Occupational HEALTH

SOUTHERN AFRICA

Official Journal of the SA Society of Occupational Health Nurses (SASOHN) and the SA Society of Occupational Medicine (SASOM)

In this issue:

Occupational exposure to benzene among service station attendants

Monitoring blood lead levels in South African industry 1995

The Emergency treatment of cyanide poisoning

Selecting biomonitoring action levels for occupationally exposed populations

Vol 2 No 2 March/April 1996

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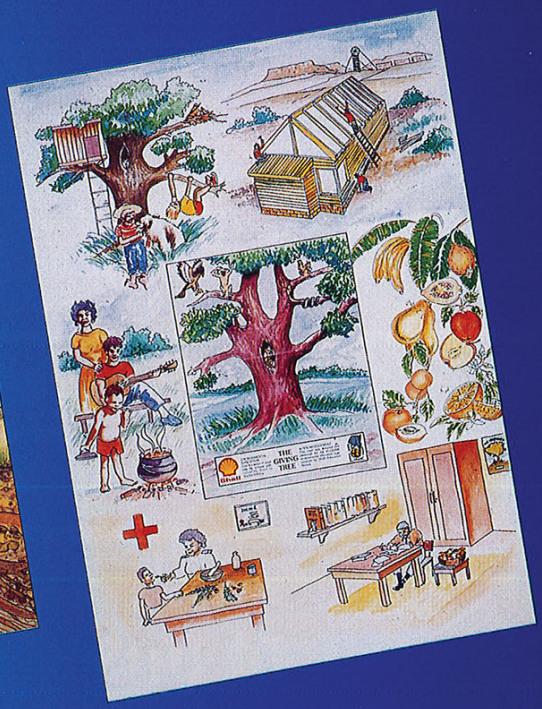

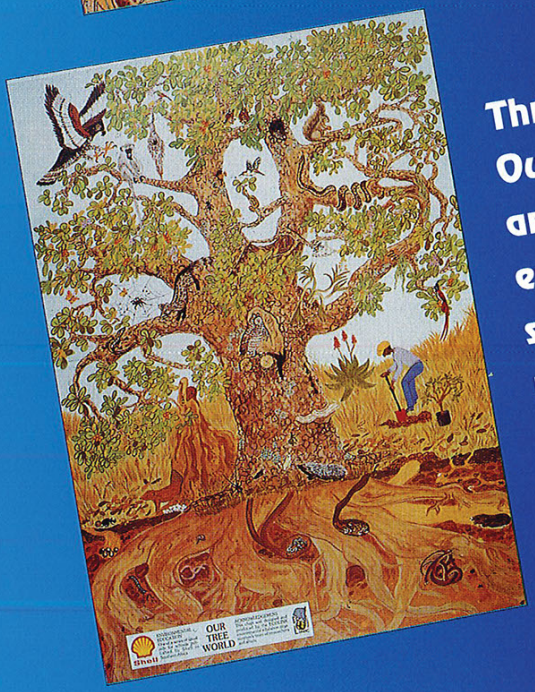

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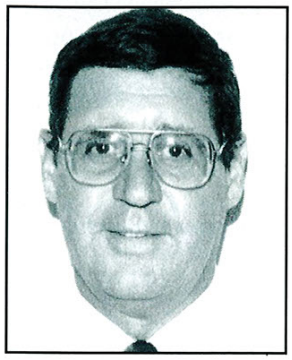
Editorial



Health Risk Assessments (HRAs)

Risk ratings and other matrices conjure new stimuli to thinking about Occupational Health auditing as well as monitoring and surveillance at the workplace.

The steps towards the implementation of HRAs are well known, and those of us practising these principles find that they work well, if implemented properly. And that's the problem, as risk assessments, and other such ratings must be performed by people who are qualified to do so, as it involves team efforts, identification of hazards and discussions with health and safety representatives, as well as workers themselves.

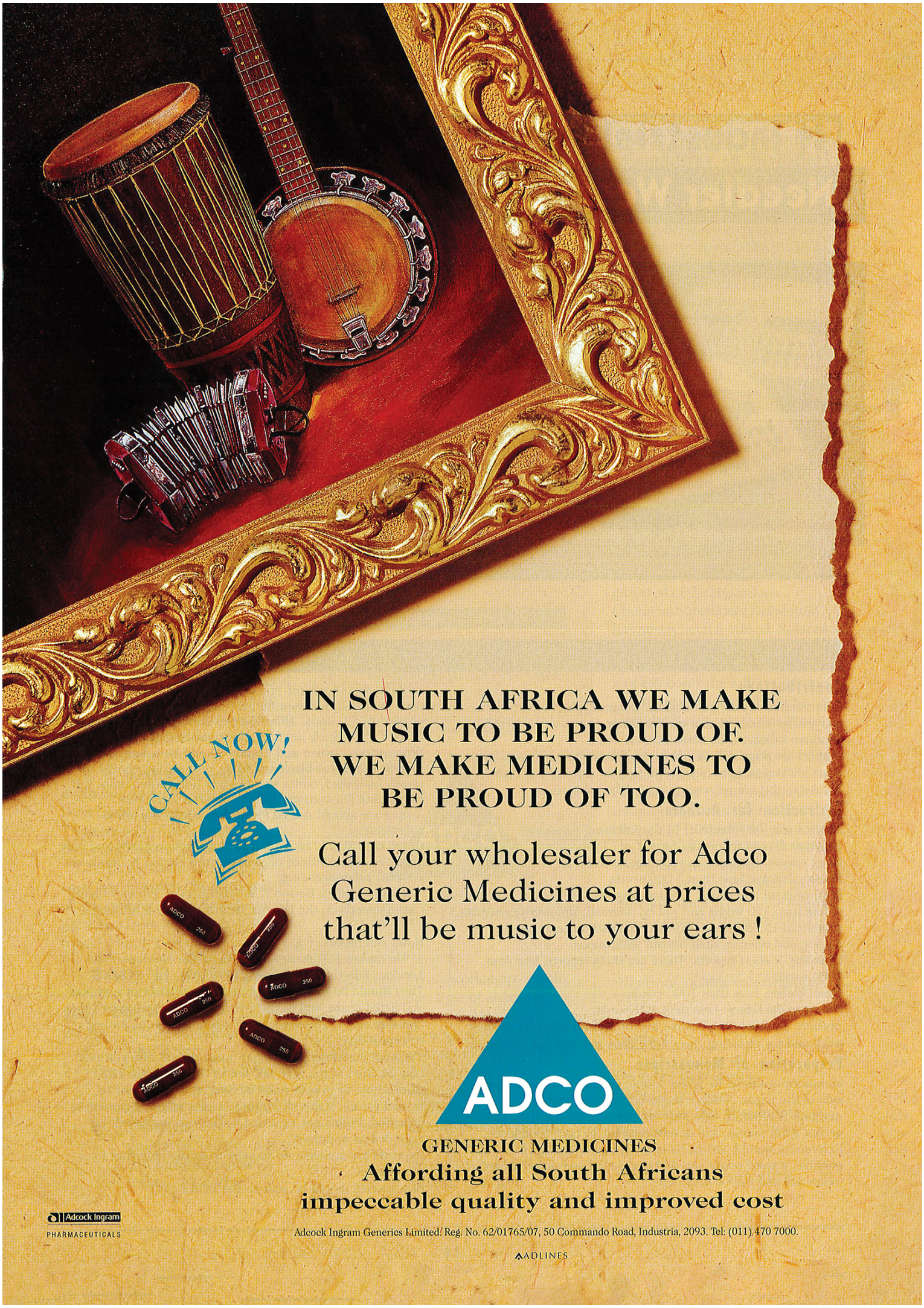
Hazard identification and the recognition of the statutory requirements under the Hazardous Substances regulations include a process in which the assessments of the workplace, the biological monitoring and clinical evaluation of the potentially exposed worker, continue to facilitate opportunities towards the implementation of procedures required to improve or eliminate risk. Recognising that risk is essentially a product of hazard and exposure, the measurement involved becomes a little hazy and validity remains a problem, simply because we do not have an accurate measurement of "health"! However, the current methodology in implementing HRAs is increasingly being accepted by industry, and effective, basic procedures should become a reality, if only to find a measure by which standards can be set. Taking into account the actual costs involved, it becomes awesome when an analysis identifies discrepancies which are cause for serious concern. Bradley's report focuses on this very point, as well as alluding to the fact that only in 1992 was the first Risk Management policy confirmed by industry in South Africa.

