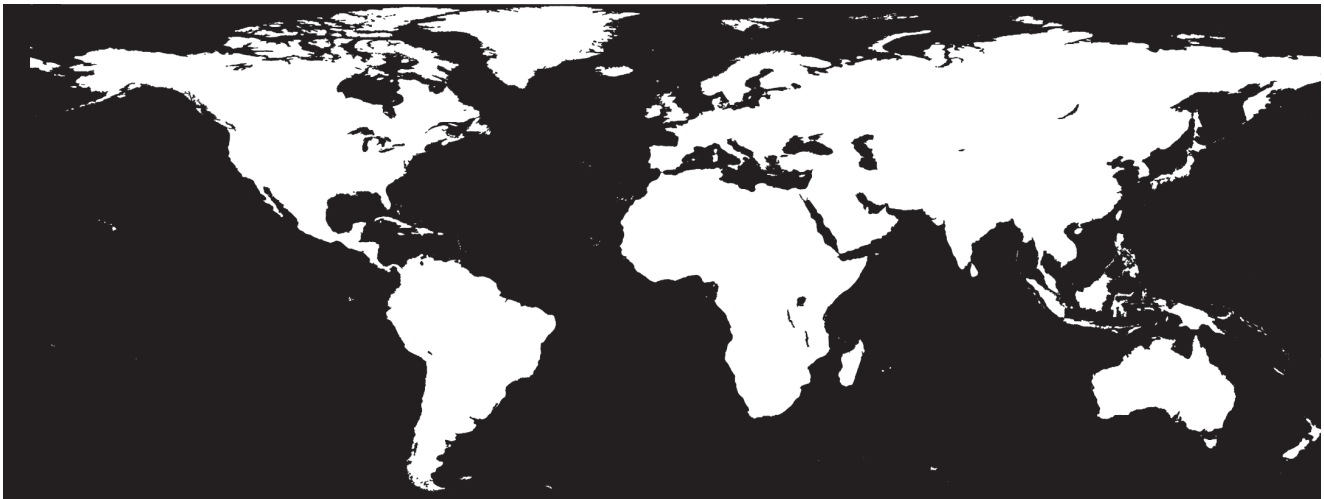
Upcoming events

LOCAL MEETINGS

DATE	MEETING	TOPIC	PLACE	MORE INFORMATION
10 Oct 2015	SASOM Namibia Branch meeting	AGM & Conference	Swakopmund Hotel, Swakopmund, Namibia	E-mail: info@sasom.org Website: www.sasom.org
15 Oct 2015	SASOM Northern Cape Branch meeting	AGM & academic programme	Red Sands Lodge, Kuruman	E-mail: info@sasom.org Website: www.sasom.org
17 Oct 2015	SASOM Akeso Clinics and SASOHN Workshop	Identification and management of the psychiatric patient	Akeso Clinic, Randburg	E-mail: info@sasom.org Website: www.sasom.org
17 Oct 2015	The SASOM Pretoria and SASOM Witwatersrand Branches meeting	AGM	Akeso Clinic, Randburg	E-mail: info@sasom.org Website: www.sasom.org
18–22 Oct 2015	7th International Nanotechnology Occupational & Environmental Health Conference	Nanotechnology, Occupational & Environmental Health	Legends Safari Lodge, Waterberg, Limpopo	E-mail: leigh@londocor.co.za Website: http://www.nanoeh2015.co.za
23 Oct 2015	SAIOH Oral assessments and PCB	Examinations and PCB	SAIOH Head Office, Randjesfontein, Johannesburg	E-Mail: info@saioh.co.za Website: http://www.saioh.org.za
28-30 Oct 2015	SAIOH Annual Conference	Into the Future with Occupational Hygiene: Harnessing Technology to Better Practice	Lagoon Beach Hotel, Cape Town	E-mail: conferencepapers@saioh.co.za Website: http://www.saioh.co.za/Conference2015.aspx
4-6 Nov 2015	SASOHN National Conference & AGM	"Be The Star of the Show"	Lagoon Beach Hotel, Cape Town	E-mail: sasohnoffice@mweb.co.za Website: www.sasohn.co.za/
5 Nov 2015	SAIOH KwaZulu-Natal Branch meeting	Branch meeting	Durban University of Technology	E-mail: info@saioh.co.za Website: http://www.saioh.org.za
8-11 Nov 2015	Developmental Origins of Health and Disease (DoHAD)	Combating the Transgenerational Risk of Non-Communicable Disease in Transitional Societies	ICC, Cape Town	E-mail: deidre.raubenheimer@uct.ac.za Website: www.dohad2015.org
12 Nov 2015	SAIOH Mpumalanga Branch meeting	Branch meeting	Secunda	E-mail: info@saioh.co.za Website: http://www.saioh.org.za
14 Nov 2015	MMPA Regional Academic Symposium	TBA	Rustenburg	E-mail: candiceu@mpas.org.za Website: http://www.mmpasa.org/wp/
20 Nov 2015	SASOM National AGM	AGM	Protea Hotel, Stellenbosch	E-mail: info@sasom.org Website: www.sasom.org
20 Nov 2015	SAIOH Council meeting	Council meeting	Anglo American Corporate office, Johannesburg	E-mail: info@saioh.co.za Website: http://www.saioh.co.za
3-5 Dec 2015	Bioethics Conference	Giving a Voice to African Thought in Medical Research Ethics	Phillip V Tobias Health Sciences Building, University of the Witwatersrand, Johannesburg	E-mail: africanvoice@earthfriendly.co.za Website: https://bioethicsresearchreview.tghn.org/community/blogs/post/988/2015/05/giving-a-voice-to-african-thought-in-medical-r/
8-9 Dec 2015	Science Forum: South Africa – 2015	Igniting Conversations about Science	CSIR International Convention Centre, Pretoria	Email: info@sfsa.co.za. Website: http://tracker1.co.za/weblink/5d43500e-6fc5-4b36-91ef-dbc991df4523.htm

Upcoming events



INTERNATIONAL MEETINGS

DATE	PLACE	MEETING	MORE INFORMATION
21-23 Oct 2015	Groningen, The Netherlands	USE2015 - Conference on Understanding Small Enterprises	E-mail: info@useconference.com Website: http://www.useconference.com
25-29 Oct 2015	Abu Dhabi, United Arab Emirates	2nd Annual BOHS Worker Health Protection Conference (WHPC 2015)	Email: conference@uae.messefrankfurt.com Website: http://www.whpc-me.com/2/home.aspx
2-4 Mar 2016	Beijing, China	2nd Conference on Occupational Medicine and Endemiology (COME 2016)	E-mail: medi_mar@engii.org Website: www.engii.org/conf/COME/2016Mar/
11-13 Apr 2016	Putrajaya, Malaysia	International Conference on Environmental and Occupational Health	E-mail: register.iceoh2016@gmail.com Website: http://www.iceoh2016.org/
13-15 Apr 2016	Suzhou, China	2016 International Conference on Environmental Pollution and Public Health (EPPH 2016)	Email: epph@engii.org Website: www.engii.org/epph2016/.
12-17 Jun 2016	Castellaneta Marina, Taranto, Italy	2nd International Conference on Atmospheric Dust	E-mail: dust@scientevents.com Website: http://www.scientevents.com/dust2016/
20-23 Jun 2016	Toronto, Canada	PREMUS 2016 – 9th International Scientific Conference on the Prevention of Work-Related Musculoskeletal Disorders	E-mail: cmoser@iwh.on.ca Website: http://premus2016.iwh.on.ca
5-7 Sep 2016	Barcelona, Spain	25th EPICOH Conference X2016	E-mail: epicoh2016@mondial-congress.com Website: www.epicoh2016.org
6-8 Sep 2016	Barcelona, Spain	8th International Conference on the Science of Exposure Assessment in Epidemiology and Practice	E-mail: epicoh2016@mondial-congress.com Website: www.epicoh2016.org

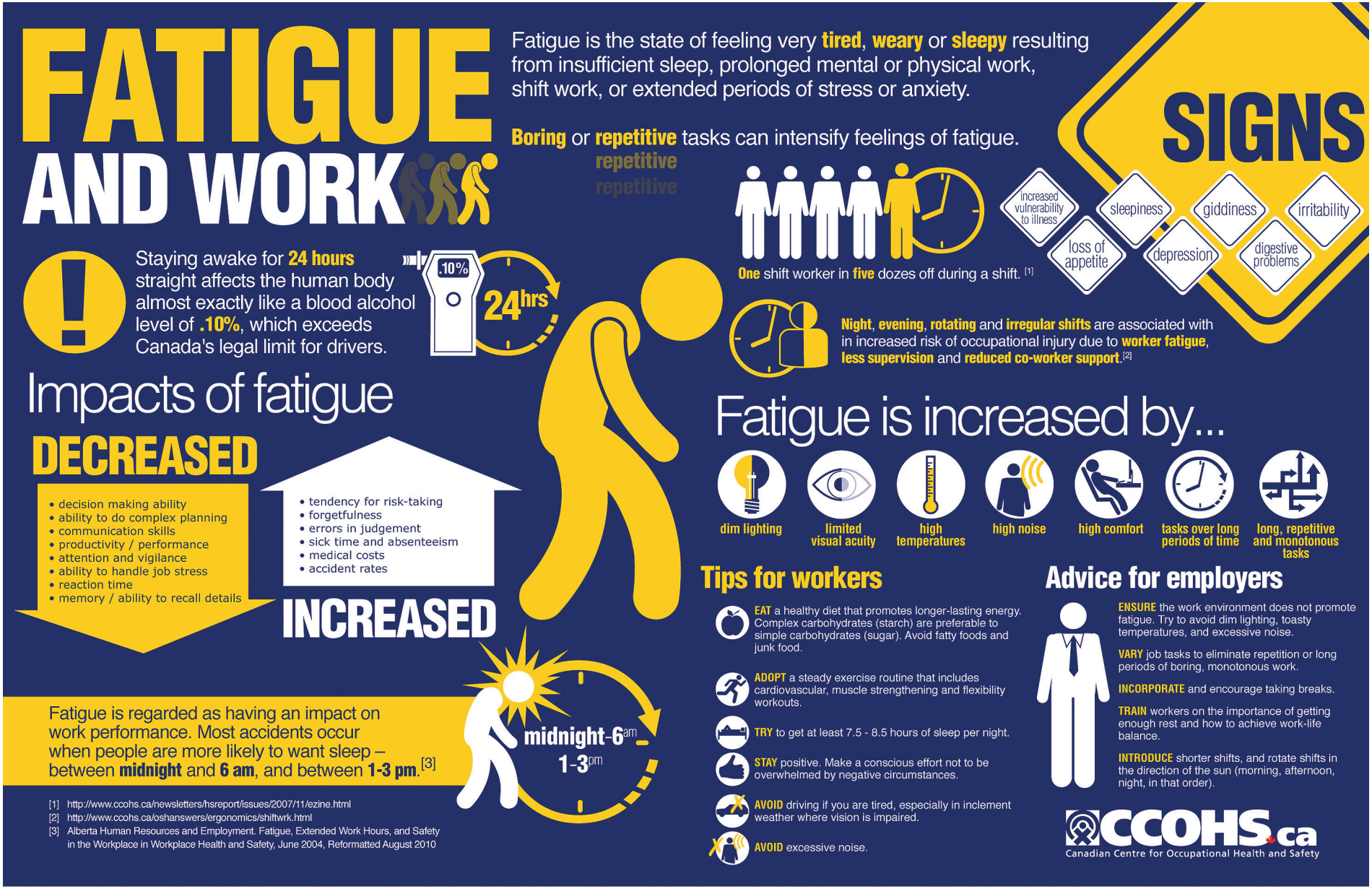
HEALTH AWARENESS DAYS, WEEKS AND MONTHS

NOVEMBER

2-6	SADC Malaria Week
14	World Diabetes Day
19	International Men's Day
25	International Day for the Elimination of Violence against Women
25 Nov - 10 Dec	16 Days of Activism for No Violence Against Women and Children

DECEMBER

1	World AIDS Day
3	International Day of Disabled Persons
10	International Human Rights Day



Source: Canadian Centre for Occupational Health and Safety (CCOHS) / Government of Canada; website: http://www.ccohs.ca/

Occupational injuries among workers in a welding company within Mangaung Metropolitan Municipality

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ABSTRACT

A questionnaire survey was conducted among 37 welders and 21 fitters (exposed group) and 30 office workers (unexposed group) employed by a welding company located in the Mangaung Metropolitan Municipality. The objective was to calculate and describe the prevalence of occupational injuries among these workers and to compare the frequencies of injuries. A total of 87 injuries were reported by workers. The most common injuries sustained were burns (n=29), cuts (n=24), eye injuries inflicted by foreign objects (n=19), electric shock (n=8), arc eyes (n=4), and bone fractures (n=3). Most occurred on the hands (n=57). More workers in the exposed group sustained injuries than in the unexposed group. It is necessary to implement safety measures in order to reduce the prevalence of injuries.

Keywords: **welders, fitters, work-related injuries, municipal workers**

INTRODUCTION

Occupational injuries result from accidents that occur during the course of work in various industries. An injury can occur anywhere on the human body due to excessive exposure to energy that exceeds physiological tolerance.[1] Occupational injuries are caused by two types of energy exposures, namely acute and chronic. Accident and injury are closely related terms and are often used synonymously although they are not synonyms.[2] Occupational injuries affect human integrity and entail high costs to the social security system of any country.[3] The economy is affected due to loss of productive hours, skilled manpower, money paid as compensation, and suffering to the injured persons and their families.[4] It is the responsibility of each country to plan, implement and control the occupational health and preventive measures, and safety policies. In South Africa, the statistics about occupational injuries are documented in the Compensation Commissioner's annual report in terms of the Compensation for Occupational Injuries and Diseases Act of 1993.[5] In 1993, a total of 242 424 occupational accidents were reported, representing an incident rate of 33.4 per 1000 workers covered by the compensation fund.[6] According to the occupational injury statistics for 1990, a high proportion of injuries were reported in Gauteng (32%), Western Cape (21%) and KwaZulu-Natal (19%). These provinces are mostly industrialised with injuries accounting for more than 70% of all reported cases of occupational injuries. More than 80% of injuries were reported in urban areas and most of the injured persons were male (> 80%).[6]

There were 217 680 occupational injuries reported for the year 2003/2004. Of these injuries, 29% occurred in the manufacturing industry, constituting the second highest prevalence in the country, following the transport sector.[7] The figures for 1993 showed that the most common body parts affected by the injuries were fingers (24%), legs (15%) and trunk (12%). The major cause of permanent disability was injuries to fingers that accounted for 57% of all cases.[6] The statistics provided for 2007 by the Federated Employers' Mutual Assurance Company Limited (FEMA), showed that the dominating causes of injuries were being struck by objects (44%), falls on different levels (14%) and striking against objects (10%).[8] The main causes of death were identified as motor-vehicle accidents (47%), being struck by objects (17%), and falls on to different levels (17%); and the nature of injuries sustained was superficial wounds (3%) and penetrating wounds (30%). The most common anatomical regions affected by the injuries were hands (24%), head and neck (19%) and legs (16%).[8]

The most common processes in the welding industry are metal inert gas (MIG) and tungsten inert gas (TIG) welding processes. The TIG welding process uses a non-consumable tungsten electrode while the MIG process uses a consumable wire electrode that produces an electric arc.[9] Welders wear full face and neck helmets with dark eye lenses to prevent exposure to ultraviolet light for both MIG and TIG welding methods. Protective long sleeve shirts, leather jackets and gloves are also worn to prevent exposure to ultraviolet light. The dark eye lenses also protect the eyes against foreign bodies.

A study conducted in Nigeria (2005) indicated that 85% of welders experienced at least one injury in the preceding year.[10] In a follow-up study[11], the number of injuries reported by 61 out of 208 welders was 105. In a study conducted in India, a high prevalence of injuries was reported among welders younger than 30 years. The study showed that these young welders had a five times higher risk of developing more than 10 injuries compared to welders older than 50 years.[12]

Occupational injuries are mostly common among workers in the welding industry and have a major impact on human integrity and

economic development. This study was conducted to calculate and describe the prevalence of occupational injuries and compare the injury frequencies among different workers in a welding company.

METHODS

A cross-sectional survey was conducted among workers in a heavy engineering CO_2 MIG welding company located in the Mangaung Metropolitan Municipality, Free State Province, South Africa. The study population consisted of full time permanent welders (n=37), fitters (n=21) and office workers (n=30). Welders and fitters work in two similar welding workshops and use the MIG welding method. At the time of the survey, in November 2011, there were 124 full-time employees working at the welding company. Workers were classified into exposed and unexposed groups. The exposed group comprised the welders and fitters, while the unexposed group comprised the office workers.

Permission was obtained from the management of the welding company before commencement of the study. Questionnaires were sent to all employees. The questionnaire included personal information such as age, gender, and marital and smoking status. In addition, work-related information was collected such as current position, years of employment and type of occupational injuries sustained during the three years prior to the survey.

Data were captured using Microsoft Excel 2007 and analysed using SAS Version 9.2. Chi square tests were used to test the differences between the exposed and unexposed workers in terms of the injury frequencies. The statistical significance level used was 95%. Frequencies and percentages were calculated.