We welcome the contribution by Fogel on the Chemical and Allied Industries Association (CAIA) which makes good reading by clearly implementing commitment and responsibility towards a caring initiative (Responsible Care programme), and hence improvements in the health, safety and environment performance criteria. Self evaluated questionnaires, and the resulting programmed development will enhance the HSE performance with the ISO 14000 standards in place.

This issue also emphasises how authors are increasingly aware of the industrial hazards and their contributions (e.g. Manjra, Cantrell *et al,* Sapire *et al,* and Weiner) are gratifying to say the least, and we welcome this as a development of the Journal's place in Occupational Health. Other issues will continue to be presented as problems become more closely identified, and therefore more important to readers as well.

Unleaded petrol remains in debate, and readers are encouraged to take note of the diverse opinions which sow confusion amongst consumer and even more so among health workers. What is apparent on current review is that leaded petrol still has a place in our society for a long time to come, and that the environmental arguments remain in contention.

Chris van Selm
Editor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Both original and review articles must include a short abstract of less than 150 words and will be refereed. Manuscripts will be submitted to referees as confidential without naming the author, and referees shall remain anonymous.
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Preparation of Manuscripts

Manuscripts should be typed double spaced, using only one side of the paper. Number pages consecutively and leave wide margins. A separate title page should contain the title, the author's full names, and details relevant to correspondence. References should also be listed on a separate page. If possible, a word count should be included and diskettes are welcomed and will be returned.

Authors should submit one original article and two copies of each manuscript. Scientific measurements should be expressed in S.I. units. Abbreviations and acronyms should only be used if absolutely necessary and must be defined on first use.
Illustrations, tables and graphs should be submitted on separate sheets as black and white prints. They should be clearly identified, tables should carry Roman numerals, I, II, III etc. and illustrations Arabic numerals 1, 2, 3 etc.
X-ray films should not be forwarded, but glossy prints submitted.
References should be set out in the Vancouver style and only approved abbreviations of journal titles should be used.
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Book references, e.g.
1. Thompson L.A history of South Africa. Newhaven and London: Yale University Press, 1990.
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Reprints are available on request from the publisher for a nominal fee.
Any queries should be sent to the Editor.

Increase in benefits: Compensation for Occupational Injuries and Diseases Act

From 1 March 1996, certain benefits have been increased.

1. Benefits in respect of schedule 4

Item 1: Temporary total disablement for periodical payments (75% of an employee's monthly earnings at the time of accident). New maximum benefit is R 7 345 per month.

Item 2: Permanent disablement of 30% paid as a lump sum (15 times the monthly earnings of the employee at the time of accident). New maximum benefit is R 4 114 per month and the minimum benefit is R500 per month.

Item 4: Permanent disablement of 100% paid as a monthly pension (75% of an employee's monthly earnings at the time of the accident). New maximum benefit is R7 345 per month and minimum benefit is R550 per month.

Item 10: An increase in funeral costs to a maximum of R4 900 or the actual amount whichever is the lesser for accidents occurring on or after 1 March 1996.

2. An increase in monthly payments under several sections of both the WCA Act and COID Act by 7% in respect of accidents occurring before 1 March 95.

3. The maximum amount of earnings on which the assessment of an employee shall be calculated increases from R80 028 to R88 140 from 1 March 1996.

New Projects: Scientific Committee on Biological Monitoring

The Scientific Committee on Biological Monitoring of SASOM has recently surveyed blood lead results obtained during biological monitoring country wide (see this issue). It will be extending this project in the near future to include the results of all biological monitoring of Hazardous Chemical Substances. Dr Tony Cantrell of the NCOH will be approaching laboratories with a view to collecting such data, which will be used to follow trends in biological monitoring, and the effect of the new regulations.

A video on biological monitoring is in preparation and will be advertised when complete.

A full guideline on the biological exposure indices as gazetted in the Hazardous Chemical Substances Regulation has nearly been finalised. Reference has been made to information published by NIOSH and ACGIH and will cover the following topics:

Substance name; Chemical formula; Synonyms; Descriptions; Uses; Metabolism (includes absorption and elimination); Effects of occupational exposure; Confounders; OEL; Biological monitoring; Normal reference range; BEI (RSA); Withdrawal level/maximum exposure level; and Biological effect monitoring.

These will be published as a guideline file. Further information can be obtained from SASOM's national office.

Health at work week

20th - 24th May 1996

20 May: Whole day conference. Cost R250

21 May: Southern Life half day seminar on "Disability, ill-health, new Labour Relations Act - the employee, employer and insurers duties and rights". Cost R60

23 May: Stress workshop - whole day. Free of charge

24 May: Ramazzini Meeting: Nosa's new occupational health module, and Prof B de Villiers: "The Occupational health centre - should it also provide primary health, should it be on site, its necessary evils and values". Cost R40

All prices include catering (excl. VAT)

Contact:

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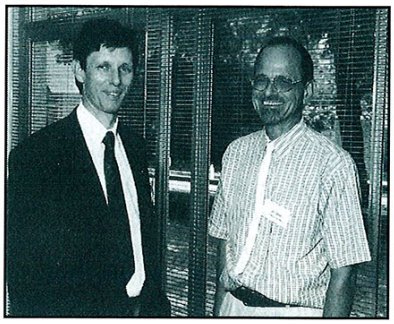
The road to Medichem 1998



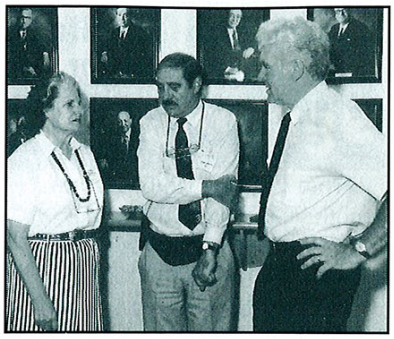
Left to right: Dr WM Coombs (Sentrachem) and Dr U Graf (University of Zurich)

SASOM is hosting the Medichem international conference on occupational health in the chemical industry in September 1998 in Cape Town. SASOM with the chemical industry wishes to ensure an ongoing dialogue with all interested parties through responsible care. It is in this spirit that SASOM and Sentrachem provided financial assistance to Prof. Uli Graf of the Department of Toxicology of the University of Zurich to attend the Pan African Environmental Mutagen Society (PAEMS) 96 conference in Cape Town.

Prof. Graf in his talk on the use of Drosophila in toxicity testing for mutagenicity illustrated yet again the need for studies to assess the hazards of chemical compounds. His full paper is available from SASOM's office

SASOM and the organising committee of the Medichem conference will be hosting similar talks, workshops etc. leading up to 1998 which will include the chemical industry, community, government, employee groups etc.

This is a further call for interested parties to contact Dr W M Coombs, chairman of the organising committee at



Left to right: Prof N van Schaiks (University of the Witwatersrand, Dr K Pheiffer (AECI), Dr H Hitzeroth (University of Pretoria)

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Pretoria Professional Society of Occupational Health Nurses

Proposed Programme for 1996

All meetings commence at 13:30 unless otherwise stated

February 7	Management of OH Services/Role of OH practitioner in industry.
Speaker	Brenda Webster
Venue	PMP Pretoria West
March 6	Dermatology in the industry
Speaker	Dr Hardie de Beer
Venue	CSIR Conference Centre
April 3	Asthma in OH
Speaker	Dr Danie du Toit
Venue	Transfarm Innesdale
May 8	Feminine Health - side effects of hormone deficiency/ hormone therapy
Speaker	Dr Pentz
Venue	HF Verwoerd Hospital
June 5	Industrial Relations - Disciplinary & grievance procedure
Speaker	To be confirmed
Venue	Feltex Foam - Rosslyn
July 3	Diagnozing Occupational Diseases
Speaker	Dr M Coombs
Venue	Bosal Africa - Koedoespoort
August 7	Interpretation of Lung infections etc
Speaker	Dr G B Irsigler
Venue	Siemens - Waltloo
September 4	Annual General Meeting (AGM)
Venue	Venue to be confirmed
October 2	Management of Regulations for hazardous chemical substances (OHS-Act) in industry
Speaker	Johan Louw - Dept. of Labour
Venue	Pick 'n Pay Hypermarket - Faerie Glen
November 6	End of year function
Venue	Venue to be confirmed

Recommendations for influenza vaccines - 1996

Recommended vaccine formulation

The following strains have been recommended for the 1996 influenza season by the World Health Organisation Collaborating Centre for Influenza Reference and Research, Melbourne, and the Southern Hemisphere Network for Influenza Vaccine:

A/Johannesburg/33/94 (H_3N_2)-like strain

A/Texas/36/91 (H_1N_1)- like strain

B/Harbin/07/94-like strain or B/Beijing/184/93-like strain

Indications

1. Persons who are at high risk for influenza and its complications because of underlying medical conditions and who are receiving regular medical care for conditions such as chronic pulmonary and cardiac disease, chronic renal disease, diabetes mellitus and similar metabolic disorders, and individuals who are immunosuppressed.
2. Residents of old-age homes, chronic care and rehabilitation institutions.
3. Children on long-term aspirin therapy.
4. Medical and nursing staff responsible for the care of high-risk cases.
5. Adults and children who are family contacts of high-risk cases.
6. All persons over the age of 65 years.
7. Any persons wishing to protect themselves from the risk of contracting influenza, especially in industrial settings, where large-scale absenteeism could cause significant economic losses.

Contraindications

1. Persons with a history of severe hypersensitivity to eggs.
2. Persons with acute febrile illness should preferably be immunised after symptoms have disappeared.
3. The vaccine, although considered safe during pregnancy should, nevertheless, be delayed until the 2nd or possibly 3rd trimester to minimise the theoretical risk of teratogenicity. However, if high-risk indications exist, delaying immunisation should be avoided.

Timing

Vaccines should be given sufficiently early to provide protection for the winter. A protective antibody response takes about two weeks to develop.

Chemoprophylaxis

In cases where vaccine has not been administered, consideration should be given to the use of supplementary chemoprophylaxis with amantadine in certain high-risk individuals, e.g. patients with chronic lung and heart disease. Amantadine should be administered in a dosage of 200 mg daily, i.e. approximately 6 - 12 weeks. The dosage should be reduced in persons with renal disease and persons over the age of 65

With acknowledgements to the SAMJ Vol 86, No 2, February 1996, 193.

Occupational health risk management - benefits vs costs

JA Bradley

Risk management is a comprehensive strategy for dealing with risks. It can be described as a managerial function aimed at protecting people, assets and profits against the adverse consequences of risk. The term risk management was first coined in the United States in 1956 by HW Snider in the Journal of Insurance and the first risk management policy in South Africa was signed by Mike Rosholt of Barlow Rand.[1]

The risk management process involves risk identification, evaluation, control and financing. Occupational health falls into risk control which is aimed at reducing the magnitude and frequency of exposure to those factors which could lead to industrial disease such as silicosis and industrial hearing loss.