The study was approved by the Ethics Committee of the University of the Free State (reference number 170/2011).

RESULTS

Questionnaires were sent to all 124 employees and only 88 responded, giving a response rate of 71%. Of the 88 participants that responded, 58 were from the exposed group and 30 were from the unexposed group. The demographic characteristics of the participants are shown in Table 1. The majority of participants were male (90% of the exposed group and 70% of the unexposed group). Most were aged 30-39 years, with a median age of 34 years. A high proportion was married (40% of the exposed group and 63% of the unexposed group).

Work-related characteristics of the participants are shown in Table 2. Forty-two percent and 24% of participants were welders and fitters, respectively; 34% were office workers. Most of the participants had worked for 1-10 years (67% of the exposed group and 60% of the unexposed group).

A comparison of the injury types in the exposed and unexposed groups is shown in Table 3. Seventy-eight percent of injuries were reported by the exposed group; 22% were reported by the unexposed group. The percentages of burn injuries in the exposed and unexposed groups were 35% and 26%, respectively ($p < 0.05$). Seventeen injuries caused by foreign bodies in the eyes were reported by the exposed group while the unexposed group reported only two such injuries ($p < 0.05$). Six percent and 21% of injuries related to electric shock were reported by the exposed and unexposed groups, respectively.

Table 1. Demographic characteristics of participants (N=88)

Variables	Exposed group n = 58		Unexposed group n = 30		p value*
	n	%	n	%	
Age (years)					
20-29	18	31.0	4	13.3	0.069
30-39	27	46.6	13	43.3	0.773
40-49	9	15.5	6	20.0	0.596
50-59	4	6.9	6	20.0	0.066
60-65	0	0	1	3.3	0.162
Gender					
Male	52	89.7	21	70.0	0.020
Female	6	10.4	9	30.0	0.020
Marital status					
Single	29	50.0	6	20.0	0.006
Married	23	39.7	19	63.3	0.035
Divorced	3	5.2	5	16.7	0.075
Living together	3	5.2	0	0	0.205
Smoking status					
Smokers	17	29.3	8	26.7	0.794
Non-smokers	41	70.7	22	73.3	0.794

*Chi square test

Table 2. Work experience and job categories of participants (N=88)

Variables	Exposed group n = 58		Unexposed group n = 30		p value*
	n	%	n	%	
Working experience (years)					
1-2	10	17.2	7	23.3	0.493
3-10	39	67.2	18	60.0	0.500
11-20	4	6.9	2	6.7	0.968
21-30	4	6.9	2	6.7	0.968
31-40	1	1.7	1	3.3	0.631
Job category					
Welders	37	42.0			
Fitters	21	23.9			
Office workers			30	34.1	

*Chi square test

Table 3. Types of occupational injuries (N=88)

Type of injury	Exposed group n = 58		Unexposed group n = 30		p value*
	n	%	n	%	
Cuts	18	26.5	6	31.6	0.270
Burns	24	35.3	5	26.3	0.019
Foreign objects in the eyes	17	25.0	2	10.5	0.014
Arc eyes	4	5.9	0	0	0.140
Electric shock	4	5.9	4	21.1	0.319
Bone fractures	1	1.5	2	10.5	0.225
Total	68		19		

*Chi square test

The results in Table 4 show the distribution of injury frequency by body location. Sixty-six percent of injuries were inflicted on the upper limbs and hands among the exposed group while 63% similar injuries were reported by the unexposed group. Thirty-one percent of injuries to the eyes were reported by the exposed group

Table 4. Injury frequency by body location (N=88)

Body location	Exposed group n = 58		Unexposed group n = 30		p value*
	n	%	n	%	
Upper limbs and hands	45	66.2	12	63.2	0.806
Bones	0	0	5	26.3	0.030
Eyes	21	30.9	2	10.5	0.075
Head	2	2.9	0	0	0.449
Total	68		19		

*Chi square test

and 11% by the unexposed group. Most of the injuries occurred among workers younger than 40 years (Table 5).

DISCUSSION

The majority of the injuries were reported by the exposed workers. Due to a small number of workers employed at the welding company and withdrawal of other participants, the sample size was limited. Welders and fitters are exposed to hazardous situations in the workplace that increase their chances of sustaining injuries. During welding, a high pressure or heat is applied in order to melt part of a large metal. Burns are more likely to occur among workers exposed to welding because of the amount of heat and pressure used in the process. The majority of participants in the exposed group sustained burns. Exposure to infrared radiation, also created by electric arc from welding, may heat the surface of the skin and underlying tissues, resulting in scarring thermal burns. In addition, exposure to ultraviolet radiation created by electric arc in the welding process can cause burns and damage the eyes, resulting in arc eyes. Welding sparks can cause eye injuries if protective equipment (face shield and safety glasses) are not worn during welding process or if workers use defective protective equipment.

The eye injuries reported in the present study may be due to poorly maintained protective equipment, lack of knowledge about the safe use of the protective equipment and/or an insufficient supply of protective equipment. The eye injuries may occur as a result of hammering associated with welding and flying metal chips. A study conducted in Port Harcourt, Nigeria, showed that flying metal chips were the main source of eye injuries among welders, accounting for 68.2% of all eye injuries, while arc rays accounted for 31.9% of all injuries.[13] A 2005 study by Lombardi et al.[14] showed that subjects sustained burns (22%) and foreign objects injuries in the eyes (72%). The prevalence of burns in the present study was higher (33.3%) than that reported in the 2005 study[14], while the prevalence of foreign objects injuries in the eyes was lower (21.8%). The study also indicated that workers who were non-welders often walked past the welding area, increasing their chances of sustaining flash burns to their eyes.[14] A fourfold increased risk of eye injuries among workers who were exposed to welding was reported in a study conducted in Hong Kong, China.[15]

Fall from heights (e.g. ladder, scaffold or fixed platforms) and contact with falling objects account for the prevalence of bone fractures and cuts reported by the participants. Welders and fitters lift objects and climb ladders and scaffolds during work, increasing their chances of falling and being struck by objects. A study[16] conducted in the cement industry by Iqbal et al. in 2010, indicated that workers sustained injuries by lifting objects (12%), falling (8%) and being struck by objects (11%).

The present study shows that the majority of injuries were sustained to the hands and fingers (67.8%). The reported injuries in the study by Iqbal et al[16] occurred on the arm (26.5%), finger (14%), and shoulder (7.8%). These findings differ from those reported in the present study.

Electric shock is common among workers who are exposed to welding, and might occur when a worker accidentally touches the welding electrode with bare hands. Workers might also get shocked when accidentally touching electric cables that are not insulated or when they come into contact with faulty electrical equipment. In the present study, electric shock injuries were common among the unexposed group. This could be due to a large number of faulty electrical appliances that they use frequently and also due to the fact that they do not wear insulating gloves to protect against electric shock. Lack of safety training about electricity may also contribute to the number of injuries reported by the unexposed group. The absence of occupational safety training, limited use of personal protective devices and prolonged hours of work were identified as the major contributing factors to the occurrence of injuries in a previous study.[17]

A study conducted in Mangalore city, Karnataka, showed that injuries were most common among younger age group workers and those without training.[18] It appeared as if some of the injuries reported in the present study might have been due to the use of equipment by untrained persons and non-compliance with safety regulations. Some of the injuries might be influenced by age and working experience of workers. Risky behaviour is influenced by age and working experience increases with age. The incidence of non-fatal accidents reported in the European Union (EU) was high among the youngest workers.[19]

Table 5. Distribution of injuries vs age groups among employees (N=88)

Age group (years)	Injuries (n = 87) Exposed group n = 58		Unexposed group n = 30		p value*
	n	%	n	%	
20-29	19	27.9	4	21.1	0.547
30-39	32	47.1	8	42.1	0.702
40-49	10	14.7	4	21.0	0.505
50-59	6	8.8	3	15.8	0.378
60-65	1	1.5	0	0	0.595
Total	68		19		

*Chi square test

CONCLUSION

Injuries among workers in the welding industry pose a major challenge and are a major health concern. This study provides valuable data. The incidence rate of occupational injuries in the welding industry needs immediate action. Implementation of occupational and safety programmes, provision of personal protective equipment and compliance with safety regulations are the principal remedial measures to prevent occupational injuries.

RECOMMENDATIONS

It is recommended that preventive measures to reduce occupational injuries should be developed and implemented in the workplace. Effective knowledge and technology about occupational risks should be enhanced and communicated to all workers

Photo courtesy of Goitsemang Keretetse

to enable them to apply safety measures necessary to prevent occupational injuries. Workers should be well-informed about the possible injury risks associated with their work. Information about preventive strategies should be provided to enable workers to make timely and informed risk management decisions. A variety of factors that contribute to workplace injury risk, including hazardous environmental conditions, economic issues, and social and workplace organisational factors should be identified, quantified and prioritised. These factors should be taken into consideration during the development and implementation of preventive measures to reduce occupational injuries.

Every employer should make provision for the maintenance of machinery and equipment. Employees should be trained about working procedures to enable them to perform their duties safely. Employees who are exposed to extremely hazardous working conditions should be provided with protective equipment such as face masks, helmets, safety boots and hand gloves to protect them from sustaining injuries.

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DECLARATION

The author declares no conflicts of interest.

LESSONS LEARNED

1. Workers younger than 40 years have a high risk of sustaining injuries and need to undergo safety training regularly
2. Injuries to the hands and upper limbs are common and require special attention to manage and prevent them
3. Welders and fitters should always use personnel protective equipment while on duty
4. Supervisors should ensure that personnel protective equipment is in good working condition

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Occupational noise-induced hearing loss prevalence and noise abatement techniques in a steel-making plant

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ABSTRACT

Background: **A high prevalence of noise-induced hearing loss (NIHL) is observed amongst employees in the steel manufacturing industry.**

Objective: **To determine the prevalence of NIHL and current noise abatement techniques implemented at a steel manufacturing plant.**

Methods: **Structured questionnaires were completed by permanent employees at a steel-manufacturing plant for the purpose of collecting information on occupational and medical histories, noise exposure in and outside the work environment, use of hearing protection devices (HPDs), and current noise abatement procedures. A walk-through survey was also conducted to observe implemented noise abatement techniques using the Noise Induced Hearing Loss Regulations of 2003 as a guideline.**

Results: **A total of 17.9% of workers suffered from NIHL (95% CI 11.8% - 22.5%). Administrative controls, lubrication and mufflers were identified by more than 70% of the respondents as control procedures most often implemented by the company. Most of the respondents (77%) used HPDs always and 97% indicated that they fit their HPDs at the beginning of the shift.**

Conclusion: **NIHL remains a significant health problem in this steel industry despite the implementation of noise abatement techniques and the implementation of a noise conservation programme with all the required elements.**

Keywords: **NIHL, noise control, steel industry**

INTRODUCTION

Noise exposure is a major occupational hazard. Noise-induced hearing loss (NIHL) is irreversible sensorineural hearing impairment caused by a combination of the type of noise (continuous or impact), exposure time, intensity and frequency.[1,2] The scientific literature suggests that exposure to excessive noise contributes to 37% of all adult cases of hearing loss and remains a significant contributor to employment morbidity internationally.[3] Research shows that chronic noise exposure also has significant non-auditory effects such as fatigue,[4] absenteeism,[5] psychological outcomes,[6] hypertension,[7,8] and cardiovascular effects.[9-11]

Occupational hearing loss continues to be among the 10 leading occupational diseases in both Canada and the United States. In the United States, about 11 million workers are exposed to hazardous noise in the work environment.[12] The National Institute for Occupational Safety and Health (NIOSH) estimates that more than 30 million workers (almost 1 in 10) are exposed to hazardous noise levels on the job.[13] In Sweden, about 9% of workers are continuously exposed to hazardous noise levels in the workplace, and approximately 100 million dollars are paid yearly in compensation.[1]

The impact of occupational NIHL is poorly studied in Africa.[14] Research conducted among steel rolling mill workers in Nigeria showed that they were not thoroughly informed about the hazards of NIHL and that they were not keen to use hearing protection devices (HPDs).[2] A recent study in South Africa indicated that there are shortcomings in the standard operating procedures for early detection of employees at risk for NIHL, and that hearing conservation techniques were not utilised properly in the iron and steel industry.[15]

Steel manufacturing is one of the noisiest industries.[16] The main noise sources include fume extraction systems, vacuum systems that utilise steam ejectors, electrical transformers, rolling mills, and ventilation fans. As a result, NIHL is one of the most commonly observed occupational health conditions in workers employed in the steel industry.[16]

The NIOSH has suggested that a more comprehensive set of elements be incorporated in hearing loss prevention programmes, including routine noise exposure assessment, engineering and administrative control of noise exposures

as the primary mechanism of reducing workers' exposure, usage of HPDs, and annual audiometric surveillance and evaluation (feedback on testing results and training on HPD fit and use).[13] In South Africa to date, there have been no broad-based efforts to assess the effectiveness of the approach as outlined in the NIHL Regulations (GN R307 in GG 24967 of 7 March 2003) to prevent hearing loss. It is important that the efficacy of hearing conservation programmes be reflected by the direction and extent of positive change in hearing loss of employees over time.[17]

The purpose of the study was to determine the prevalence of NIHL, obtain historical occupational hygiene noise survey data to determine the extent of noise exposure in the areas studied, and assess if required noise abatement techniques, as stipulated by the Noise Induced Hearing Loss Regulations, were implemented in a steel-manufacturing plant.

METHODS

This was a descriptive cross-sectional study, which included administration of a questionnaire, a walk-through survey to determine compliance with the recommended noise abatement approach and techniques as stipulated in the NIHL Regulations 2003, and anonymous collection of NIHL data from the on-site clinic of all participants. All permanent employees with base line audiograms were included in the study which took place from 30 June to 26 July 2011.

The structured questionnaire was based on South African National Standard 10083,[18] Noise Induced Hearing Loss Regulations GN R307 in GG 24967 of 7 March 2003,[19] and information obtained from peer-reviewed scientific literature. It consisted of 31 questions, including four from the steel-manufacturing company pertaining to maintenance and fitting of HPDs. The questionnaire covered demographic characteristics, employment history, self-perceived short noise exposure outside the work environment, subjective noise levels in the plant or work area where most work was performed, medical history, usage and maintenance of HPDs, and noise control procedures implemented by the company.

The questionnaires were distributed during a pre-shift meeting; some were given to the supervisors of each section to distribute to employees who were absent from the meeting. The questionnaire was explained to the employees and study participants signed an informed consent form before they completed it. Some of the employees took the questionnaires with them and were requested to return them to the supervisor within one week. Unique study numbers were assigned to study participants and were linked to employee numbers in order obtain audiogram records from the on-site clinic. Both numbers were recorded on the first page of the informed consent form attached to the questionnaire. The occupational health practitioner (OHP) detached the page with these numbers after providing the required NIHL information from the medical file.

Four hundred employees were given questionnaires, and 134 (33.5%) completed questionnaires were returned. The completed questionnaires were taken to the company's on-site clinic where the OHP identified whether the employee had presented with NIHL or not, from the medical records. The NIHL status of each employee was indicated at the back of the questionnaire.

Employees with a 5% shift from the baseline audiogram were classified to have NIHL, despite the fact that the NIHL Regulations state that a 10% shift from the baseline audiogram should be considered as NIHL. This approach was followed because, in this steel-manufacturing company, a 5% shift from the baseline audiogram indicated that actions to prevent further NIHL should be initiated. All audiometry tests were conducted according to SANS 10083, using the Everest audiometric testing program.

The collected data from the questionnaires were double entered into Epi-data and transferred to STATA 12. Descriptive statistics were used to report data as means, standard deviations and frequencies where appropriate. Proportions of people with NIHL were calculated using STATA 12.

Ethical approval (number 122/2010) for the study was obtained from the Research Ethics Committee of the Faculty of Health Sciences, University of Pretoria. Permission was also obtained from the steel-making plant to conduct the study.

RESULTS

Table 1 summarises the characteristics of the study participants. Of the respondents, 81.3% were male and 18.7% female. There were 67.2% employees in the age group 31-50 years. The majority of employees had tertiary education (55.3%) and more than a third (35.8%) had secondary education.

Table 1. Characteristics of study participants (N = 134)

Characteristic	n	%
NIHL		
Yes	24	17.9
No	110	82.1
Sex		
Male	109	81.3
Female	25	18.7
Age (years)		
21-30	29	21.6
31-40	46	34.3
41-50	44	32.9
51-60	15	11.2
Education level		
No schooling	5	3.7
Primary	7	5.2
Secondary	48	35.8
Tertiary	74	55.3

Noise-induced hearing loss

As shown in Table 1, 18% of the respondents (n = 24) had NIHL (95% CI 11.8% - 25.5%). The average no. of years employed for those with NIHL was 18, compared to six years for those without NIHL. Table 2 summarises the prevalence of NIHL stratified by sex and job categories. Operators and electricians had the highest prevalence rate in terms of NIHL (6% and 3%, respectively).

Three per cent of the respondents did not undergo a baseline-hearing test when they joined the company and 4.5% were not informed about their baseline audiogram results (Table 3). A total of 33% of the participants had no periodic audiograms.