The Occupational Health and Safety Act(Act 85 of 1993) as amended and all Regulations promulgated under this statute aim to protect the health and safety of employees in the work environment and any member of the public who could be affected by the activity of the industry. This statute defines risk as the probability that injury or damage will occur. It further requires that the employer establish the hazards to the health and safety of persons at work.

The Environmental Regulations for Workplaces set out the requirements for noise, illumination, thermal stress and ventilation. Lead and Asbestos Regulations stipulate the requirements for these substances. The Regulations for Hazardous Chemical Substances (HCS) list some 700 chemical stress factors and set out Occupational Exposure Limits (OELs). These regulations require that the employer assess the risks of potential exposure to the listed substances. Assessment is defined as a programme to determine any risk of exposure to a HCS associated with any hazard at the workplace in order to identify the steps needed to be taken to remove, reduce or control such hazard. When making the assessment, the employer shall keep a record of the assessment and take into account the HCS to which an employee may be exposed, what effects the HCS may have on an employee, where the HCS may be present, in what physical form it is likely to be, the route of intake, the extent to which an employee can be exposed, the nature of the work, and any reasonable failure in control measures. The key concept here is the word "extent". This implies the probability of exposure.

In order to establish the above, a comprehensive risk assessment needs to be performed by a person or persons qualified in such matters. Only then may the employer be required to quantify (measure) the risks and perform a biological and/or medical monitoring programme. The philosophy behind first performing a risk assessment then quantifying the risk, are the costs of monitoring programmes.

The Compensation for Occupational Injuries and Diseases Act (Act 130 of 1993) (COIDA) regulates the payment of compensation to employees who have contracted a disease while in employment. As long as the disease arose out of and in the course of employment, that employee is entitled to compensation. The compensation amount is based on the employee's earnings at the time of diagnosis of the disease and also the severity of the disease. In the last few years, the value and the number of claims for occupational disease have been on the increase due to increased employee/union awareness.

Workmen's compensation rebates are paid on the historical claims history of a company based on a fixed period of three years and further, on an assessment, the criteria of which include a) the compensation amounts paid out by the commissioner for injury/disease arising

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Occupational Hygiene Manager
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in Gauteng, 1996

Asthma Seminars	Headache Seminars
8 May 1996	17 May 1996
16 July 1996	23 July 1996
8 October 1996	22 October 1996

in KwaZulu-Natal, 1996

Asthma Seminars	Headache Seminars
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from that company and b) the number of accidents for that company.

Section 85(1) states that if, in the opinion of the commissioner, the business is designed, equipped, organised or conducted in such a manner so as to prevent occupational accidents/diseases, the commissioner may lower the tariff which that company pays annually.

If a company wishes for reduced compensation tariffs (premiums) they may apply to the commissioner to inspect the company to see whether the company is managing its health risks adequately. The problem is that the workmen's compensation inspectorate lacks the necessary training for such inspections and there is a dire shortage of inspectors to carry out such tasks.[2] The occupational health and safety inspectorate with its particular skills should be able to provide this service to the commissioner. However there is a lack of inspectors in this department as well.

Many industries are now linking their insurance premiums and rebates to health and safety risk management programmes such as rebate amounts linked to NOSA 5 star and occupational health management programmes. This makes a great deal of sense. Industry should be penalised through its insurance premiums if it is not managing its health risks and potential exposures.

Are the costs of occupational health management programmes really justified? In 1990 the Workmen's Compensation Commissioner spent R452 147 462 in total for the compensation of industrial disease and injury. Of this, R2 607 818 was paid out for compensation of industrial disease.[3] On the other side of the coin, in 1994 at AECI Explosives Ltd Detonators Plant at Modderfontein - a division with about 100 employees working in lead areas, some R2.5 million was spent in compliance with the Lead Regulations .[4] Is this really justifiable in view of the kind of fines being imposed on employers for non-compliance? Thor Chemicals comes to mind: R13 500 for 2 mercury-related deaths. One has to remember however, that if all 100 employees were to contract lead poisoning, what would the financial implications be, not only in fines in terms of non-compliance to the OHS Act, but the increased workmen's compensation premiums and also hidden costs such as medical costs, employee removals, re-training etc? A mere R25 000 was spent on occupational health risk assessments in Detonators department. This is "a drop in the ocean" compared to the potential costs were those employees to contract lead related health effects. This seems sufficient justification to comply with legal requirements.

In 1985, community concern about the health, safety and environmental risks arising from the chemical industry led to the formulation of the "Responsible Care" initiative in Canada. Other countries followed and in 1994 the Chemical and Allied Industries' Association (CAIA) in South Africa committed itself to the Responsible Care drive. The chemical industry has realised the need to carry out its operations in a responsible manner in order to protect its employees and the public from potential risks resulting from its core business. One of the Responsible Care management standards relates to the health and safety of persons and one of the requirements is that management perform exposure assessments and safety analyses to evaluate health and safety hazards to employees from processes; equipment; potentially hazardous chemicals, physical or biological agents; or other worksite conditions. This is in line with legislative requirements and the South African industries' quest for world class performance. In the "new" South Africa, the drive is towards basic human needs and rights.

Occupational health has been identified as a priority issue in the Reconstruction and Development Programme[5] and CAIA is making a serious effort to address this issue - the benefits of implementing such programmes outweighing the costs.

The World Conservation Union, the United Nations Environment Programme and the World Wide Fund for Nature together have launched the "Caring for the Earth" initiative - the purpose of which is human responsibility for the earth.[6]

All of the above initiatives are aimed at protecting our environment and people from the negative impact resulting from man's activities.

Summary

Integrated risk management programmes need to be put into place in order to prevent occupational disease and injury and environmental degradation. The role of occupational hygienists has never been so important as it is now and their assistance in achieving the above visions requires little amplification.

References:

1. *Valsamakis AC, Vivian RW and Du Toit GS The Theory and Principles of Risk Management.* Butterworths, 1992.

2. *Workmen's Compensation Commissioner, January 1996.*

3. *Workmen's Compensation Commissioner, July 1995 For Year 1990.*

4. *AECI Explosives Limited, Detonators Factory, Modderfontein.*

5. *ANC National Health Plan, March 1994.*

6. *Lombaard W."Responsible Environmental Care" National Safety and Occupational Hygiene July/August 1995 Vol Lv No 4.*

The chemical industry's Responsible Care initiative

R Fogel

Dr R Fogel
Pr:End, PhD

Before discussing Responsible Care, some information on CAIA - the Chemical and Allied Industries' Association. Our industry is large and important with a combined annual turnover of more than R30 billion. In the manufacturing sector it is second in size only to the food industry. Our members include all the bigger companies and many of the smaller ones. CAIA's fundamental purpose is to represent our members and promote their well-being, influence and image. The industry recognises that its licence to operate depends on the goodwill of the people among whom it functions, and Responsible Care is the mechanism for ensuring this. In fulfilling this mission we are committed to continuous improvement in our safety, health and environmental performance and to keeping the public informed of our progress.

This is an "Initiative" rather than a "Programme": the word programme suggests a once off series of events, whereas an initiative conveys the impression of something ongoing and permanent.

Responsible Care came about following a disturbing sequence of industrial disasters over the past 30 years. These included Seveso, Bhopal, Piper Alpha, Minimata etc. Not surprisingly this gave rise to a widespread feeling that the chemical industry was prohibitively hazardous. A coherent and positive response was developed in Canada in 1984 where the Canadian Chemical Producers' Association decided that a comprehensive strategic process was the only way to recover public acceptance, and this was the first formal enunciation of "Responsible Care".

Since then it has been adopted by nearly 40 chemical associations throughout the world, and in this country CAIA launched it in April 1994.

Responsible Care:

- Commits companies to improved Safety, Health and Environment (SHE) performance
- Recognises and responds to public concern
- Supports sustainable development

It is a code of ethics and behaviour, backed up by guidance on how to comply. Commitment to Responsible Care is a public undertaking by the Chief Executive of a company pledging himself and his organisation to comply with demanding principles, best encapsulated in the overall concept of Sustainable Development: ensuring that progress today is not at the cost of the well-being of future generations. Responsible Care follows naturally from the fundamental ethic of Sustainable Development, hence this basic pledge. Responsible Care also pledges the company to co-operation with other companies and with Government on safety, health and environmental issues. It demands that companies take full account of the SHE implications of existing and planned operations. Perhaps most important of all it forces companies to communicate with employees, the authorities, customers and affected communities. The Chemical industry is unique in applying this policy of openness. It is necessary to stress that Responsible Care envisages safety, health and environmental issues as part of a continuum, and in so doing recognises that they are inherently inseparable. It is concerned with the well-being of people inside and outside the factory and with that of the environment in which we all live.

Without appropriate guidance, these pledges are platitudinous, even meaningless, so Responsible Care provides member companies with guidelines, termed Manage-ment Practice Standards. These cover:

- Health and safety in chemical plants and facilities
- Waste management and pollution control
- Transportation of chemicals
- Storage and distribution of chemicals
- Community awareness and emergency response
- Product stewardship

In this country the first five of these documents have been used and the sixth on Product Stewardship should be available within a matter of weeks. More than 40 workshops on the standards have been held since launching the initiative 18 months ago, where CAIA members have debated their contents and by so doing made the best practice by the most advanced companies in the industry available to all who attended.

Adherence to the principles set out in these documents will shortly be estimated by member companies using a self evaluation questionnaire, and in due course CAIA will publish the collated results as a starting point for the evaluation of subsequent progress. Our overseas colleagues have all found that Responsible Care has greatly improved SHE performance, as demonstrated by the steady reduction of emissions, accidents and complaints. Public perception still seems equivocal, as shown in a recent survey by CEFIC, the European Federation of Chemical Industry Associations. This is sad but hardly a surprise: it tells us we have to try harder and do better. Particularly in this country we seem to find it difficult to get a coherent message across to the public. If industry were better at this, and if it grasped the importance of public participation at an early stage, development would not encounter such opposition and, for example, the chaos surrounding dumping of hazardous waste in Gauteng would have been avoided.

Experience has shown that all management initiatives are more effective if they are treated as an integral part of the whole process of running the organisation. Safety, health and environmental management must thus be a part of the way the organisation operates, not an added on afterthought. Nobody, and certainly no company, is perfect, and what we are seeking to impart via Responsible Care is a mechanism for ensuring continuous improvement. CAIA therefore urges companies committing themselves to Responsible Care to set up a management system which starts with an appraisal of the position at the time of commitment. The organisation must then decide its policy, provide the resources to implement that policy, set targets for improvement and implement them. In due course it must audit its progress, reconsider its policy and set new targets. The process is iterative and demands continuous re-appraisal and improvement. An international standard on the subject, ISO 14000, is expected to be published in the near future, formally embodying this approach. Responsible Care is fully compatible with this standard, so that a company embarked on this initiative will not have to retrace any of its steps if it wishes to obtain formal ISO accreditation.

CAIA will make commitment to Responsible Care a condition of membership, probably in mid-1997, three years after the initiative was launched here. Everywhere this approach has been used overseas, it has, together with the self-assessment procedure, provided a mechanism for exerting peer pressure and an effective force for the improvement of SHE performance. The self-assessment procedure will also highlight organisations needing assistance, and provide a potential sanction mechanism against those unwilling to improve performance. In order to reassure the public that Responsible Care is not just a window dressing exercise, CAIA also plans to introduce external verification of member company compliance with the Management Practice Standards.

CAIA is convinced that Responsible Care will improve the SHE performance of our industry and so enable it to continue to serve its stakeholders and society in general.

Occupational exposure to benzene among service station attendants

Shuraib Manjra, Simphiwe Mbuli

Introduction

Petrol vapours are a complex mixture of hydrocarbons, mainly in the C_{4-6} range. Benzene constitutes two to five percent of petrol by volume in South Africa. This makes it one of the most important constituents from a public health viewpoint considering its proven health risks. Benzene has been classified as a proven human carcinogen (A1) by the international Agency for Research into Cancer (IARC)[1]. Prolonged exposure to high concentrations of benzene has been associated with increased risk of various lymphopoetic malignancies.

The draft Regulations for Hazardous Chemical Substances[2] was published by the Department of Manpower (now Department of Labour) in 1995. The purpose of the regulation was to control workers' exposure to hazardous chemical substances through setting of Occupational Exposure Limits (OEL) above which workers should not be exposed without adequate control measures being instituted. The Regulation set a Control Limit of 5 parts per million (ppm) for benzene.