Non-occupational noise exposures

Around one-third (37%) of the participants were exposed to loud music on a daily basis and 15.7% used earphones when listening to music; 41% claimed to drive their cars daily while windows were open, while 10.4% reported to be involved in shooting or hunting exercises at least once a month without wearing HPDs (see Supplementary Table 1 online).

Table 2. Prevalence of NIHL by sex and job category (N=134)

Variables	n	%
Sex		
Females	5	3.7
Males	19	14.2
Job category		
Artisans	2	1.5
Boilermakers	1	0.8
Coordinators	2	1.5
Electricians	4	3.0
Fitters	2	1.5
Human resources	1	0.8
Maintenance	2	1.5
Furnace Operators	9	6.0
Tappers	1	0.7

Table 3. Employees responding "Yes" to medical surveillance questions (N=134)

Variables	n	%
Exposed to noise at previous job	59	44.0
Entry medical examination	129	96.3
Baseline audiogram	130	97.0
Normal hearing status results	126	94.0
Results communicated	128	95.5
Subsequent audiogram(s)	90	67.2
Hearing test(s) conducted by an OHP	103	76.9
Hearing problem experience(s)	21	15.7
Threshold shift	75	56.0

Table 4. Usage of HPDs (N=134)

Variables	n	%
Frequency		
Always	103	76.9
Occasional	16	11.9
Seldom	3	2.2
Never	12	9.0
Type		
Earplugs	103	76.9
Earmuffs	16	11.9
Moulded	3	2.2
Other	12	9.0
Duration of use (hours)		
1	13	9.7
2	1	0.7
3	0	0.0
4	8	6.0
5	3	2.2
6	11	8.2
7	8	6.0
8	90	67.2
Fitting		
Beginning of the shift	130	97.0
No need to wear	4	3.0
Cleaning frequency		
Always	98	73.1
Once a week	33	24.6
Once a month	3	2.2

Control procedures

Administrative controls, lubrication and mufflers were identified by 78.2%, 75.0% and 73.9% of the respondents, respectively, as control procedures most often implemented by the company to reduce noise levels. Respondents also indicated that substitution (65.8%), sound absorbing materials (67.3%), and controls along the path (70%) were implemented within the plant. In this steel-making company, employees with NIHL were redeployed to other sections of the plant were noise levels were lower.

Medical histories

Only 12% reported to have suffered from measles, mumps and 8% from meningitis. Eight per cent occasionally experienced pain in their ears, while 7% had a family member who suffered from hearing loss (see Supplementary Table 2 online).

HPD fitting and hygiene

Most of the respondents (76.9%) used HPDs always and 97% indicated that they fit their HPDs at the beginning of the shift, and that fitting of their HPDs was being done according to the instructions on the pack or as taught at

the company (Table 4). More than half (56.7%) reported that their hearing improved within 12 hours after leaving the workplace. Only 24.6% of the respondents reported that they cleaned their HPDs once a week; 2.2% cleaned them once a month.

Area noise levels

The average noise levels reported for different sections during the occupational hygiene survey are shown in Table 5. The highest noise level of 91.0 dBA was reported for the electrical and mechanical workshop (M2). Noise levels in raw materials (M1) and crusher and furnace (M4 – PSP) sections were 1.7 and 2.6 dBA lower than those in the electrical and mechanical workshop, respectively. The reported noise level for the control and mixing section was more than 10 dBA lower than in the other plant sections.

Noise abatement

The noise abatement techniques observed during the walk-through survey are summarised in Table 5. The following controls were implemented in all sections: administrative controls, personal protective equipment (PPE), job rotation, and control along the path. Substitution was implemented in M2, and the control and mixing section (M3). Only elimination and acoustical enclosures were implemented in M3.

DISCUSSION

The results of this study and the occupational hygiene survey confirmed that noise was a significant occupational hazard in this steel-manufacturing plant despite continuous efforts by management to implement noise abatement techniques. Eighteen percent of employees who took part in this study had NIHL levels higher than 5% from the baseline. No peer review studies on the prevalence of NIHL in the steel and iron industry have been conducted in South Africa. However, the prevalence of NIHL in this study (18%) is comparable to the 16% of disabling hearing loss in adults that is attributed to occupational noise worldwide.[20] A higher prevalence (33.5%) of NIHL was observed in a study conducted in a Brazilian steel and iron industry than in this study.[21]

The level of education or the number of years attending school was positively associated with a decline in the risk of developing NIHL.[22] The reason for this might be that employees with higher literacy levels are able to read, follow instructions, and understand demarcations or signs pertaining to noise and its related health effects. However, despite high literacy levels in these workers, a significant number of them were affected by occupational noise. The

Table 5. Area noise levels measured during 2011 annual occupational hygiene survey and abatement techniques per plant section

Plant section	Noise rating level (L_{avg})	Job category	Abatement techniques
M1 (Raw materials)	89.3 dBA	Material controllers Artisans Apprentices Production workers Buyers Plant operators Accountants Human resource	Administrative controls PPE Job rotations Controls along the path
M2 (Electrical and mechanical workshop)	91.0 dBA	Electricians Boilermakers Artisans Apprentices Fitters	Administrative controls PPE Job rotations Controls along the path Substitution
M3 (Control and mixing plant)	77.0 dBA	Plant operators Engineers Coordinators	Administrative controls PPE Job rotations Controls along the path Substitution Elimination Acoustical enclosures or barriers
M4 – PSP (Crusher and furnace)	88.4 dBA	Furnace operators Crusher plant workers Fitters	Administrative controls PPE Job rotations Controls along the path

respondents might have interpreted tertiary education as any form of education, training or certificate received after leaving formal schooling, even if obtained at the workplace. Further studies need to be conducted to evaluate the role of education as a predictor for NIHL.

More males than females are employed in the steel-manufacturing industry due to the nature of the work that requires physical strength. In the steel production and manufacturing industries, the literature indicates that a heavier burden of NIHL is evident in males than females because more men are employed in jobs that require them to work in those areas of the steel-making industry where noise levels are high.[23] It was therefore not surprising that males had an almost four-fold higher prevalence of NIHL than females.

"The highest exposed employees were operators, electricians and fitters."

During the walk-through survey, it was observed that noise exposure level varied depending on job category and males were predominant in all the sections of the company. The noise levels reported in an annual occupational hygiene survey of 2011,[24] completed prior to this study, confirmed the observation. Average noise levels of three out of four plant sections exceeded the noise-rating limit of 85 dBA as stipulated in the NIHL Regulations. The highest exposed employees were operators, electricians and fitters. The prevalence of NIHL amongst these workers was also the highest and may be attributed to 8-hr equivalent noise exposure levels above the noise-rating limit.

Almost all the respondents claimed to have always worn HPDs when performing work that generated noise. This might have been a result of enforcement of health and safety procedures within the company. However, HPD usage information was self-reported, and this might have introduced reporting bias due to social desirability.[25] The most common explanation for inconsistent use of HPDs was discomfort and pain in the ears. Different types of HPDs should therefore be made available to cater for anatomical variations.[26]

Further support of incorrect use of HPDs was that 56.7% of respondents reported that their hearing improved within 12 hours after work. The improvement of hearing might be indicative that temporary loss of hearing after exposure to noise (temporary threshold shift) was present during the previous shift.

Medical surveillance

The NIHL Regulations of 2003, Regulation 8, requires that an employer should establish and maintain a system of medical surveillance for all employees. The medical surveillance should consist of a baseline audiogram, a periodic audiogram, and an exit audiogram test.[18] Periodic health examination should be mandatory for all workers, and a participation rate of nearly 100% should be expected for all workers exposed to noise levels above the noise-rating limit.[23] Three percent of the respondents did not undergo a hearing test when they joined the company. This suggests that there is a shortfall in the company's hearing conservation programme. A concern is that 4.5% of the respondents were not informed about their baseline audiogram results. This might affect employees' knowledge about their own hearing status and precautionary measures to be taken to prevent the development or exacerbation of NIHL. A further concern was that 33% of the participants did not have a subsequent periodic audiogram. In these cases, changes in hearing ability would not be detected at an early stage. With annual audiometric testing, it is possible to detect changes in hearing ability before the development of clinically significant hearing loss.[27] In Turkey, the proportion of employees that undergo annual hearing tests in the iron and steel industry is 19.7%. The proportion of employees without periodic audiometric testing at the study site was much lower than this, which might be an indication of the company's effort to implement or comply with the NIHL Regulations.[28]

Noise control procedures

The observations during the walk-through survey and feedback received from the majority of employees were proof of the company's effort to reduce occupational noise exposure of employees. Control measures were persistently applied; however, the effectiveness thereof must be evaluated regulary.[18] Engineering and administrative controls are the most effective control procedures against excessive noise exposure. Only if engineering and administrative controls are not reasonably practical, should the company implement the use of HPDs.[2] The desirable hierarchy of control measures implemented is evidence that the company applies the required control measures.

A concern is that some of the employees did not know which noise control procedures were implemented within the company. This may indicate that the induction programme did not cover the legislative requirements thoroughly in terms of noise control procedures. The importance of education programmes to prevent NIHL cannot be stressed enough. No employee can be expected to assist with the implementing and maintenance of noise control programmes if he or she does not know the control procedures and programmes that are implemented within the company.

Non-occupational noise exposures

Literature shows that non-occupational activities such as shooting exercises, powerboats, loud music, lawn mowers, and flying of private aircraft contribute to the total noise exposure of occupationally-exposed workers.[29] Research indicates that exposure to loud music leads to symptoms such as tinnitus and hearing loss and this may add to an individual's cumulative noise dose if encountered regularly.[30,31]

Neitzel et al.[31] characterised non-occupational exposures associated with sporadic activities, depending on the duration and magnitude of the noise. Different recreational activities may cause increased temporary threshold changes on hearing or may even cause NIHL if temporary threshold shift occurs before the next shift. Scientific studies have proven beyond reasonable doubt that recreational gun shooting produces sensory hearing loss by damaging hair cells in the cochlea if HPDs are not used.[32] Almost 11% of the respondents were involved in recreational gun shooting which might have had a negative impact on their hearing ability.

Non-occupational noise exposures have a high potential to add to the daily noise dose and to increase the risk of developing NIHL. Only 41% admitted to driving cars while widows were open. Noise levels while driving a convertible car or a car with open windows ranges from 82 to 92 decibels and may therefore contribute to the development of NIHL.[33] Eleven percent of the participants rode motorcycles without HPDs. Noise around the motorcycle helmet due to wind turbulence is 90 decibels at 60 km/h and increases linearly when plotted against the log of speed, to reach 110 decibels at 160 km/h.[34] To encourage behavioural changes, the company needs to institute education programmes pertaining to the duty of care of non-occupational noise exposure and its consequences. This may have a positive impact on the company's efforts to reduce the prevalence of NIHL.

Medical histories

Studies have shown that some infectious diseases, like measles and mumps, are associated with acute hearing loss,[35] and that these infections may negatively affect hearing ability with age or might cause gradual hearing loss that can remain unobserved for years. Twelve percent of the respondents had suffered from such diseases. Meningitis is a risk factor for hearing loss in childhood and this can be a progressive problem.[36] Only 7.5% of employees reported to have suffered from meningitis and are therefore more likely to develop NIHL in adulthood. The evidence that hearing loss can be hereditary[36] makes the 6.7% of the respondents with a family member that had suffered from hearing loss or deafness more susceptible to develop NIHL. Such a link and the possible impact thereof on a company's NIHL prevalence rate cannot be ignored. Ototoxic antibiotics account for about 3-4% of NIHL in adults.[37] Only 1.7% of workers were on antibiotics and a possible causal association between NIHL and antibiotics intake needs to be investigated further to establish if any causal associations exist for this study population.

Hygiene practices

Good hygiene practices, such as cleaning and storage of HPDs, are of utmost importance. Failure to clean HPDs regularly may cause ear infections and increase the possibility of hearing loss. Occupational health education should cover the importance of personal hygiene, and signs and symptoms of exposure to noise.[19]

> "Failure to clean HPDs regularly may cause ear infections and increase the possibility of hearing loss."

Limitations

The findings of this study were based on self-reported answers from questionnaires, which may lead to misclassification of disease and exposure status. For example, people with NIHL might have underestimated their non-occupational noise exposure activities. Data associated with alcohol intake, smoking, hypertension, and other potential confounders were not collected. The low response rate might have affected the internal validity of the study. Supervisory involvement during data collection might have influenced the attitude of employees to their general duty of self-care in terms of noise protection and reported prevalence since some questionnaires were given to the supervisors to distribute to the employees who were absent during the pre-shift meeting.

RECOMMENDATIONS

1. Collaborations between employees and management should be improved in order to curb the prevalence and the incidence of NIHL, i.e. proper use and maintenance, and reporting of failures of noise abatement techniques.
2. During the employee's medical entry examination, the medical history and non-occupational noise exposures should not be ignored because they might increase the risk of an employee developing NIHL.
3. Employees should be thoroughly trained in the correct use and time of fitting of HPDs.

CONCLUSION

The fact that one in five employees has NIHL may be indicative that some elements of the stipulated noise conservation

programme are not adhered to, or that non-occupational exposures might have contributed to the observed NIHL, or that the occupational hygiene survey reported noise levels were inaccurate. A holistic approach, i.e. medical management, occupational hygiene monitoring, and administrative and engineering control procedures, is required to effectively manage NIHL cases in steel-making plants.

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DECLARATION

The authors declare no conflicts of interest.

LESSONS LEARNED

- Adherence to all elements of the current stipulated noise hearing conservation programme is essential to increase effectiveness thereof
- NIHL research in the steel and iron industry in South Africa is often neglected
- Because periodic audiometric tests conducted by the company do not include all the employees, it might not be possible to detect changes in hearing ability before the development of clinically significant hearing loss, which might lead to an increased burden of NIHL in the company

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Criminal liability: negligence and environmental health

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ABSTRACT

Lack of compliance to effluent discharge standards in the waste water treatment industry lead to the discharge of poor quality effluents which cause increased levels of health risks in South Africa. No case law exists in South Africa to serve as precedent to enforce the criminal liability of individuals and water treatment entities. The author utilises the Bloemhof Municipality case study to illustrate the possible application of criminal action concerning the negligence in waste water treatment which, in turn, has been tested and instituted successfully in terms of environmental transgressions against both corporate structures and individuals in the mining industry. South African courts have to give consideration to the prospect of criminal action in the waste water treatment industry to deter sustained inadequate purification of raw water and inadequate treated effluent discharges in our water resources.

Keywords: **water pollution, effluent discharge, criminal negligence, water-borne diseases, waste water treatment plants**

BACKGROUND

In dealing with issues of occupational health and environmental management, the principle of "duty of care" is inseparable from the aspects of public health and public interest; even more so when dealing with issues of sanitation and water supply in both the public and private sectors. Water contamination through effluent discharge into our natural resources accounts for one of the biggest contributors to the contamination of our water resources.[1] Duty of care dictates that the functionaries of this essential service should apply due diligence in the completion of their mandate to their customers. Water service providers are mandated through section 24 of our Constitution to ensure non-pollution and to prevent the water sources being adversely affected, thus allowing for the containment of specific water-borne diseases and deaths. This is enforced through Section 83 of the National Health Act (61 of 2003) which mandates environmental health inspectors to investigate conditions constituting pollution detrimental to health; or those likely to cause or constitute a health nuisance.[2] Accountability in relation to the principle of duty of care and prosecution of non-compliance is, however, hindered in the waste water treatment industry by unnecessary administrative red tape, causing long delays and, in turn, deterring prosecution against state departments.

To date, no charges have been levied against wrong-doers in the waste water treatment sector to allow the National Prosecuting Authority (NPA) to investigate criminal sanctions against public water service providers and, inter alia, directors, managers and personnel in their personal capacities, who have contravened anti-pollution legislation.

This article cites important developments and applicable case law originating from the enforcement of anti-pollution aspects in the mining industry, which the author argues need to be duplicated in the water and sanitation industry to ensure adequate accountability of the water service providers, thus ensuring better health and safety standards within the sector.

Current indications reflect that the risk of water-borne diseases is constantly growing because of the non-compliance with laws regarding waste water treatment.[3] The risk in relation to water-borne diseases is confirmed through the cited Bloemhof case study and the outbreak of a typhoid epidemic in Delmas in 2005, caused by insufficient sanitation systems. The author indicates that current statistics pertaining to effluent treatment could suggest the possibility of further risk, noting the following indicators based on waste water treatment plants (WWTPs) in the Republic of South Africa. The current status quo dictates that our WWTPs require urgent attention or face a high risk of failure. Twenty percent of WWTPs are running in excess of their design capacity. Almost 90% are not compliant in relation to more than three effluent determinants, implying that these elements are discharged into our natural resources without being treated.[3] The previous Minister of Water Affairs, Edna Molewa, recently commented on the poor state of affairs of water infrastructure, describing it as a "mammoth problem" needing a "mammoth solution".[4]

The article first highlights the recent Bloemhof Municipality diarrhoeal disease outbreak to interpret the liability and the consequences thereof. Oversight

is then given in terms of current legislation and legal remedies to mitigate future occurrence thereof. These legalistic lessons applied in the mining environment are translated to the public sector to ensure stricter control of possible diseases associated with effluent discharges into natural resources. Lastly, the author motivates the use of the environmental criminal liability structure to allow for individual liability and the accountability of directors, managers, employees and contractors in the event of negligent effluent or waste water discharges desecrating the environment and allowing the imminent risk to public health.