Service station attendants by virtue of their exposure to petrol fumes were identified as a group of workers affected by the provisions of the then draft regulation, now promulgated under the Occupational Health and Safety Act of 1993[3]. Their exposure to benzene occurs over a working shift of up to eleven hours. A risk assessment conducted by us indicated the potential for exposure and was thus categorised as being a potential risk.

The absence of vapour recovery systems, found in many European countries, contributed to this risk categorisation. Categorising exposure as such necessitates air monitoring, one of the fundamental tools used to evaluate workplace contaminants. It is in view of this requirement of the regulation, in addition to the fact that benzene is designated a Control Limit in the said Regulation, that exposure assessment in the form of air monitoring was conducted.

Subjects and Methods

Service stations in three geographical areas of the country - KwaZulu-Natal, Gauteng and the Western Cape - were classified according to the following criteria: volume throughput; location of service station (urban and suburban); the extent to which the service station may be enclosed (e.g. under a building); the concentration of benzene in petrol and environmental factors such as ambient temperature, relative humidity, altitude, and wind factors. These criteria were chosen because of their ability to affect exposure patterns. In urban environments tail pipe benzene emissions may contribute to overall benzene exposure; in enclosed service stations the contribution of wind factors in mitigating exposure may be reduced; and temperature and relative humidity may play a role in vaporisation. "Worse case scenarios" were preferred. Based on monthly volume throughput, service stations were divided into high (> 200 000 litres), medium (> 140 000 litres) and low (<80 000 litres) volume stations.

Three service sites were chosen in each of the provinces, representing low, medium and high volume throughput stations. Depending on the number of employees per shift at a particular service station, which varied between two and nine, two to five attendants were randomly chosen for personal monitoring. In all of the low volume throughput stations sampled there were only two workers on a particular shift,

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in which case both were sampled.

Monitoring was conducted using passive (diffusive) samplers. A diffusive sampler is a device which is capable of taking samples of gas or vapour pollutants from the atmosphere at a rate controlled by a physical process such as diffusion through a static air layer or permeation through a membrane, but which does not involve the active movement of the air through the sampler[4]. This method was preferred to pump (active) sampling because of its simplicity and ease of use. Their light weight compared to pumps makes them less obtrusive and more acceptable to workers. In addition, the number of personnel involved and the wide distribution of service stations around the country would require a great number of pumps. The high costs associated with the use of sampling pumps which include the cost of purchase, use and maintenance, and the consulting fees of an occupational hygienist, were important considerations. The overriding consideration however, was that comparisons between active and passive sampling in benzene monitoring, particularly in long term sampling, show comparable results[5].

Organic Vapour Monitoring (OVM) badges were used to collect personal exposure samples. Traceair badges manufactured by Gillan Instrument Corporation, USA, were used to collect samples in the Cape Town survey. In the Durban and Johannesburg surveys badges manufactured by 3M were used. Sampling is initiated by removing the cover of the badge and attaching it nearest the breathing zone of the worker, in this case the shirt or overall collar. At the end of the sampling period the cover was replaced and the sample labelled. In accordance with the manufacturers' specifications, the sampling rate was taken to be 35.5± 0.6 cc/min. In addition to the samples, at least one field blank was collected at every service station sampled. The purpose of collecting field blanks is to detect contamination of samples during handling, transportation and analysis and were therefore handled in the same manner as the sampling monitors except that they were not used for sampling.

Temperature, relative humidity, wind factors and barometric pressure were recorded at the commencement, middle and end of the study. For analysis, the mean of the three results was taken.

The Traceair badges were analysed by a private laboratory in Cape Town and the 3M badges by the 3M laboratory. In both cases the sampling media were desorbed using carbon disulphide and the analyte analysed using a gas chromatograph fitted with a flame ionisation detector. The minimum detectable limit according to this method is 10 micrograms (0.003 ppm). The final results were calculated using the method recommended in the manu-facturers' "Sampling and Analysis Guide", after taking into account temperature, recovery coefficient and correcting for field blanks.

The data was captured on Dbase 3+ and analysed using Epl-Info Version 6. For analytical purposes the samples which had contaminants below the detectable limit, were considered at the lower limit of detection (0.003 ppm).

Results

Twenty six petrol pump attendants were sampled. The sample included at least 50% of a shift size in all cases except one where 2 out of 6 attendants were sampled. Sampling time varied according to the shifts at individual service stations. Attendants were monitored for a full shift which varied between 393 minutes to 835 minutes, with a mean exposure time of 542 minutes. The results are summarised in **Tables I and II**. All results were well below the Occupational Exposure Limit of 5 ppm (or this limit corrected for shifts longer than 8 hours). The highest value recorded was 1.03 ppm in a single worker. This outlier was excluded in further analysis. The mean exposure to benzene was 0.15 ppm (range: below detectable limit- 0.47 ppm).

The mean exposure level in Johannesburg was significantly higher than both Cape Town and Durban ($p<0.005$). The mean exposure in the low, medium and high volume stations was not significantly different. There was a weak, non significant, negative correlation between volume throughput and exposure ($r=0.17$).

There was no correlation between environmental conditions and exposure.

Discussion

This study found a low level exposure to benzene among forecourt attendants at petrol service stations. The mean exposure of 0.15 ppm closely approximates those found in other studies. European studies[6] conducted between 1986 and 1992 show a mean exposure of 0.19 ppm (range: 0.05-3.34).

Area	Volume	Mean exposure (ppm)	Mean exposure by area (ppm)	Range of area (ppm)
Cape Town	low	0.00		
	medium	0.04	0.05	0.00-1.03
	high	0.41		
Johannesburg	low	0.60		
	medium	0.31	0.27	0.10-0.47
	high	0.20		
Durban	low	0.23		
	medium	0.04	0.11	0.04-0.31
	high	0.09		

Table I: Summary of results

Kearney and Dunham[7], found a mean exposure of 0.10 ppm to benzene in a high volume service station in the USA, while Ollison[8] found a mean of 0.07 (range: not detectable - 0.18). McDermott and Vos[9], in surveys conducted at many centres in the USA, found exposures ranging between 0.02 and 0.24 ppm.