"Water service providers are mandated through section 24 of our Constitution to ensure non-pollution and to prevent the water sources being adversely affected"

BIOLOGICAL DISEASES AND ENVIRONMENTAL HEALTH

On 2 June 2014, the National Institute for Communicable Diseases (NICD) released the following information:

"An outbreak of diarrhoeal disease in Bloemhof Municipality, North West Province, was reported during the week of 26 May 2014. Healthcare facilities in the area noticed an increase in the number of patients presenting with diarrhoea on Sunday 25 May 2014. On Monday 26 May 2014, numerous schools closed after more than 100 school children were ill with diarrhoea. Over 300 cases of diarrhoea were seen at healthcare facilities by Friday 30 May 2014, with 7 persons (mostly young children) requiring admission to hospital; the majority of cases were mild.

A total of three deaths have been reported since the outbreak began – all were young children <2 years of age with diarrhoea complicated by dehydration who presented late to healthcare facilities. Laboratory testing of stool samples has excluded cholera as the cause of the outbreak. Final results of stool sample testing for other bacteria, viruses and parasites that commonly cause outbreaks of diarrhoea are pending. Water samples have also been submitted for laboratory testing, and results are awaited. There have been recent problems with safe water quality and supply in the area, with reports of sewage spillage and possible water supply contamination." [5]

This begs the question of why the pollution caused by sewerage and water operators, i.e. local government, is pardoned from the strict compliance enforced on the mining and manufacturing industry through the National Water Act (NWA) and the National Environmental Management Act (NEMA). In terms of the Constitution, when litigating against local government structures, the process entails exhaustive intervention criteria and notice of intended litigation. This creates discourse in relation to the enforcement of environmental compliance when dealing with the state. Bosman and Boyd[6] also cite the differentiation and inequality in the treatment of local government in relation to the industry and believe that the preferential treatment extended towards local government causes legislative inconsistencies.

It is therefore contended that the process of protecting our water resources cannot be viewed in isolation, bearing reference only to the mining and fabrication industries. Sufficient oversight by environmental custodians also needs to be applied, giving criminal consideration to the different government sectors and individuals employed within the sector, e.g. local government, thereby emphasising the pivotal role local government is playing in relation to pollution and not protecting our water resources.

SOCIO-ECONOMIC CHALLENGES VS ENVIRONMENTAL HEALTH CONSIDERATIONS

The plight of outdated and inadequate water treatment plants is seen as a major contributing factor in the non-compliance of waste water management.[7] Addressing previously inadequate and obsolete infrastructure, aggravated by unskilled operators, could affect the progress made in terms of adequate sanitation facilities.[7] It was only after the election of the new democratic government that the ratio of access to proper water and sewerage was improved by addressing the needs of rural communities that suffered due to the selective principles of providing sanitation.[8]

It should, however, be noted that the dereliction of infrastructure is not a defence for negligence, and the aforementioned "duty of care" dictates that any responsible waste treatment official is required to prove that he/she took reasonable action to prevent the exposure of communities to harmful circumstances or situations.

GREEN DROP AWARDS 2012

In assessing the extent of the pollution caused by waste water treatment service providers, the Department of Water Affairs developed a programme called the Green Drop Awards in December 2008 to focus on the waste water treatment function specifically, thus monitoring the unauthorised discharge of effluent and the improvement of treated effluent discharge into our rivers.

Unfortunately, the last released report of the Green

Drop initiative was the 2012 report.[9] The key criteria assessed by the state included the status and trends of municipal waste water treatment and public treatment facilities of the Department of Public Works. The Green Drop initiative allowed the Department of Water Affairs to improve and monitor the actual progress in reducing the discharging of untreated effluent and risks associated with specific catchment areas.[10]

In the Green Drop assessment, a total of 156 municipalities were identified, providing waste water services from 821 treatment systems. In 2012, a total of 153 of the 821 treatment systems were identified as being of a critical risk in relation to design capacity, operational flow exceeding capacities, and non-compliance pertaining to the quality of effluent discharged, which creates risks to human health. A further 212 plants were identified as being of a high risk, representing 44% of the total national composition of waste water plants considered as being of a waste water risk with reference to the effluent treatment processes.[11] It is critical that solutions be sought to mitigate the public health risk associated with the pollution of water resources cited in terms of the Green Drop report. The lowest performing province, with 96.1% of all its plants within the critical risk category, was the Northern Cape.[12]

The critical status of a waste water treatment plant is assessed not only on its effluent treatment, but also on its capacity. Should the infrastructure or capacity of a treatment plant be overloaded, the incoming effluent is discharged without being treated due to the excessive incoming volumes, unless sufficient buffering facilities exist to protect the pollution of downstream water resources.

In some instances, the capacity and inflow of various waste water treatment plants are unknown thus, the possibility exists that the WWTPs could be severely overloaded which might result in untreated effluent discharges into our natural resources. Examples of this can be seen in the KwaZulu-Natal region where, in 10 of the 18 WWTPs, flow monitoring still needs to be initiated, and seven of the 18 are functioning within the high risk parameter reflected in the Green Drop report.[13]

Based on the findings of the 2012 Green Drop report, and compared to the findings of the 2011 Green Drop report, it can be confirmed that, irrespective of the overwhelming unrestrained non-compliance of WWTPs, the situation pertaining to non-compliance had worsened. Pollution through effluent discharge has not yet been properly regulated through legalistic processes and has, in the past, only been sanctioned through interdictory processes and legislative oversight, including intervention protocols and very limited class actions against the non-compliant authorities. Would additional remedies or strategies like "Command and Control Systems" not be better suited for WWTP non-compliance?[14]

LEGAL REMEDIES AND CASE LAW TO ADDRESS NEGLIGENCE ASSOCIATED WITH EFFLUENT DISCHARGE

To date, polluters such as various local authorities have only been exposed to interdictory processes, without any criminal litigation or pursuance thereof. Examples of interdicts served in the prohibition of our local authorities to discharge untreated effluent include the recent case of Save the Vaal[15] in which an interdict was successfully acquired against the Emfuleni Local Municipality to prohibit the discharge of untreated effluent into the Vaal River system due to its failing sanitation pumping system.[15]

INTERDICTS GRANTED AGAINST MUNICIPALITIES

Other actions include the granting of an interdict by the Grahamstown High Court against the Ndlambe Local Municipality[16] which discharged effluent into the Bushman's River. The founding affidavit sought interdictory remedy in terms of section 19(1) of the NWA[17] and section 28 of the NEMA.[18]

In *Agritrans CC and Another v Mafube Municipality*[19] the Bloemfontein High Court in the Orange Free State Provincial Division also held the accounting officer (municipal manager) in contempt, based on his failure to ensure the continued maintenance of effluent pumping systems.

CRIMINAL LIABILITY OF MUNICIPALITIES AND THEIR EMPLOYEES

Although recent developments indicated the court's willingness to apply schedule 3 under the NEMA, which allows for various offences of which directors or employees could be held personally liable for pollution and degradation of environmental resources, specific enforcement of similar schedule 3 transgressions of effluent discharges are yet to be enforced against operators and individuals in the Waste Water Treatment Sector under the NEMA. Bosman and Boyd confirm this statement in citing the aforementioned as legislative inconsistency with both the NEMA and the NWA criminalising non-compliance, but compliance is only enforced against corporate structures and not against local government structures. This being notwithstanding that both the NEMA and the NWA do not specifically exclude the state from compliance.[20] The general populist opinion still absolves local governments that discharge effluent into our natural resources, from any criminal liability.

This was the case prior to the Bloemhof water contamination crisis in which the Centre for Environmental

Rights directly questioned the possible dereliction of duties performed by the municipal manager and/or other parties. This raised the question in relation to the possibility of culpable homicide of three infants.

"Due to the growth of South Africa's population and our economic potential, our water resources are become increasingly strained."

On Monday 4 June 2014, the Centre for Environmental Rights requested the NPA to investigate possible criminal charges to be laid against the municipal manager, contractors and municipal officials involved.[21] The investigation would relate to the consideration of criminal charges against the municipal manager, for the first time allowing for the possible individual criminal liability of a municipal manager in terms of the NEMA.

The investigation requested was based on the following aspects:

1. Culpable homicide, in relation to the death of the three infants;
2. Contraventions of provisions of the NWA, 1998, particularly section 19, 20 and 151;
3. Contraventions of the Water Services Act, 1997, particularly section 82;
4. Contraventions of the NEMA, 1998, particularly section 28, 30 and 49A (e) and (f).[21]

The essence established under section 28 of the NEMA confirms the responsibility and prima facie liability of any person who unlawfully and intentionally, or through negligence, commits an act or omission which degrades the environment through pollution or detrimentally affects the environment in a significant nature. The importance thereof confirms the prospect of criminal charges, should the act or omission relate to a schedule 3 transgression of the NEMA. The principle applied to assess the municipal manager will therefore consider the "duty of care" applied by the manager to prevent or mitigate the harm to the environment. The principle also correlates with section 2 of the NEMA under which "duty of care" is one of the primary principles upon which the NEMA is based. Notwithstanding the principle being recognised by our legislation, this assessment is also enshrined in our common law principles and, more specifically, in *Rainbow Chicken Farm (Pty) Ltd v Mediterranean Woollen Mills (Pty) Ltd.*[22] which describes the duty of care as a specific duty entrusted to prevent harm against others.

Section 30 of the NEMA further focuses on the *control of emergency incidents* and defines the event as sudden or unexpected which will or can possibly cause serious damage to the environment. The section also elaborates on the meaning of the "responsible person" which, in the above circumstances, could envisage liability of the person who was responsible for the incident. Section 30 (3) further obligates the responsible person to take reasonable steps to notify the public should any risk be posed to public health and safety in general.

Liability in terms of the NEMA further obligates the responsible person to minimise or contain the associated risks in relation to public health and the environment. Thus, all possible and reasonable actions must be undertaken to limit the effects on health and safety in relation to the public.

Section 151 of the NWA could further contribute to the importance of local government officials' accountability, noting that sections 151 (i)* and (j)† are considered a schedule 3 offence under the NEMA which allows the application of section 34 which, in turn, allows for individuals to be criminally prosecuted in terms of the Act. Paragraphs (i) and (j) allow the omissions or acts of any person performed intentionally or negligently to be a prima facie criminal offence should a water source be polluted or detrimentally affected.

PERSONAL CRIMINAL LIABILITY FOR DIRECTORS, COMPANIES AND EMPLOYEES

Unfortunately, to date, no specific reference can be cited of personal liability in terms of effluent discharges into our natural water resources from poor waste water treatment operations, but several indications of possible criminal liability can be found in corporate structures' liability where either the directors or subsequent functionaries have been held accountable.

The first case bears reference to a mining company in the Ermelo District being cited for two contraventions in terms of the NEMA and a further contravention in relation to the NWA.[23] The charges focused specifically on the failed responsibilities of the company, directors, mine manager and environmental officers to adhere to environmental legislation. The Ermelo Regional Magistrate Court ruled to hold directors and individuals accountable under the aforementioned legislation as the NPA and legal representatives of the Golfview Mining (Pty) Ltd. Company settled in terms of a section 105A state plea agreement.[23] The

* "(i) unlawfully and intentionally or negligently commit any act or omission which pollutes or is likely to pollute a water source" – Section 151(i), National Water Act 36 of 1998

† "(j) unlawfully and intentionally or negligently commit any act or omission which detrimentally affects or is likely to affect a water source" – Section 151(j), National Water Act of 1998 Act 36 of 1998, Notice No. 1091 (Aug 26, 1998)

case constituted a landmark for environmental prosecution, signalling the first case in which the court sought to hold directors and individuals liable in their individual capacities. The sentence in relation to the transgression confirmed the payment of R3m to the Mpumalanga Province and a further R1m on non-compliance thereof in five years. In recognition of the prospect determined by the NEMA, allowing for rehabilitation of the affected environment, the company was instructed to contribute between R50m and R100m for rehabilitation.[23]

Another recent case confirming clear intent by the NPA to enforce the section 34 criminal sanctions was heard by the Nelspruit Regional Magistrate Court when Nkomati Anthracite (Pty) Ltd.[24] was concurrently prosecuted on four transgressions of both the NEMA and the NWA.

The above case law indicates the increasing possibility of "persons"‡, including local government sectors, being held accountable in terms of their failure to either prevent or mitigate the detrimental effects of spillages of effluent pollution into our water resources.

CONCLUSION

Due to the growth of South Africa's population and our economic potential, our water resources are become increasingly strained. South Africa is a water-scarce country and the time for procrastination has passed in relation to the protection of our water resources; conservation of all natural resources is becoming increasingly important.[25] Continued unrestrained effluent discharge into our natural resources could result in massive health risks, leaving us to account for a crisis that we ourselves have created.[25] We are not only exposed to the possibility of a sanitation threat, but also the reality of polluting the limited water resources in our water-scarce country. These facts could cause severe deterioration of public health should caution not be applied. Negligence in cases of effluent discharges could be resolved through similar provisions as utilised in ensuring compliance in the industrial and mining sectors which allows for foreseeable criminal sanctions against both corporate structure and individuals that hide behind the corporate veil. However, the applicability or feasibility of the legislation and case law utilised in the mining sector needs to be tested when dealing with effluent discharge transgressions in the field of WWTPs. Good governance should require reasonable caution in protecting our resources.

DECLARATION

The author declares that, to the best of his knowledge, no conflict of interest is present in terms of the aforementioned work.

‡ Definition of "person" - Section 1, National Water Act 36 of 1998

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Point-of-care testing: Is it ready for prime time?

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Clinical laboratories offering a consultative service have, over the years, seen an increase in calls related to point-of-care (POC) devices and the results they produce. These range from simple urinary dipsticks and pregnancy test kits, to the interpretation of results produced by the different drugs of abuse test kits. This mini review will discuss the advantages and concerns surrounding point-of-care testing (POCT).

POCT refers to any testing performed outside the traditional, core or central laboratory. It is one of the fastest growing aspects of clinical laboratory testing, estimated to be increasing by at least 10-12% per year overall and upwards to 30% per year in some testing areas.[1] With evolving technology and overall improvements, there has been an increased demand for the use of POCT. Whilst viewed as a testing modality similar to the traditional laboratory, it is vitally important that it also meets all the quality requirements necessary for patient management.

POCT has the potential to provide faster test results and realize therapeutic interventions with improved patient outcomes. However, when used inappropriately, it can produce misleading results and can lead to an increase in healthcare costs. In view of the different settings associated with POCT testing, including hospital patient care units, physician private rooms, occupational industry, and the homes of patients, processing and testing in most cases is carried out by non-laboratory personnel. This is in contrast to the central traditional laboratory where testing requires well-established quality assurance procedures. In order to fully understand these concepts, Table 1 summarises the differences between the central laboratory and POCT.

POCT ranges from held-hand devices (e.g. glucose meters) to small bench top analysers. With improvements in technology and test menus, the last few years have seen a shift of testing from the routine laboratory to the bedside of the patient. Whilst proponents of POCT point to clinical and economic justification regarding its use, concerns have been raised regarding the quality assurance of POC results.[2] POC tests and platforms fall under 'waived tests'. These tests are not subjected to the strict regulatory requirements (personnel, quality control, proficiency testing, other quality assurance) to which a moderate-complexity laboratory is subjected. All that is required for most waived tests is that the manufacturer's instructions be followed. Even though manufacturers have addressed many concerns surrounding the quality assurance of testing, instrumental and procedure-related causes of result inaccuracies have been identified in all three phases of the testing process.[3] Although information is sparse regarding POCT errors, it is estimated, from findings of the clinical laboratory, that approximately 90% of the quality-related issues are associated with the pre and post-analytical phases of testing.[3]

Quality processes require that an operator understand the importance of obtaining the correct result on the right patient. This requires sufficient time to be spent on quality procedures encompassing all phases of testing. Whilst quality processes are important in the production of test results, a key component that is often neglected is the appropriate selection of the POC device/platform.

With the introduction of POC devices, e.g. glucose meters, there has been an ongoing, competition-driven development in both meter and strip technology which has allowed for greater accuracy and reliability of results. However, despite the advances in technology, there is significant variation among these monitoring devices, making it very necessary that POC devices undergo validation studies, and that criteria be met in terms of the precision and bias before implementation into clinical use.[4]

The selection of a POC device is discussed extensively in the literature, and cannot be covered in this review. Some important prerequisites regarding placement include:[3]

- Does the POC device meet the criteria for its intended use?
- Does it meet the accuracy and precision requirements for the specific test?

Table 1. Differences between the central laboratory and POCT

Central laboratory	POCT
Most laboratories in SA are SANAS-accredited; and comply with good practice guidelines and quality assurance procedures to achieve high levels of accuracy and precision.	Tests are minimally invasive; require small volumes of blood from fingerpick, with minimal sample preparation. Achieves quick turnaround times and therefore therapeutic intervention.
Tests are performed by certified healthcare professionals. All results are verified and interpreted accordingly.	Testing is operator-dependent. Proper training and competency certification are necessary for reliable results.
Laboratory results are electronically transferred into patients' medical records using the laboratory information system.	Many POC devices have adopted connectivity, enabling electronic transmission of results; however, this is not yet achieved on all platforms and devices.
Large volume laboratories lead to lower cost/test.	Cost effectiveness must be determined as POCT can be generally more expensive; however, this must be weighed against the overall benefits. Overall health costs can be reduced with fewer hospital admissions and length of hospital stays.

Table 2. Physiological and pre-analytical variables that affect result interpretation

Influence	Outcome
Fasting status	Fasting is not required for Total and HDL cholesterol levels; however, 12 hours of fasting is required for accurate triglyceride levels.[5]
Glucose	It must be noted that whole blood glucose levels are 10 -15% lower than plasma/serum levels.[4]
Illness	Cholesterol levels are lower during illness, stress and following a myocardial infarction. Testing should be delayed in these cases.[5]
Therapeutic drugs	Common drugs that elevate cholesterol include B-blockers, steroids, vitamin D and contraceptives.[5]
Over the counter drugs (OTC)	The false positive test result associated with over-the-counter (OTC) medication and drugs of abuse testing is a very common finding and must be clearly understood by users.
Poor sampling	Blood should be free flowing from a fingerpick. Excessive squeezing causes haemodilution or haemoconcentration, leading to poor results.[5]
Reagent storage	Failure in reading package inserts. Extreme temperatures, humidity and sensitivity to light may affect reagent kits/strips/cassettes.[3]
Use of expired reagent strips	A common error seen with urine dipsticks and pregnancy test strips.[3]
Failure in recognising manufacturer's instructions	These include improper timing of test (e.g. reading a dipstick result), and failure in recognising interferences of the specific POC device.
Contamination of urine jars	This leads to carry over or dilution and can affect the sensitivity and specificity of the test.
Quality control	Failure in running control samples and/or in recognising warning signs of technical failure.

- Is the level of staffing and training adequate for optimal results?
- Was an evaluation regarding the cost-effectiveness of the POC device/platform performed?

It is important that users fully understand the impact of the various physiological and pre-analytical factors associated with testing (Table 2). The adoption of standard operating procedures (SOPs) and policies that specify requirements for testing (personnel, annual competency records, proper reagent and quality control material handling, device maintenance, and specimen handling) will instill confidence and lead to quality results.

CONCLUSION

During the past decade, in the field of POCT, the test menus have expanded, consolidated platforms have been introduced, analytical technologies have improved, and devices have become easier to use. It is important that POCT be embraced; however, users must be mindful of the primary objective of testing which is the production of quality, reliable results. It is therefore important that the clinical laboratory, with its sound background in "quality", be consulted prior to the purchase and implementation of POCT.

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NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH
Division of the National Health Laboratory Service

Introduction: Nurturing a culture of sustainable prevention in OHS through research

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The world of work is forever changing and so are the occupational health and safety (OHS) challenges that workers and employers face on a daily basis, in both the formal and the informal economies. We know the burden of occupational diseases and injuries in South Africa is immense, but we have, as yet, not quantified that burden or calculated the cost to our country and to our people. International best practice, as well as our own extensive experience in OHS, has shown that the vast majority of occupational injuries and diseases are preventable.

The Sustainable Development Goals (SDGs), which replaced the Millennium Development Goals (MDGs) have been published and the United Nations (UN) will convene a summit to adopt these goals as the post-2015 development agenda. Of great importance for the world of work is that decent work is one of the goals, and there are important synergies with other goals such as health, youth employment, gender equity and sustainable economies.

The cumulative scientific knowledge of our common humanity should be utilised to make it possible for all women and men to maximally benefit, including their health and safety at workplaces. Similarly, the creation of new knowledge through research is of paramount importance to inform and support preventive interventions at workplaces. Research that is reliable and has scientific rigour also provides all important information for policy development and policy coherence in OHS for different government departments. In addition, research findings inform teaching and training for all role players in the world of work in both the formal and the informal economies. Research is of paramount importance to determine the burden of occupational diseases and injuries and to help inform a focus on prevention rather than merely applying for compensation once workers are sick or injured.

It is my fervent hope that we can find the common ground at workplaces amongst all the role players and that we can build on the strength of each individual to bring greater unity of purpose to have economically sustainable, healthy and safe workplaces.

We acknowledge and celebrate the NIOH researchers and their supervisors and mentors for the enormous amount of work and dedication that made these research presentations possible. It is our belief that the creation and optimal utilisation of new knowledge through research provide excellent opportunities to make a significant positive impact on OHS in the world of work.

Acknowledgements

We wish to acknowledge the support of Ms Joyce Mogale, CEO of NHLS and NIOH, for her support for inclusive research and we salute the NIOH choir for their beautiful rendition of different songs from Africa.

The implementation and evaluation of a health information system in a health laboratory service

Presenter: Mr David Jones
Section: Safety, Health and Environment
Authors: D Jones, K Wilson, M Morgan, B Kistnasamy, L Darwin, P Adu, A Yassi, J Spiegel

Introduction: OHASIS is software which collects a range of workplace health and safety information including incident reporting and investigation, employee health and hazardous waste tracking. OHASIS was developed by the Global Health Research Program at the University of British Columbia, Vancouver, Canada. In July 2011 OHASIS was installed at the National Health Laboratory Service (NHLS). At that time the NHLS employed in excess of 7100 employees in 349

pathology laboratories; there are also three national institutes.
Objectives: To assess the feasibility and perceived benefit of introducing OHASIS in the NHLS.
Methods: A 15% stratified random sample was selected based on occupational categories. The sample was evaluated to ensure representivity of gender and laboratory size. An online questionnaire was sent to the selected participants in February 2013. A second survey was done two years after the first and also following the widespread online rollout of OHASIS.
Results: Results focused on knowledge of health and safety resources in place, training needs identified, levels of awareness of workplace hazards and levels of compliance with controls in place in the laboratories. Improvements were reported in those who have been trained on various topics where training is done in house, including knowing how to report an injury. Knowledge of hazard identification processes had improved significantly as had ease of accessing information from management following a reported incident. Significant increases in a number of respondents who indicated compliance with control measures were also noted including reporting of problems, supervision, use of eye protection and respirators.
Discussion: The pre-intervention survey results informed the widespread implementation of an online OHASIS. The survey information has identified health and safety needs and practices in the organization. Building on these insights, a revision to the information system modules and reports has been undertaken.

Occupations and breast cancer in women treated at a tertiary hospital in Johannesburg

Presenter: Dr Spo Kgalamono
Section: Occupational Medicine
Author: Dr Odette Abrahams

Introduction: Breast cancer is one of the commonest forms of malignancy in women in South Africa. Many occupational carcinogens to the breast have been described and other unidentified synthetic chemicals used in workplaces may also be breast carcinogens. Additionally, shift work that disrupts circadian rhythm probably causes breast cancer.
Objectives: The aims of the study were to identify occupations associated with an increased risk of breast cancer in black South African women, and to specifically assess if there is an association between shift work and breast cancer in these women.
Methods: This was an unmatched case-control study using secondary data from the existing Johannesburg Cancer Case Control Study (JCCS) database. All women patients recruited from 1 January 2001 to 31 December 2009 were included in the analysis, resulting in 1 903 cases and 3 990 controls. An expert group estimated the likelihood of occupational shift work for occupational groups present in the JCCS database. ORs were estimated using logistic regression. Those who had never worked were the reference category for occupations and those with a low likelihood of shift work for shift work.
Results: Following adjustments for possible confounders, no statistically significant ORs were found between specific occupations and breast cancer. Manufacturing had the highest OR (1.44, 95% CI: 0.42- 4.94), followed by office workers (OR 1.44 95% CI: 0.31-5.94) and health workers (OR 1.31, 95% CI: 0.36-4.76). After adjusting for confounders, the OR for women who possibly did shift work was 2.18 (95% CI: 1.34-3.56) and for those with a high likelihood of shift work the OR was 2.13 (95% CI: 1.26-3.61).
Discussion: No convincing associations between type of occupation and breast cancer were identified. Despite limitations in measuring shift work a strong association between this risk factor and breast cancer was found.

OECD sponsorship programme for the testing of manufactured nanomaterials: the South African contribution

Presenter: Ms Melissa Vetten
Section: Toxicology & Biochemistry
Authors: M Vetten, M Gulumian

Introduction: The safety of manufactured nanomaterials is an important concern throughout the world in order to ensure that the impact on human health is fully understood.
Objectives: The OECD's Working Party on Manufactured Nanomaterials (WPMN) launched a Sponsorship Program in 2007 to ensure that tests used to address safety with manufactured nanomaterials are consistent and validated.
Methods: The WPMN selected a priority list of 11 Manufactured Nanomaterials for testing based on materials which are in, or close to commercial use. South Africa successfully proposed the inclusion of gold nanoparticles to be included in their representative list.
Results: 14 nm citrate stabilised gold nanoparticles were thoroughly tested based on the OECD guidelines. The physical-chemical properties of the nanoparticles were thoroughly characterised. Environmental fate and toxicity was assessed, as was mammalian toxicity through both in vitro and in vivo testing.
Discussion: This testing programme was a first of its kind collaboration between government, industry and academia in the generation of testing dossiers that can be used in the future to address safety concerns of manufactured nanomaterials.

Immunohistochemical screening for epidermal growth factor receptor (EGFR) and anaplastic lymphoma kinase (ALK) mutations in lung adenocarcinoma in South Africa

Presenter: Dr Naseema Vorajee
Section: Pathology
Authors: N Vorajee, J Murray, J Phillips

Introduction: Lung cancer is the most common cause of cancer related deaths. The poor survival of lung cancer patients is attributable to late presentation which may preclude surgery based therapy. There are several types of lung cancer with squamous cell carcinoma (SCC) and adenocarcinomas (AC) of the lung being the most common. There has been a shift in trend from predominantly SCC to AC in smokers. Recent advances in therapy have shown that patients with lung AC and EGFR or ALK mutations may be amenable to treatment with new, chemotherapy agents that target cells with these mutations.
Objectives: To determine the frequency of EGFR and ALK mutations in lung AC using surgical biopsies from the NIOH archives. To identify the demographic characteristics of patients with lung AC and EGFR or ALK mutations. To identify morphological patterns of lung AC with EGFR or ALK mutations.
Methods: All lung biopsies received for diagnosis at the NIOH from 2008 to 2014 were reviewed and all cases of lung AC were included in the study.

Using appropriate positive and negative controls, immunohistochemistry was performed on representative sections of lung AC using Roche antibodies for EGFR mutation (SP111 and SP125) and ALK fusion protein (D5F3).
Results: Preliminary analyses of the results suggest that EGFR and ALK mutations are present in the South African population. These will have to be validated with established molecular techniques to confirm the mutations.
Discussion: Immunohistochemistry is an acceptable and relatively easy technique for identifying mutations in lung AC. There are targeted therapy options for patients with lung AC and EGFR or ALK mutations. The NIOH is a national referral centre for lung disease and needs to be able to identify mutations in lung AC to assist physicians to treat their patients.

Lung cancer risk attributable to occupation: in a case control study in black South Africans 2001-2008

Presenter: Mr Cornelius Nattey
Section: Epidemiology
Authors: D Kielkowski, M Urban

Introduction: Lung cancer is the 4th most common malignancy in South Africa. Although smoking is a well established risk factor, the role of occupational exposures in the local setting is not clear.
Objective: To estimate the lung cancer risk associated with common South African occupations.
Methods: Data from the Johannesburg Cancer Case-Control Study (JCCCS) on black cancer patients from 2001-2008 were used. Information from 579 lung cancer cases and 1120 frequency matched controls were analysed. Controls were randomly selected from cancers thought not to be associated with the effects of tobacco matched by sex and age (±5years). Occupation or workplace was used as an indicator of occupational exposure. Odds ratios (OR) and 95% confidence intervals (CI) were estimated using unconditional logistic regression; ORs were adjusted for smoking, HIV status and domestic fuel use. Attributable fraction (AF) was estimated using Miettinen's formula.
Results: The mean ages of cases and controls were 56.0 and 57.1 years respectively. Among men the adjusted OR for lung cancer was 3.0 (95% CI 1.1-4.5) in miners. Working in the transport industry was also associated with an increased risk of lung cancer: the OR was 1.7 (95% CI 1.1-3.5). In women, working in the food and beverage industry was associated with increased risk of lung cancer with an adjusted OR of 7.3 (95% CI 1.1-43.3). Domestic work was also associated with an increased risk of lung cancer: the OR was 4.9 (95% CI 1.0-9.3). Occupation resulted in an AF of 13% in men and 46% in women.
Discussion: A number of occupations had elevated ORs for lung cancer. The high ORs in domestic workers is a notable finding. Specific risk factors need to be identified in these occupations. The study was limited to subjects treated in Johannesburg and hence may not be generalisable to the rest of the country.

Linkage of human resource records and tuberculosis registry to assess the risk of occupational TB in resource limited healthcare setting

Presenter: Mr Molebogeng Malotle
Section: HIV TB
Authors: M Zungu, L O'Hara, A Yassi, M Malotle, L Darwin, S Barker

Introduction: Healthcare workers (HCWs) are known to have an increased risk of tuberculosis (TB) due to occupational exposure. Current measures for determining TB incidence in HCWs are less than satisfactory, as there are no databases with information on both confirmed TB diagnosis and employment in the health sector.
Objectives: To assesses the feasibility of developing a healthcare

workers' tuberculosis registry using South African human resource records and a provincial tuberculosis registry.

Methods: A probabilistic record linkage of the human resource records and the Gauteng provincial TB registry was performed to estimate the probability that a human resource record and TB registry record refers to the same person. The record linkage used Microsoft SQL Server 2008 using a custom application. Ethical approval was granted by the provincial government and ethics boards of the Universities of Pretoria and British Columbia.

Results: The authors linked the human resource records and provincial TB registry for the period 2009-2012. There were 59 808 human resources records and 239 611 entries in the provincial TB registry. The human resources records were fairly complete, while the provincial TB registry had 84 928 records missing some birthdates. After the initial linkage, the newly created database had 32 915 records. These were then further evaluated using linkage quality scores and manual matching decision rules to produce a final database with 1 137 records.

Discussion: Probabilistic record linkage of human resource records and a provincial TB registry is a feasible method for creating a single reliable database assessing risk of occupational tuberculosis in HCW.

Determination of viable airborne *Mycobacteria tuberculosis* cells

Presenter: Ms Olga Kgasha
Section: Immunology & Microbiology
Authors: O Kgasha, T Singh

Introduction: Overcrowded and poorly ventilated areas increase the risk of contracting airborne infections. *Mycobacterium tuberculosis* (MTB) can remain airborne for several hours after the procedure has ended or infectious source has left the area. MTB can live up to several months and even years outside the human body therefore assessing viability of such organisms is important to understand its survival and potential risk of exposure.

Objectives: Evaluate the use of qPCR-PMA for the detection and determination of viable MTB in environmental samples and to validate qPCR-PMA for application in indoor air assessments.

Methods: Five air samples of known concentration ($1x10^6$ of MTB H37Ra 25177 strain) were collected on five consecutive days in a simulated test room. The samples were analysed using the quantitative PCR combined with propidium monoazide (PMA) and a comparative assay (Baclight assay). Different concentrations of the PMA dye was used at differing light intensities to optimise the qPCR-PMA method. The Baclight assay was used with BH-2 fluorescence microscopy to differentiate between viable and non-viable cells.

Results: The light sources used ranged from 70W-650W with the higher intensity (150-650W) affecting the dye penetration through the cells thus increasing the number of dead cells. Comparable results were obtained when using 50uM PMA dye and the low intensity light source (70-105W). PMA dye activation using the 70W light showed similar results to the untreated cells compared to the 105W lamps. A visual inspection of cells using the BacLight assay showed that the proportion of viable versus non-viable cells were similar to the PCR method.

Discussion: PMA is useful in determining the viable proportion of air samples by binding to the DNA of dead/damaged cells and influence the detection signal of qPCR. The method provides a quantitative estimate and is hence favoured over the Baclight assay to estimate risk to airborne MTB cells.

Free-living amoebae isolated from a hospital water system in South Africa: A potential source of nosocomial and occupational infection

Presenter: Mr Petros Muchesa
Section: Immunology & Microbiology
Authors: P Muchesa, M Leifels, L Jurzik, TG Barnard, C Bartie

Introduction: Free-living amoebae (FLA) are unicellular eukaryotes that are ubiquitous in the environment, mainly in natural aquatic environments (rivers, streams, hot springs) as well as in man-made water systems such as domestic tap water, swimming pools and hospital water distribution networks. Although mostly beneficial in their natural habitat, some FLA are transmitters of pathogenic bacteria and are known human pathogens that can cause opportunistic and non-opportunistic central nervous system infections, as well as lung and skin infections. The aim of this study is to find out if patients and healthcare workers may be exposed to potentially pathogenic FLA in hospital water distribution.

Objectives: To investigate the occurrence of FLA and potential intracellular bacteria in a public hospital in South Africa.

Methods: A total of 97 water and biofilm samples were collected from the municipal water inlet of the hospital, theatres, theatre sterilization service unit, central sterilization service unit, endoscopy/gastroscopy unit, intensive care unit and the renal unit. These were analysed for the presence of FLA using amoebal enrichment technique, PCR and sequencing.