The wide range of individual results could be explained by variations in work practices and the performance of additional tasks such as tank dipping or supervising deliveries. Work practices giving rise to additional exposure would include standing next to the fill opening or the habit of trying to visually assess the fullness of the petrol tank where the attendant's face comes close to the fill opening. Spills also account for additional exposure especially to the individual involved in the cleaning up operation. Spills were not recorded in this study. The cause of the high levels in a single worker (1.03 ppm) could not be ascertained as he had died from cancer of the colon in the period between sampling and analysis. The significance of the latter to exposure is not clear, but unlikely.

The lack of significant differences in mean exposure between low, medium and high volume service stations and the weak, non-significant, negative correlation between service station volume throughput and exposure could be explained by the average volume of fuel pumped by an individual worker. The latter is not known but a reasonable assumption is that the volumes pumped per attendant are roughly similar. High volume service stations proportionally employ more attendants than do low volume service stations; as a result the volume pumped per attendant may be equal or greater in the low volume service stations, partially explained the weak negative correlation.

The low levels of exposure in Cape Town relative to the other areas is possibly due to the use of different sampling badges and analytical laboratories. This is evident from the lower sensitivity of the Cape Town laboratory. The cause of the significantly higher mean exposure in Johannesburg is also unclear. The added significance of this is that the percentage benzene by volume is lower inland compared to coastal areas. The difference may be explained by environmental causes (lower relative humidity, less windy conditions, higher temperature on the day the survey was conducted) or higher environmental benzene concentration. There was no correlation between exposure and ambient conditions such as temperature, relative humidity, barometric pressure and wind conditions. Background benzene levels were not measured.

This study suffers several limitations. The small sample size and the fact that the study was conducted on a particular day of the week during the summer months, limits the ability to generalise the results. No short term exposure sampling was conducted to ascertain short term exposures and to ensure regulatory compliance with short term exposure limits (STEL). The latter may be high during an actual vehicle fill-up, during petrol delivery and gauging, and during

Volume throughput	Mean exposure (ppm)	Range (ppm)
Low volume	0.20	bdl-0.47
Medium volume	0.14	bdl-0.39
High volume	0.14	bdl-0.36

bdl - below detectable limit

Table II: Mean exposure by volume throughput

spill clean up which occurs infrequently. Accurate assessment of the volumes of petrol pumped by individual attendants rather than a rough estimation, number of cars filled up, as well as observation of work practices may be important to explain the variation in exposure. These shortcomings will be cor-rected in future studies which would need to be conducted in light of the introduction of unleaded petrol.

Conclusion

This study found benzene exposure to service station attendants well below the Occupational Exposure Limit of 5 ppm and in all but one case, well below 1 ppm. At these low levels the risks to petrol pump attendants can be considered minimal. Factors responsible for variable exposure were not identified.

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Monitoring blood lead levels in South African industry in 1995

*A SCBM:SASOM*Project*

AC Cantrell & RL Landless

Abstract

A number of local laboratories co-operated in a study of blood lead levels obtained during biological monitoring done in terms of the Lead Regulations. The findings indicate that the existing removal level of 80µg/dl could be lowered without major implications to lead users.

Background

The routine measurement of blood lead levels in exposed workers is required in terms of Lead Regulations under the Occupational Health & Safety Act (No 85 of 1993)[1]. Probably the one most critical requirement of these regulations is the statutory removal from work of male workers whose blood lead level is found to exceed 80µg lead/100dl of whole blood on routine examination. This value is considerably higher than bio-monitoring action levels in many other countries[2], and the results of this study should be useful in reviewing the local regulations.

This report presents the findings of a recent project carried out by the Scientific Committee on Biological Monitoring (SCBM) of the SA Society of Occupational Medicine (SASOM). The SCBM comprises representatives from SASOM, SASOHN, the universities, SAIMR, NOSA, CSIR, government departments, the National Group of Pathologists, the Federation of SA Pathologists, and others. One of the projects of the SCBM is to evaluate trends in biological monitoring, and to make the appropriate recommendations to the responsible authorities. This study was initiated by the SCBM, and the results are presented on its behalf.

Study population

The twelve laboratories currently participating in the National Blood Lead Quality Control Scheme run by the NCOH were invited to participate in the project. These laboratories regularly analyze control specimens circulated by the Scheme, and have performed within a narrow window of accuracy for many years[3]. Of the participating laboratories, three were not doing any biological monitoring, and two did not supply data. The seven laboratories which submitted data for this study, however, handle the vast majority of blood lead estimations done in the country. In order to guarantee confidentiality of both patients and laboratories, each laboratory was asked to submit only a list of the blood lead values measured during a three-month period in 1995. Laboratories were coded, and no patient details regarding name, gender, age or occupation were obtained. In a way, this may have detracted from the value of the data, but such details are often not available to the laboratory and would have introduced certain ethical constraints. It can be assumed, however, that the workers screened were predominantly male.

Results

The laboratories were coded A to G descending order of the number of assays done during the 3 month study period. This number ranged from 2229 to 35, with a mean of 649 and a median of 388. A total of 4541 results was analysed. These data are presented in Figures 1 and 2.

Certain factors should be borne in mind when evaluating the data. One cannot generalize these data to all workers exposed to lead. It is possible that where no monitoring service is in place, exposure levels may be higher. Furthermore, the strategies applied in biological monitoring usually concentrate on those workers with the highest exposure. The whole workforce may not be screened as frequently as those most at risk. It can also be expected that any such data set will contain multiple

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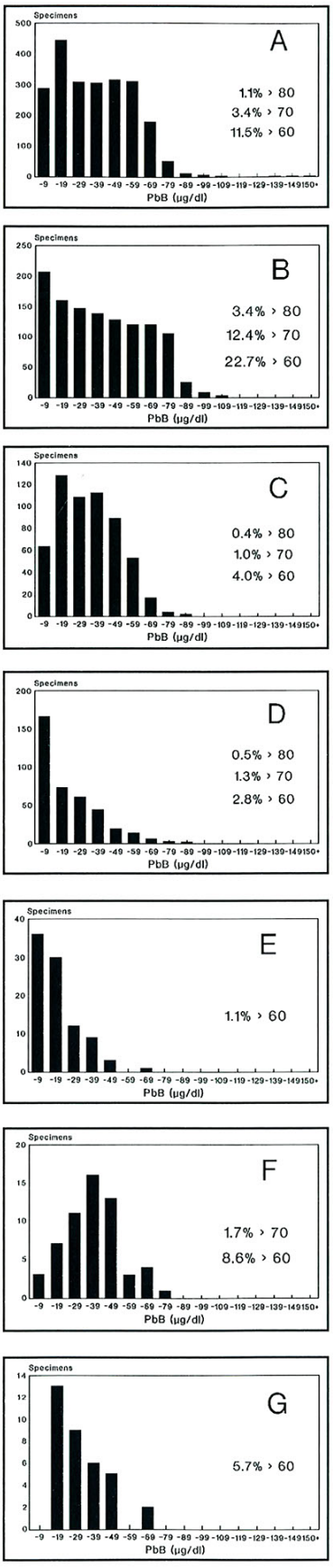

Figure 1: The distribution of blood lead results from individual laboratories A to G

results from those workers with high exposure, who will be monitored closely following withdrawal from exposure. Such results would tend to introduce an upward bias within the set.