Results: Of the 97 samples, 77 (79.4 %), 40 (52%) water and 37 (48.1%) biofilm, contained FLA. The genera *Acanthamoeba*, *Vermamoeba* (formerly *Hartmanella*) and *Naegleria* were detected by morphology, 18S rRNA PCR and sequence analyses. Further sequence analysis of the *Acanthamoeba* positive isolates revealed a close resemblance with the potentially pathogenic T20 genotype. Transmission electron microscopy of positive FLA samples showed the occurrence of potential intracellular bacteria whose identity were not determined in this study.

Discussion: These results show a potential health risk to immuno-compromised patients and healthcare workers as some of the species detected are pathogenic and may harbour potential intracellular bacteria responsible for nosocomial infections. To date, this is the first report on the detection of potentially pathogenic amoebae from South African hospital water systems.

Exposure to volatile organic compounds and formaldehyde in histopathology and cytology laboratories

Presenter: Mr Gabriel Mizan
Section: Occupational Hygiene
Authors: GE Mizan

Introduction: Exposure to volatile organic compounds (VOCs) has been linked to various adverse health effects on the body, including changes in the liver, harmful effects on the kidneys, lungs, heart, and nervous system, as well reproductive health effects. Formaldehyde is a respiratory sensitizer and is classified as a suspected human carcinogen by the International Agency for Research on Cancer (IARC).
Objectives: The purpose of this study was to assess the extent of exposure to these harmful compounds within histopathology and cytology laboratory workers of the NHLS.
Methods: Air sampling for VOCs and formaldehyde was carried out in 11 histopathology and cytology laboratories located at different provinces of South Africa. The measurements were conducted using air sampling pumps and sorbent tubes, following a standard NIOSH chemical sampling methodology. Additional grab samples for formaldehyde were taken using a direct reading formaldehyde meter. The air sampling in each laboratory was complemented by a walk-through and an information gathering process to ascertain the frequency and degree of contact with the abovementioned substances.
Results: None of the air samples that were taken using sorbent tubes exceeded the respective South African Occupational Exposure Limits for the various VOCs or formaldehyde. In addition, none of the instantaneous grab measurements taken using the direct reading formaldehyde meter exceeded the South African OEL, however approximately half of these measurements exceeded the well recognized American Conference for Governmental Industrial Hygienists (ACGIH) Ceiling Limit. Several tasks performed within these laboratories, including tissue cut-up, staining and making-up of formaldehyde, were identified as potential exposure risk.
Discussion: Control strategies to reduce potential exposure to VOCs and formaldehyde in histopathology and cytology laboratory work are discussed, as well as the limitations of chemical surveys in drawing definite conclusions on true worker's exposure.

A study of respirator fit and face sizes of South African health laboratory respirator users during 2013-2014

Presenter: Ms Jeanneth Manganyi
Section: Occupational Hygiene
Authors: J Manganyi, K Wilson, D Rees

Introduction: In the hierarchy of controls, the use of respirators is listed as the least preferable means of exposure or infection control; however it is often the primary means of protection in many industries including the health laboratory industry. Health laboratory employees include N95 respirator users working with infectious diseases such as tuberculosis (TB).
Objectives:
- To determine the proportion of respirator users achieving an adequate fit while wearing their current supplied respirators
- To describe facial characteristics of respirator users and to group these faces into three face sizes (small, medium and large)
- To explore the relationship between face size and demographic variables
- To explore the influence of face size on respirator fit

Methods: 610 employees participated in this study. Quantitative respirator fit testing was conducted using a Portacount fit testing machine. Four facial dimensions were taken using callipers and a tape measure. STATA 12 was used to perform descriptive and interferential statistics.
Results: Of the 610 employees who participated, a large percentage (78%) of respirator users failed fit testing and were not protected by their currently supplied medium size respirator. The use of poorly fitting respirators could create a false impression of protection in the laboratories where employees are possibly exposed to hazardous biological agents including TB.
Discussion: The study outcome indicates a need for immediate testing of all respirator users and for a range of sizes and styles of respirators to be provided to all employees requiring respirators. A respiratory protection programme including respirator fit testing needs to be compiled and implemented. There is a need to investigate the relevance of panels used in designing respirators worn by South Africans. Lastly, one respirator size does not fit all.

In vitro toxicity assessment of dust emissions from South African gold mine tailings sites

Presenter: Ms Charlene Andraos
Section: Toxicology & Biochemistry
Authors: C Andraos, M Gulumian

Introduction: The city of Johannesburg, South Africa, is recognised for its large contribution to the gold mining industry but is also confronted with the challenge of managing the waste produced. The waste is stored as tailings at different sites and currently there are over 380 such sites in and around the city. Despite efforts to contain the dust emitted, the exposure to surrounding communities is inevitable. Previous published health risk assessments involving hazard identification, exposure

assessment and dose-response assessment have shown that dust from tailings sites could be a risk to communities.

Objectives: The aim of this study was to conduct hazard identification of tailings dusts to determine whether communities in and around these sites may be at risk from exposure to these dusts.

Methods: The physicochemical analysis of tailings dusts was determined with size distribution analysis, elemental analysis using ICP-MS, quartz analysis using X-ray diffraction and surface reactivity analysis using ESR spectroscopy. Toxicity assessment involved determining the uptake of dusts into cells using the CytoViva Hyperspectral Imaging system and assessing the toxicity using the xCELLigence impedance-based system in a bronchial epithelial and monocytic macrophage cell line.

Results: The tailings dusts showed the presence of nanoparticles (< 100 nm), known to lodge deep in the respiratory system and to reach internal organs via the bloodstream. High levels of transition metals such as iron, manganese, and nickel known to generate free radicals were identified and the presence of quartz, tridymite and cristobalite was confirmed. In addition, the dusts exhibited high surface reactivities. Time-dependent uptake of the dusts into cells was observed and toxicological analysis showed dose-dependent toxicities in both cell lines studied.

Discussion: These results may therefore suggest possible toxicity of these dusts where, upon exposure, may exert adverse health effects on those residing in proximity to these tailings sites.

Characterization of respirable crystalline silica dust in the abandoned mines around, Roodepoort, central rand Johannesburg, South Africa

Presenter: Ms Thingahangwi Madzivhandila
Section: Occupational Hygiene
Authors: T Madzivhandila, G Sekobe, B Kgarebe, J Larkin

Introduction: There are many abandoned mines in SA, so it is important to determine whether they pose a potential health risk. The mines on the West Rand are gold mines which are associated with silica dust. Breathing crystalline silica dust can cause silicosis and crystalline silica has been classified as a human lung carcinogen (IARC, 2002).

Objectives:

- To identify the mineral composition in the dust obtained from abandoned mines
- To characterize the particle size of the dust
- To evaluate the seasonal exposure risks to the community staying near abandoned mines

Methods: Six abandoned mines were studied. Each mine had four sampling stations. One at the source, and three others situated at 500, 1000 and 15 000 metres downwind from the source. Sampling were taken in all four seasons. In total, 144 air samples were collected on 25 mm 5.0 µm pore size PVC, silicon-free filters, in a Dorr-Oliver cyclone sampling device at 2.2 l/min for 8 hrs using low volume sampling pumps and 11.5 l/min for 8 hrs using high volume sampling pumps. One soil sample was grabbed at each of the 6 study sites in each season. The particle size distribution of these 24 soils samples was determined by sieving. The Method for the Determination of Hazardous Substances (MDHS101) was used for preparation of calibration standards, sampling and analysis. The samples were analysed using XRD.

Results: Air samples from all six study sites had detectable levels of crystalline silica at the source and up to 1500 m further away throughout the year.

Discussion: The average inhalable concentration of silica was below the USA EPA exposure limit of 10 mg/m^3. The average respirable concentration of silica was below the USA EPA exposure limit of 3 µg/m^3

Conclusion: Communities staying within 1500 m of abandoned mines are exposed to detectable levels of silica dust.

Environmental asbestos monitoring during asbestos roof removal in two human settlement areas

Presenter: Mr Tebogo Nthoke
Section: Occupational Hygiene
Authors: T Nthoke, T Madzhivhandila, G Mizan, G Sekobe

Introduction: the National Institute for Occupational Health (NIOH) carried out asbestos sampling after the removal of asbestos-cement roofs damaged by hail at two townships within Gauteng province.

Objectives: The aim of the surveys was to determine the levels of asbestos fibre concentrations in ambient air in relation to recognised standards and to ensure that the refurbished houses were safe for reoccupation.

Methods: Measurement of asbestos concentrations in air was carried out using air sampling pumps and mixed cellulose ester filters. A total of 35 air samples were taken at randomly selected houses located in the two townships. The samples were taken after the asbestos-cement roofs were replaced with non-asbestos (corrugated metal) roofs. The sampling pumps were placed in static positions on both the outside and inside of the selected houses. The samples were analysed using Phase Contrast Microscopy and Scanning Electron Microscopy - Energy Dispersive Spectroscopy (SEM-EDS), following the MDHS 39/4 and RTM2 methods, respectively.

In addition, four bulk samples from the asbestos cement roofs were analysed for asbestos fibre using SEM-EDS.

Results: Although the three main types of commercial asbestos (Chrysotile, Amosite and Crocidolite) were identified in bulk samples

of asbestos cement roofs, all air samples, excluding one, taken after the replacement of the asbestos-cement roofs with corrugated metal roofs, returned results below the Clearance Indicator of 0.01 fibres per millilitre of air (f/ml). One result was equal to the Clearance Indicator.

Conclusion: Based on the results from the air sampling it was concluded that the removal of asbestos cement roofs did not result in any significant asbestos concentrations in the air following removal. This was also attributed to the following of safe work procedures during the dismantling of the existing roofs.

Systemic contact dermatitis: occupational dermatitis caused by inhalation of metal dusts (2 case reports)

Presenter: Ms Anna Fourie
Section: Immunology & Microbiology
Authors: HA Carman, AM Fourie

Introduction: Two workers from metal processing factories developed severe generalised contact dermatitis. Neither worker was actually working with the metals. Linking workplace exposure with the clinical presentation of dermatitis is challenging, particularly when the exposure is not through direct contact.
Objectives: Establish if occupationally related systemic contact dermatitis was related to metal exposure in the workplace.
Methods: A clinical assessment was conducted of two workers from different companies who presented at the NIOH skin disease clinic. Case 1 worked at a steel cutting factory whose condition improved when away from work. Case 2 worked at a chrome plating factory as an electrician. His dermatitis condition improved when away from work as well. Patch tests and skin prick testing (SPT) was performed on both workers. The level of exposure to the relevant metals occurring in the workplace was obtained from the respective companies.
Results: Case 1 worked at a steel cutting factory and developed severe dermatitis in a symmetrical flexural distribution (atopic dermatitis). His hands, face and folds of the neck were not affected. The patch test was positive (1+) to nickel sulphate whilst the SPT was negative. The ambient nickel levels (≤0.008 mg/m^3) at the workplace were lower than the South African (SA) recommended maximum exposure level. Case 2 was an electrician exposed to chrome twice daily when briefly walking through the chrome plating section of the factory. He had severe dermatitis on his inner arms and his legs which spread over his body as erythrodermia. Atopic dermatitis was questionable. Both the patch tests and SPT were positive to potassium dichromate. Hexavalent chromium in air samples (<0.01 mg/m^3) at work was lower than the SA recommended maximum exposure level.
Discussion: The source of exposure to the allergens was the surrounding air in both cases. The inhalation of the metal salts caused systemic contact dermatitis. Contact dermatitis occurred even though the level of nickel and hexavalent chromate in the two respective factories was below the SA recommended safety limits.

Occupational exposure to iron oxide nanoparticles in a research laboratory

Presenter: Ms Nthabiseng Muriel Mogane
Section: Occupational Hygiene
Authors: NM Mogane, K Voyi

Introduction: The synthesis and use of iron oxide nanoparticles (NPs) is increasing but there is limited information on the extent of exposure and on preventing occupational exposure to these particles in research laboratories in South Africa.
Objectives: To asses potential emission points of iron oxide NPs in the air and exposure to these particles during their synthesis in a South African research laboratory.
Methods: Particle condensation counters (CPC), scanning mobility particle sizer (SMPS) and an ultrafine particle counter (UPC) were used to measure the particle concentration and size distribution over time, in a research laboratory. Area and personal filter-based samples were also collected for analysis, using an inductively coupled plasma mass spectrometry (ICP-MS) for elemental iron analysis, and scanning electron microscopy (SEM) for size, shape and chemical composition.
Results: The concentration of particles in the laboratory increased during synthesis. The particles as measured by CPCs ranged from a minimum of 321 particles/cc for background level to a peak of 114,325 particles/cc during synthesis. The highest particle concentration, 114,325 pt/cm^3, measured by the UPC was during the purification process. Task-based measurement showed high short-term exposure. Elemental iron was found in the filter-based samples with the highest concentration (0.09 mg/m^3) positioned closest to the emission source. The particles were agglomerates and aggregates of smaller particles as observed on electron microscopy. The use of engineering control during synthesis of iron oxide NPs reduced exposure to these NPs.
Discussion: Exposures well above background were demonstrated. Using full shift sampling may result in missing peak particle concentrations during tasks which release high concentrations of NPs. Agglomerates and aggregates of NPs were detected by the UPC. This finding was supported by the agglomerates and aggregates observed on the filters by electron microscopy. Employees at NPs synthesizing laboratory are exposed to NPs in the form of single particles and agglomerates and aggregates.

Whither to occupational health in South Africa?

Frank Fox

National Secretary: SASOM, e-mail: frankhfox@gmail.com

Occupational health, or the lack of it, has been in the news recently in a number of ways. First, there is the epidemic of silicosis combined with TB in ex-mine workers which has resulted in legal action against the mining industry and second, there is the unfortunate state of affairs in the Compensation Commissioner's offices, both at the Department of Health CCOD and the Department of Labour Compensation Fund, where claims are not being paid. The person who suffers most as a result of this is the worker who does not get access to care when needed and doesn't get the compensation owed either.

Underneath all of this is the provision of occupational health services which are meant to prevent occupational injury and disease in the first place. There are very few multidisciplinary State occupational health services (apart from limited services for some public sector employees and the National Institute for Occupational Health (NIOH)), and service delivery is through the private sector by occupational nurses, occupational medicine practitioners (doctors) and occupational hygienists. This is limited to those companies with a conscience and that can afford the services needed, and there is an enormous gap in SMMEs and the informal sector where there is no occupational health. This gap has been recognised in the National Health Insurance (NHI) white paper but the focus seems to be on curative and assessment services provided from clinics rather than preventive care.

Occupational injuries are obvious and get immediate attention but occupational disease is often occult and doesn't appear until many years of continuous exposure have elapsed. Further, occupational injuries affect individuals, and diseases affect large numbers of people, rendering them unfit for work and creating a burden on society, often impoverishing entire communities (as in the case of silicosis and TB). The ILO estimates that about 2 million deaths occur annually due to occupational exposures, and Fingerhut et al.,[1] commenting on the WHO Global Burden of Disease Project,[2] make the point that just five occupational risk factors account for 850 000 deaths and 24 million years of healthy life lost per annum. They also make the point that virtually all cases of silicosis, asbestosis and coal worker's pneumoconiosis are occupational in origin. South Africa has a huge problem in these areas.

Risk management to prevent occupational disease is regulated by two different government departments in South Africa (the Department of Mineral Resources for the mines, and the Department of Labour for all other industry). These two departments have separate Acts of parliament that they administer, and operate separate Inspectorates. The regulations under these Acts cover the same occupational risks yet sometimes take different approaches. The control of exposure to hazardous substances is regulated by two sets of occupational exposure limits (sometimes being applied to the same workplace). All this can be very confusing and, added to this, there are two different government departments managing compensation for occupational diseases. The Department of Health administers the Occupational Diseases in Mines and Works Act (ODMWA) which provides for compensation for occupational lung disease in miners, and the Department of Labour administers the Compensation for Occupational Injuries and Diseases Act (COIDA) which covers everything else.

In the middle of all this sits a single organisation which spans both sides but leans towards the mining sector: the NIOH. This institute, which is very similar to institutes in other countries (NIOSH in the USA, to mention just one), currently resides in the National Health Laboratory Service (NHLS), a public entity governed by a board appointed by the Minister of Health. The NIOH provides, variously: laboratory services (clinical and occupational hygiene), consulting services (in a broad range of occupational health disciplines), research, and teaching of scientists, doctors and hygienists through affiliation with Wits University and links to other universities. Despite the pivotal role that this institute has had in the past, and should have in a new view of the management of occupational health risk, its future is doubtful. The NHLS is in trouble: bills are not paid by the Provinces and funds are short. Bodies such as the NIOH may be seen as nice to have.

Occupational health is a multidisciplinary field, requiring an understanding of engineering, medicine, ergonomics and toxicology to mention but a few areas, and is covered mainly by the disciplines of occupational hygiene, occupational medicine and occupational health nursing, with input from other clinical disciplines. Skilled practitioners are in short supply. Occupational medicine is a recently recognised specialty and the numbers of specialists is slowly growing; but outside of academic departments there is currently little scope for career development. The Southern African Institute for Occupational Hygiene (SAIOH) examines and accredits

occupational hygienists who have obtained training available at a few academic institutions in the country. Skills in this field are scarce and attention is needed to both training and career development if we are to meet the needs of the economy and prevent further outbreaks of occupational disease.

In conclusion, we sit with a major health risk that is poorly understood by the mainstream medical fraternity, has fragmented regulatory control across both prevention and compensation, a shortage of skills in the field, and a national institute that might be in jeopardy.

With all this going on there is a need to highlight the issues in occupational health to create greater awareness of the issues and perhaps stimulate a dialogue between the major stakeholders to map out the future of occupational health in South Africa. Could the NIOH become the glue between all the pieces?

With this in mind, SASOM and SAIOH have commissioned a series of articles to discuss occupational health in more detail over the next few issues of *Occupational Health Southern Africa*, which will hopefully stimulate the discussion.

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Where to NIOH?

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BACKGROUND

The National Institute for Occupational Health (NIOH) – part of the National Health Laboratory Services (NHLS) – is the only multidisciplinary specialised state occupational health service in South Africa. It is not only the scientific resource to all industries nationally, but a player within and outside the African continent. Apart from assisting with the drafting of regulations and providing specialised services and laboratories, staff is also involved in research, teaching, and specialised skills training.

Rumours are that the Institute's role and future home are under revision. Perhaps the problem is the lack of real understanding of the role of occupational health in South Africa? A fiscal challenge? Or, at worst, restructuring without ownership as it does not fit neatly into a box of health services. Kathy Malherbe looks at the well-being of occupational health, the role of the NIOH, and why it appears to be an unnecessary conundrum for all stakeholders.

WHERE TO NIOH?

Occupational health has been in the news recently, predominantly for the wrong reasons, due to epidemics of occupationally-related diseases amongst mine workers and the lack of delivery from the Compensation Commissioners' offices. The NHLS too has been marred by corruption allegations this year and the swift termination of the whistle blower's employment.[1] However, they welcome a new era of good news with the appointment of Joyce Mogale as the new CEO this month. The general consensus is that Mogale will bring a welcome change and restructuring of this umbrella body.

The NHLS is the largest diagnostic pathology service in South Africa, with the responsibility and pivotal role of supporting the national and provincial health departments in the delivery of healthcare. It also provides laboratory and related public health services to over 80% of the population through a national network and adheres strictly to international standards. Testimony to this is that the NHLS was the recipient of a prestigious international award in 'European Quality' in the health sphere in Monteux in Switzerland.[2]

Is the NIOH to become a refugee?

Rumour has it that the NIOH is going to be forced out of its home – currently the NHLS. And the organisation appears to have nowhere to go. Alleged re-structuring is neglecting to take into account the pivotal role it plays in occupational health and safety in South Africa. Preventive health is poorly understood by most people and, when it comes to health and safety, prevention needs a great deal of motivation and, often, enforcement. The end user – the worker – suffers the most if prevention is ineffective.

Unless the restructuring takes into account the needs of affected parties, an opportunity to build an institute most appropriate for South Africa will be lost, and what we have could well be damaged.

The NIOH is a division of the NHLS but the plan is to move it out of the NHLS along with the National Institute for Communicable Diseases (NICD) and the National Cancer Registry (NCR). However, the NICD and NCR are going to be part of the newly formed NAPHISA – National Institutes of Public Health of South Africa. The NIOH was also supposed to be part of NAPHISA but, for incomprehensible reasons,

this plan appears to have fallen through. It will be a travesty if the NIOH isn't allocated a home.

The question is 'why'?

The NHLS has supported the three institutes through money derived from the provinces. This move will relieve the NHLS of the burden of cost to the province of these institutes. The NICD is more clearly a DoH support structure, unlike the NIOH which supports a number of government departments.

THE ROLE OF THE NIOH

The NIOH was born out of the mining industry and performed important work in researching the occupational health risks in mines. It has evolved to also provide important support and laboratory services for both general industry and mining; mining employs only 500 000 of South Africa's 15 million working people. The NIOH provides specialised services to industry and is dedicated to researching the health effects of work.

The NIOH should equitably serve all 15 million

Mining is a high risk industry and deserves attention but specialist services such as clinical, occupational hygiene, toxicology and advisory services are needed across all industries, including construction, agriculture, fishing and manufacturing.The laboratories also provide some unique public sector analyses, for example, asbestos fibre characterisation, and the measurement of some chemicals in air as well as exposures of workers to these.

Occupational health and safety needs recognition as an essential preventive discipline at the highest level of the State, and the country needs to provide the resources to protect the health of workers. Workers have a constitutional right to not be harmed at work and the State needs to provide the services to uphold this right. Also, a national institute should be instrumental in building societal awareness of the importance of occupational health and safety. The dissipation of an institute such as the NIOH, or a misplaced home, will slowly erode the level of care and it will slide backwards in terms of research and care of the worker.

THE REALM OF OCCUPATIONAL HEALTH IS NOT STATIC

Occupational risks are in a constant dynamic state which means that, as science and technology develop, so new risks have to be taken into account by practitioners and the NIOH. The labyrinth of medical and safety compliance in the construction industry is a prime example, which is why the new Health and Safety regulations were promulgated in December 2014.

Nanotechnology is an excellent example. Although nanotechnology is a major breakthrough in science designing, producing and using structured devices through manipulating atoms and molecules at nano scale, it needs to be done responsibly and in a regulated manner. The risk of exposure to nanoparticles is also a priority strategic thrust for the NIOH – both researching the toxicity of nanoparticles and contributing to guidelines for the measurement thereof and the surveillance of workers. This is in collaboration with government departments such as the Department of Trade and Industry. Although the NIOH does not promulgate regulations, it provides scientific input in collaboration with international agencies.

OCCUPATIONAL HEALTH IS NOT JUST A 'NICE TO HAVE'

National institutes for occupational health and safety are common around the world. All BRICS countries have them in one form or another. They are common because occupational health and safety requires specialised interdisciplinary functions. An institute is a means of bringing the requisite disciplines together to support and develop the Occupational Health and Safety System (OHSS). Specialised occupational health and safety practitioners are often in short supply. A national institute is a mechanism for establishing capacity in a range of key disciplines, and providing and developing expertise through critical masses of practitioners.

SO WHAT ARE THE VITAL SIGNS OF OCCUPATIONAL HEALTH AND SAFETY IN SOUTH AFRICA?

The symptoms

Dr Frank Fox, South African Society for Occupational Medicine (SASOM) National Secretary says, "Our health and safety laws are amongst the most modern in the world and are constantly under review by the various departments concerned. However, the fragmentation makes things complicated, as there are different approaches between the Department of Mineral Resources (DMR) and the Department of Labour (DoL). The DoL is making a concerted effort to improve both its services and the law. The DMR is doing the same at the centre but the provincial inspectorate is very varied in quality and training and a law unto itself. A major challenge is that we have workplaces which fall under both the Occupational Health and Safety Act and the Mine Health and Safety Act. These two Acts have separate standards for occupational exposure limits, which leads to difficulty in interpretation and implementation."

He says, "The big difference between us and the rest of the world is the quality and training of the inspectorate, and the subsequent application of the law. Despite efforts to improve the administration of the compensation system it is not readily apparent.

"On the medical side, there is no service provision for occupational health within the DoH. Their focus seems to be entirely treatment focused. There is some light in that

occupational health has been mentioned in the National Health Insurance (NHI) white paper but this is still a clinic-based treatment focus."

And complications…

In considering the status of occupational health in South Africa, it is important to consider other aspects of the OHSS besides occupational health service delivery. For example, the enforcement agencies are under-resourced and lack skills; surveillance of occupational disease and injury is weak (especially of disease); funding for research is inadequate, especially outside the mining industry; skilled human resources are in short supply; the services only cover a small proportion of workers; rehabilitation of injured workers is poor; and the compensation systems are largely dysfunctional.

There is also the pivotal role that education and communication play in reaching the entire working population. Starting at a young age and reaching the entire population is important – Brazilian institutes have programmes in schools and, in the USA, the National Institute is very active on social media sites in order to reach those who need it most.

Dr Fox feels that occupational health and safety is treated as the 'poor cousin' within the DoH. "Additionally, occupational health and safety is not a priority, given the many competing health and safety issues, e.g. motor vehicle accidents, HIV, TB, cancer, obesity, diabetes, etc. These issues are, of course, very important and this is not a competition. But it does mean that, if you do not have dedicated capacity for occupational health, it will not be picked up elsewhere."

Part of the problem is the lack of understanding of the people in positions of power in occupational health, compounded by the fragmentation of the regulation of occupational health and safety within government, and the consequent lack of ownership of such a valuable resource as the NIOH. Although occupational health is showing signs of life, the prognosis depends on the administration of a change of perception and a substantial dose of dialogue.

SMMEs ARE NOT THE LITTLE LEAGUE IN OCCUPATIONAL HEALTH

Occupational health is battling to find its proper place in South Africa and is, at best, at a crossroads. Only large companies are able to offer services to employees and these are concentrated in urban areas and in large (but remote) mining and manufacturing companies. The neglect is at grassroots level, rural areas, small, medium and micro-enterprises (SMMEs), and the government's serious focus on occupational health, not just in terms of regulation, but in terms of service promises and implementation.

At the moment, the provision of occupational health services is mandated within the Mine Health and Safety Act and within some regulations under the OHS Act but the service has to come from private practitioners. This is a cost that smaller industries bear very reluctantly. Other countries have organised state-mandated occupational health services.

Most employment within South Africa is in the SMME sector, according to the National Treasury research report (2008) on SMMEs. South Africa has an estimated 2.8 million SMMEs which contribute 52%-57% of GDP.[3] SMMEs also provide about 60% of jobs, and contribute more than 40% of the country's total remuneration.[3] This means that SMMEs in South Africa employ more people than corporates within the private sector and government combined.

It is not common for labour brokers to provide occupational health services, and SMMEs cannot afford them,'' says Fox (even if they are aware of the need, which most are not). There is also a lack of data on the true burden of ill-health caused by poor working conditions. Quality control in occupational health is another concern. It is caring for a few of the people all of the time and most of the people not at all. The NIOH, together with occupational health organisations in the profession, has a pivotal role in addressing these issues – SMMEs, quality control and the true burden on the health of workers caused by poor working conditions, as well as quality control in occupational health.

THE NHI AND THE NIOH

Dr Fox agrees, "This is exactly where the NIOH may have a role to play. Looking after the smaller industries and providing a service that they can afford. The DoH has a role in making occupational health services accessible to unserved and poorly served workers (e.g. informal sector, small enterprises, retired and unemployed workers). The NHI does present an opportunity to develop this. The role of a national institute in this would be to support policy development, conduct research into what works and what does not, provide advice and high-level laboratory and professional services to support the DoH services, and train practitioners. A national institute would not be involved in the day-to-day delivery of services, however."

FOCUS SHOULD BE ON PREVENTION NOT CURE

SMMEs should be a major focus for occupational health and safety. "There is so much more to occupational health, including creating decent work, preventing occupational injury and disease, and promoting the health of workers. In many countries, compensation is seen more as social security than occupational health. Also, it tends to dominate discussions on occupational health when, in fact, prevention should be the dominant discussion, particularly in South Africa."

SO WHAT TO DO?

It may be that there is need for change to bring the NIOH into a more meaningful role in the overall management of occupational health and safety in the country. But this will not happen if it is simply demolished without broad consultation with all stakeholders.

The treatment

Dr Fox says, "SASOM would like a transparent and constructive discussion between the DoH and all stakeholders about the future structure of occupational health services in the country and this includes the future of the NIOH."

Summary of NIOH's role

- Support and inform the drafting of national policy, model legislation, strategic and operational OHS plans
- Provide specialised services and laboratories
- Facilitate teaching and training
- Facilitate the production of OH specialists
- Facilitate decisions about research priorities and research

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Kathy Malherbe is a freelance writer specialising in health, particularly science and technology. She is a winner of the Pan African Award for Excellence in Science and Technology (Health) and a finalist in the Discovery Health Journalism awards

People on the move in occupational health

Anja Franken

Anja Franken completed her PhD in Occupational Hygiene at the North-West University (NWU) in 2014, and the degree was conferred in May 2015. She is a lecturer in the School of Physiology, Nutrition and Consumer Sciences at the NWU, Potchefstroom Campus, where she lectures post-graduate occupational hygiene students. She supervises MSc and PhD students in their respective research projects, and has successfully supervised 13 MSc students to completion since 2008. Currently, she is participating in the development of modules for the new BHSc degree in Occupational Hygiene which will commence in 2016.

Anja Franken.

Anja has published several peer-reviewed papers, both nationally and internationally, and has presented her research at conferences in South Africa, the Netherlands and France. She obtained a Thuthuka research grant from the National Research Foundation for 2012-2014, which was extended to 2015-2017.

For her PhD, Anja investigated the permeability of metals, such as platinum and rhodium, through human skin, and the factors potentially influencing permeability. Her research showed that both platinum and rhodium in salt form are permeable through Caucasian skin, with increased permeability of platinum through African skin. The results were published in *Toxicology in Vitro* (2014 (8):1396-1401) and *Toxicology Letters* (2015 (232): 566-572) and were also presented to the International Platinum Group Metals Association's PGM Science Task Force in November 2014. For the mining and refining industry, the research findings have indicated that these metals can permeate through the skin and potentially reach the vascular system. However, more importantly, the metals are retained inside the skin which leads to continued permeation even after leaving the workplace; therefore, any skin contact with these metal salts should be avoided. In addition, the diverse workforce should be considered as African workers have an increased risk for skin permeation.

Anja's research continues with the comparison of permeability between African and Caucasian skins, as well as supervision of post-graduate students investigating the influence of pH and mechanically damaged skin on permeation of platinum group metals.

Truck driver health: the hidden factor in road safety

As the awareness of diabetes increases towards marking World Diabetes Day in November, the role of industry in addressing employee awareness and management of the disease needs to be explored. The transport industry is probably one of the most vulnerable sectors, with truck drivers in particular, being at increased risk of a number of debilitating health conditions, including diabetes. Isuzu Trucks South Africa recognises the impact that a poorly managed health condition has on truck drivers and other road users at risk. As industry and the public prepares for the busy festive period, driver health is a crucial, but often overlooked factor in overall road safety.

Craig Uren

In the wake of any disaster involving a truck, attention immediately turns to the vehicle's mechanical soundness and capabilities of the driver. Little, if any, focus is placed on the health status of the driver. However, studies have found that truck drivers – particularly long haul drivers – work under uniquely physically demanding conditions, putting them at increased risk of a range of chronic health conditions, including diabetes and hypertension. Poor reaction times, as a result of poor health, can significantly increase the risk of collision, if we consider that a reaction time slowed by only two seconds will take a truck travelling at 80 km/h 44 metres closer to an obstruction on the road.

In various studies around the world, researchers have found that truck drivers are at increased risk of being overweight or obese, having high blood pressure, and developing Type 2 diabetes. A recent study of truck drivers released by the *Journal of Diabetes and Metabolic Disorders*[1] noted: "High blood sugar was found in 52.1% of the drivers, 9.1% of them were in diabetic stage, and when using the haemoglobin sugar test 77.6% of these drivers were in this stage. Excessive body weight was recorded in 65.6% of the study population, 44.8% were diagnosed with overweight and 20.8% with obesity. High blood pressure was recorded in 16.4% of drivers." In the US, numerous studies have found that truck drivers are at increased risk of lung, colon and larynx cancer, ischaemic heart and cerebrovascular disease, chronic obstructive pulmonary disease, low back injuries, diabetes and non-alcohol cirrhosis – and, as a result – at increased risk of motor vehicle accidents. In Canadian studies, uncontrolled and poorly controlled diabetes among truck drivers has been found to contribute to an increased risk of road accidents.[2]

Clearly, this is a universal problem. The conditions under which truck drivers work lend themselves to unhealthy practices, which can escalate to chronic illness over time. By the very nature of their work, truck drivers spend long hours sitting, with little physical exercise and poor sleep cycles. They also tend to eat unhealthy convenience food, snacks and drinks containing high levels of salt or sugar. Over time, these factors increase their risk of weight gain, high blood pressure and Type 2 diabetes, among other conditions.

Responding to this pervasive trend, Craig Uren, Chief Operations Officer at Isuzu Truck South Africa, says, "The well-being of truck drivers and road users in general is of critical importance to us. We urge drivers and companies operating in the transport sector to take charge of this rapidly growing health and safety risk through simple measures such as routine testing. Professional blood tests for glucose level monitoring must be conducted at least annually among all drivers. If drivers are found to be diabetic, the condition can be controlled by ensuring each driver has his or her own glucometer in order to test and record his or her own blood glucose levels daily, and be guided on managing the condition by Diabetes SA. By helping manage truck driver health, we can improve their personal well-being and that of their families and contribute to improved safety on South Africa's roads.

If Type 2 diabetes is not managed properly it can result in symptoms such as blurred vision, tiredness and lack of concentration impacting on a driver's ability to function optimally on the road. There is also a risk that a driver with uncontrolled Type 2 diabetes could suffer a hypoglycaemic attack while driving, with associated dizziness, weakness or even loss of consciousness.

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SASOM Annual General Meeting, conferences and SASOM Branch activities in October and November 2015

The SASOM Annual General Meeting (AGM) will take place on 20 November 2015 at the Protea Hotel Stellenbosch at 16h30. Notice of the meeting has been sent to all members, and nominations for the SASOM Executive Committee are awaited. Only SASOM members in good standing for 2015 may nominate and vote.

An interesting conference hosted by the SASOM Western Cape Chapter will precede the AGM. The programme commences at 10h30 and includes:

- Current issues in health and safety regulation in the United Kingdom – Implications for occupational health services: Dr Anne Raynal
- A glimpse into the future of Hazardous Chemical Substances Regulations – Feedback from the Department of Labour Technical Committee on the rewriting of the Hazardous Chemicals, Lead and Asbestos Regulations: Dr Greg Kew
- The Kuduwave and legal compliance. Findings of a study evaluating the Kuduwave audiometer for compliance with standards for hearing conservation purposes: Ms Anita Edwards
- Disability and the Employment Equity Act – A review of issues related to increasing access to employment for people living with disabilities and a look at the EEA's definition of disability: Mr Peter Strasheim
- HIV-associated neurological deficit in professional drivers – A review of the literature and a proposal for new research: Dr Hetta Gouse
- A review of the return on investment (ROI) of a health promotion programme at a multinational company: Dr Danie Viljoen
- An introduction to the Medichem Scientific Committee of ICOH activities in South Africa: Dr Murray Coombs

On 10 October 2015 the SASOM Namibian Branch will host their annual conference, "The Goal Posts of Occupational Health", in Swakopmund, with presentations on the following topics:

- Developments on the Namibian Occupational Health Scene: Dr Ali El Sheriff
- Occupational Law and Ethics: Mr Johan Roux
- Fatigue Management in Industry: Mr Willie van der Merwe
- Occupational Lung Diseases at the Namibian Lung Clinic: Dr Wotan Swiegers
- Ototoxin exposures in the workplace – an underestimated issue?: Mr Nico Potgieter
- Venomous bites – live demonstrations on what to do and what not to do: Dr Christo Buys
- Hepatitis in industry: Dr Herman Strauss
- Occupational health – from South Africa into Africa: Prof. Daan Kocks

The SASOM Northern Cape Branch Annual General Meeting will be preceded by an academic programme on 15 October 2015 at 18h00 at the Red Sands Lodge. Prof. Theuns Verschoor will present "The Impaired Physician' and Dr Jim Te Water Naude will talk about The Asbestos Relief Trust.

SASOM, the Akeso Clinics and SASOHN have joined forces to present a workshop on the identification and management of the psychiatric patient on 17 October 2015 at 07h30 at the Akeso Crescent Clinic in Randburg. The SASOM Pretoria and SASOM Witwatersrand Branches will hold their Annual General Meetings at the Akeso Crescent Clinic after the conclusion of the workshop.

For more information on any of the above activities, contact Jenny Acutt in the SASOM National Office: e-mail: info@sasom.org; telephone: 012 803 7418.

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SASOHN snippets

SASOHN 35TH ANNUAL CONFERENCE AND ANNUAL GENERAL MEETING – NOVEMBER 2015 SAFETY, THEORY, ACTION, RESEARCH

SASOHN Western Cape will be hosting the 35th Annual National Conference and AGM from 4 to 6 November 2015 at the Lagoon Beach Hotel, and is supporting the Starfish Foundation as the charity of choice.

Three pre-conference workshops will be facilitated by experts in the subject areas, and include audiometry, the ageing worker, and TB in the occupational health worker. The conference programme for Thursday includes eight speakers presenting topics relevant to occupational health nursing, and includes a motivational talk by Dr Helgo Schomer. See www.sasohn.co.za for more details.

A full programme of entertainment has been lined up for participants' enjoyment – Making Waves cocktail function on the Wednesday evening – be sure to wear something nautical. The gala dinner and awards evening will be held on Thursday – smart and dashing with a touch of gold – to celebrate SASOHN's 35th birthday and the outstanding achievements of members.

SASOHN Western Cape looks forward to seeing you all there, making friends, creating memories and taking home new knowledge that will help you make a difference to the lives of workers in South Africa.

ACADEMY OF NURSING SOUTH AFRICA (ANSA)

SASOHN is proud to announce that four SASOHN members have now been inducted as fellows of ANSA: Linda Grainger and Louwna Pretorius who are both founder members of this prestigious group, Penny Orton in 2014 and most recently, Karen Michell. The inauguration in September 2015 brought the number of fellows to 53. Nominations to ANSA are made by peers and are then adjudicated by a panel in South Africa as well as an international adjudicator. Nomination is open to any registered professional nurse or midwife who has made an extraordinary contribution to the field of health care in South Africa, evidenced by outcomes and impacts on individuals, systems, policies and/or organisations; evidence of leadership, innovation and scholarship; and the potential contribution of the person to the activities of the Academy. The fellows urge all SASOHN members to nominate occupational health nurse practitioners whom they believe meet the criteria for fellowship. More details are available on the website: www.ansaacademy.co.za.

Louwna Pretorius is a board member of ANSA and Penny Orton was recently elected as a board member, giving SASOHN good representation on the Board. ANSA has an important role to play in the development and advancement of the specialist nurse and advanced practice nurse. Occupational health nursing (OHN) is one of 16 specialities identified by the South African Nursing Council for these two groups of nurses. SASOHN, through its members who are fellows, will actively participate in the development of the OHN specialist and advanced practice in South Africa.

Linda Grainger

Louwna Pretorius

Penny Orton

Karen Michell

ANSA held its first Annual Colloquium on Friday 31 July 2015, in Gauteng. The purpose of this first Colloquium, in collaboration with South African Nursing Council (SANC), Democratic Nursing Organization of South Africa (DENOSA), and other professional and professional specialist societies, was:

- To obtain an overview of the current status of specialist nursing by sharing ideas and experiences
- To discuss common issues around the generic competency framework, education and training, as well as practice matters related to specialist nursing in South Africa

Guest speakers included Dr Jabu Makhanya, the Chief Nursing Officer for South Africa; Professor Busi Bhengu, Chairperson of SANC; Ms Madithapo Masemola, Acting General Secretary: DENOSA; Ms Hannelie van Rensburg: Director: DHET; and Professor Sinegugu Duma from the University of Cape Town. All the presentations are available on the ANSA website: www.ansaacademy.co.za. During the afternoon session, delegates worked in three small groups on the following aspects of the specialist nurse and advanced nurse practice:

- Applying the new role of the nurse specialist and advanced practitioner in practice – positions, job specifications, responsibilities, career ladder, and remuneration
- Facilitating articulation between qualifications (legacy and new) to increase the production of specialist nurses – models for NEIs/HEIs
- The need to develop practice standards for specialist nurses

Going forward, ANSA will formulate a position statement in support of the specialist nurse and advanced practice nurse, and will engage with stakeholders to start the development of practice standards against which specialist nurses can be assessed for competence. The OHN competencies are available on the SANC website: www.sanc.co.za.

The ANSA fellows look forward to more nominations in the category of occupational health nursing clinicians. Please contact one of the fellows: Louwna Pretorius at louwna.pretorius@corobrik.co.za, Penny Orton at pennyo@dut.ac.za, or Karen Michell at karen@cosafety.co.za, if you require assistance or further information.

Prepared by: Penny Orton
SASOHN National Education Representative,
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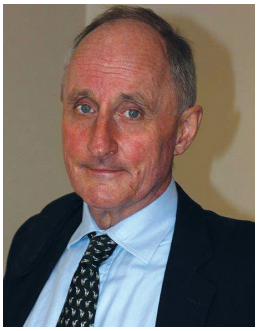
MMPA Annual Congress September 2015

The MMPA held its 18th Annual Congress at the Riverside Sun Hotel on the Vaal River on 4 and 5 September 2015. The Riverside Hotel has recently been refurbished and the MMPA was the first public engagement undertaken by the hotel. It is a picturesque building, beautifully located and overlooking the Vaal River.

The programme featured a number of prominent speakers representing diverse but critical disciplines, including women in mining, occupational asthma, management of mental health illnesses in the workplace and a focused update of medicine and the law. In the welcome address, Dr Vusumuzi Nhlapho, President of the MMPA, pointed out that members of the MMPA, "… as health and medical practitioners, have a unique and important opportunity to offer real and sustainable value to our companies, to the employees and the surrounding communities". He continued to highlight that the organising committee therefore wanted to put together a Congress that will "showcase the contributions of our discipline to the industry environment and developments – and highlight how impactful health investments can create positive changes in the region's operating environment."



Peter Strasheim

It is for this reason therefore that a highlight of the Congress was an inaugural roundtable discussion on Sustainability and Sustainable Development in the Mining Industry, featuring representatives from the Chamber of Mines (Mr Nikisi Lesufi, Senior Executive for Health and Legacies), the National Union of Mineworkers (Mr Erick Gcilitshana, National Secretary for Health), the Centre for Sustainability and Industry at the University of the Witwatersrand (Ms Nancy Coulson, Programme Manager), with Dr Charles Mbekeni (Head of Health and Medical Services at Anglo Platinum) giving a scenario planning for the provision of heath services in the mining industry that anchored the panel discussion. The session was ably chaired by Dr Thuthula Balfour from the Chamber of Mines (Head of Health) who ensured that many voices from different sectors were heard. Robust and insightful discussions analysing the challenges as well as potential solutions were held, which emphasised the critical role of private-public-partnerships in ensuring sustainability for the mining industry.

Dr Vusi Nhlapho with members of the Executive Council and Past Presidents of MMPA

Mr Peter Strasheim, Director at DLM Consultancy, gave an interesting talk and update on Medicine and the Law, particularly as it relates to reasonable accommodation in the workplace. He outlined, in detail, a case in the Supreme Court of Appeal (Ruiters vs General Motors) in which the court found in favour of an employee who was unfairly dismissed because the company concerned failed to provide appropriate accommodation. Of importance is that the occupational medical practitioner and the orthopaedic surgeon were commended for their ethical conduct in the matter and advocacy of the employee's rights.

On the clinical front, Dr Spo Kgalamono, Head of the Occupational Medicine Section at the National Institute for Occupational Health, gave a comprehensive overview of asthma in the workplace and highlighted key aspects of clinical management. The presentation was well received by the delegates and robust discussion around difficult clinical cases followed.

As usual, the Gala Dinner, sponsored by Mylan, was held on Friday night. Real Signature provided the musical entertainment way into the early hours of Saturday morning. The MMPA was honoured to host Dr Sophia Kisting, Executive Director of the National Institute of Occupational Health and the National Cancer Registry, to give a thought-provoking keynote address. Dr Kisting briefly reflected on her professional experiences as an occupational medicine specialist in various international organisations and jurisdictions. She highlighted the importance that the world of work plays in affirming individual identity and promoting the culture of human rights. She expressed her appreciation of the fact that the forthcoming Global Sustainability Goals (GSGs) speak specifically to the notion of decent workplaces. Turning her attention to the mining industry, Dr Kisting asserted that an incredible amount of world-class practices and research have taken, and contintinue to take, place in South Africa. She then challenged all delegates to take the work they do on daily basis very seriously, and to use all potential opportunities to address gaps in occupational practice as an opportunity to conduct research. Dr Kisting pointed out that the NIOH would be keen to provide assistance with regard to workshops to promote capacity in research. This point was echoed by Dr Vusumuzi Nhlapho at the closing of the Congress when he invited delegates to use regional academic symposia as well as the Annual Congress to showcase their academic activities.

These are just some of the highlights of a well-attended and highly successful Congress. The MMPA would like to invite all members to a regional symposium to be held in Rustenburg on 14 November 2015.

Report by: Dr Vusi Nhlapho, MMPA President,
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SAIOH and our international partners

Dear SAIOH members, it has been some time since I have written to you and I trust that you are all well.

BACKGROUND

A number of countries throughout the world have formed occupational hygiene associations in an effort to develop and promote occupational hygiene within their borders. To further promote and develop occupational hygiene internationally, a number of these associations got together to form the International Occupational Hygiene Association (IOHA). IOHA further formed a National Accreditation Recognition Committee (NARC), aimed at affording associations with member certification schemes the opportunity to attain international recognition of their schemes through application to the NARC, the subsequent submission of certification procedures, and the evaluation thereof against set criteria.

In 2006 SAIOH applied to have its certification scheme recognised. After the necessary evaluations were carried out by the NARC at their Board Meeting in Leiden, Holland, in September 2006, IOHA formally recognised SAIOH's certification process.

Associations need to reapply every five years to have their certification schemes reassessed. SAIOH went through this reassessment in 2011 and is due for a further reassessment in 2016.

SAIOH REPRESENTATION

Since becoming a member of IOHA, SAIOH has been represented by various persons. SAIOH IOHA representatives, to date, are:

- Rob Ferrie – Rob was the first SAIOH representative and was also elected as, and served as, the IOHA President
- Deon Jansen van Vuuren – Deon followed Rob and was also elected as, and served as, the NARC Chairman
- Peter-John (Jakes) Jacobs – Jakes is the current IOHA representative, having taken over from Deon as of September 2015

SAIOH representatives serve a three-year term on the IOHA Board, which is extendable for an additional three years. Typical duties of the representative include:

- Representing SAIOH at IOHA Board meetings held twice per year, putting forward SAIOH's opinions as needed
- Actively participating in working groups established by IOHA in an effort to promote occupational hygiene worldwide
- Putting into place memoranda of understanding with our sister organisations in an effort to add value to SAIOH members. Examples include access to publications and memberships of sister organisations at reduced costs
- Ensuring that member certification is recognised worldwide, affording SAIOH members the opportunity to practice occupational hygiene globally
- Creating a platform for international assistance and cooperation within the occupational hygiene sphere

SAIOH, through its representative, needs to assist IOHA in helping to attain its vision and mission, which are set out as follows:

Vision: A safe and healthy working environment for all.

Mission: Enhance the international network of occupational hygiene associations that promotes, develops and improves occupational hygiene worldwide, providing a safe and healthy working environment for all.

IOHA Board representatives at the Board meeting held on 26 April 2015 in London

WHY BELONG TO IOHA?

We live in a "global village". With technology and research moving along as fast as they are, IOHA provides the ideal platform to network and provide SAIOH members with access to the latest information and trends regarding occupational hygiene. Through mutual recognition, SAIOH members are also afforded the opportunity of having their certification as occupational hygienists recognised by participating member schemes, globally. Affordability in becoming a member of international associations such as the British Occupational Hygiene Society (BOHS) and the American Industrial Hygiene Association (AIHA) is now a reality as a result of international networking.

Through our international partners, SAIOH has been able to put a MoU in place with the United States' National Institute for Occupational Safety and Health (NIOSH). SAIOH is also currently working on MoUs with other sister organisations, and hopes to have these in place within the foreseeable future.

REMAINING RELEVANT INTERNATIONALLY

I attended two recent IOHA meetings: the IOHA Board meeting held in London in April 2015, where I was officially introduced by Deon Jansen van Vuuren as the incoming SAIOH representative, and a meeting held at the AIHA conference in Salt Lake City in June 2015. At both these meetings I realised how important it is to remain relevant internationally. One needs to be relevant not only as an individual, but also as an association. Society relies on us to ensure sound competency within the occupational hygiene space. Both local and international companies have this expectation when employing a SAIOH certified occupational hygienist. We need to have the most up-to-date information and research available. This needs to happen through active engagement with our international partners which is what I hope to build upon during my tenure as the IOHA representative. My wish is to enhance the value you get from SAIOH through improved international engagement and partnerships.

Should you have any questions, suggestions or comments in relation to the above, please forward these to me at peterj@saioh.co.za

Report by: PJ "Jakes" Jacobs
SAIOH Immediate Past President
e-mail: peterj@saioh.co.za

Classifieds

Supplementary tables

‘Occupational noise-induced hearing loss prevalence and noise abatement techniques in a steel-making plant’

V Nkosi, N Claassen, K Voyi

Supplementary Table 1. Employees responding “Yes” to non-occupational noise exposures questions (N=134)

Risk factor	n	%
Powerboats	6	4.5
Shooting/hunting exercises	14	10.4
Motorcycles	15	11.2
Private aircrafts	3	2.2
Loud music	49	36.6
Drive with open windows	55	41.0
Electric saws	24	17.9
Lawn mowers	21	15.7
Walkman earphones	21	15.7

Supplementary Table 2. Percentage of employees responding “Yes” to medical history questions (N=134)

Risk factor	n	%
Ear infection/drainage discharge		
Yes	5	3.7
No	128	95.5
Not sure	1	0.7
Painful ears		
Yes	11	8.2
No	122	91.0
Not sure	1	0.7
Ear surgery		
Yes	3	2.2
No	130	97.0
Not sure	1	0.7
Measles/mumps		
Yes	16	11.9
No	114	85.1
Not sure	4	3.0
Encephalitis		
Yes	2	1.5
No	126	94.0
Not sure	5	3.7
Meningitis		
Yes	10	7.5
No	119	88.8
Not sure	5	3.7
Head injury		
Yes	8	6.0
No	126	94.0
Family member(s)		
Yes	9	6.7
No	118	88.1
Not sure	8	6.0
Antibiotics/drugs		
Yes	2	1.5
No	123	91.8
Not sure	9	6.7

Occupational Health and

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