Inter-laboratory comparison

From Figure 1, it will be seen that the distribution of results varies between laboratories. Apart from the number of specimens handled, the distribution pattern also varies. By applying the Chi Squared test, Labs A & B, and A & C are shown to differ significantly. This is partially due to the specific customer mix, and the marketing strategy of each laboratory. However, the distribution of results obtained by the high volume laboratories offering a monitoring service reflect relatively high blood lead levels. One can conclude that they are serving lead-using industries where significant exposure occurs. Labs D & E are commercial laboratories which monitor workers with a lower average exposure. Labs F & G, on the other hand, do their own in-house monitoring where the whole work force is screened, and the patterns represent specific environments.

It should also be borne in mind that not all blood lead estimations done represent biological monitoring. Certain laboratories also carry out differential diagnostic lead tests and will tend to record a larger proportion of normal values.

Pooled data

Whatever the variation between laboratories, it is clear from Figure 2 that extensive biological monitoring of lead

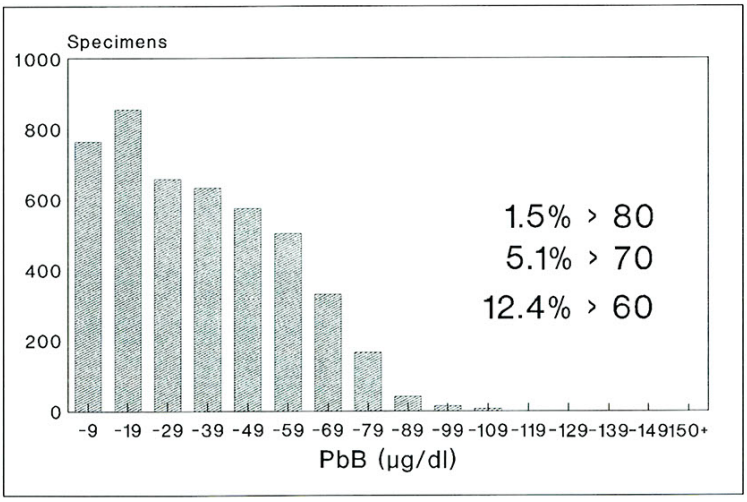

Figure 2: The combined distribution of blood lead results from all laboratories

exposure is taking place in South Africa. Extrapolating for the whole of 1995, at least 18 000 tests are done annually. Of these, only 1,5% exceed the 80µg/dl legislated limit, while 0,3% exceed 100µg/dl. The main finding of this study, however, lies in the number of results in the region below the 80µg/dl limit, levels towards which our legislation should be moving. That only 5,1% of all results, some of which may be repeat estimations, exceed 70µg/dl implies that the economic implications of conforming to a lower limit would not be excessive. It is therefore recommended that the findings of this study be used as the basis for reassessing the Lead Regulations.

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The emergency treatment of cyanide poisoning

HJ van der Merwe & G Greyvenstein

Abstract

Cyanide poisoning occurs from systemic absorption of cyanide and its derivatives. Immediate first aid and nursing or medical attention is essential to secure the survival of a casualty overcome by cyanide exposure. A treatment guideline is provided for this purpose.

Introduction

Cyanides have the potential to be highly toxic through the inhalation, absorption (skin, eye) and ingestion thereof.

Cyanides are also one of the quickest acting poisons, inhibiting the mitochondrial oxidation-reduction reactions systems in body tissues with resulting anoxia.

Uses

Cyanides are mainly used for extracting gold from ore in the mining industry, for electroplating in the metal industry, for fumigation in pest control, in the manufacturing of nylon in the plastic industry and in formulating other chemical derivatives. Hydrogen cyanide (HCN) is a colourless or pale blue liquid or gas with an odour of bitter almonds.

Cyanide also occurs naturally in small amounts in almonds,[1] cassava roots, lima beans and in the pits of apricots and peaches. Vitamin B12 also contains cyanide but is tightly bound and not harmful.

Exposure to cyanides

Exposure to cyanides can occur in work places where cyanide is produced and used, by breathing motor vehicle exhaust fumes (a main source of cyanide release into the air) as HCN, by breathing air or drinking contaminated water near industrial effluent discharges or waste sites. Tobacco smoke also contains small amounts of cyanides.

Skin contact with hydrogen cyanide or cyanide salts can produce skin irritation and superficial sores.

Various bacteria, fungi and algae can also produce cyanides.

Interestingly, the coral reefs of the Philippines[2] supply 70% of the world's marine fish for the aquarium industry and most of the fish are caught with cyanides by squirting it into the reef to paralyse the fish. Fish from the reef provide half of the inhabitants' protein diet and 700 of the 2500 fish catchers have so far been trained to use nets in an on-going education programme.

First aid treatment

It is important to apply prompt first aid treatment and to obtain immediate nursing/medical assistance.

A first aider and the casualty must be protected from further cyanide exposure during decontamination and treatment.

Inhalation

Remove the casualty from further exposure. Keep the casualty warm and at rest. Administer oxygen by means of a facial mask if the casualty is breathing. If the casualty is not breathing apply artificial respiration by giving oxygen with a suitable bag or mask mechanical device. **Don't apply mouth to mouth resuscitation!**

Skin contact

All contaminated clothing of the casualty must be removed and the skin must be washed under a water shower. Continue further treatment of the casualty as for inhalation.

Eye contact

Irrigate the eye(s) with water for at least 10 minutes. Continue further treatment of the casualty as for inhalation.

Ingestion

Usually nothing is given by mouth. Continue further treatment of the casualty as for inhalation.

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Antidotes

The Health and Safety Executive (HSE)[3] in the United Kingdom has recently concluded that it "will no longer recommend the use of any antidote in the first aid treatment of cyanide poisoning and will not require employers to keep supplies".

The situation in of South Africa differs from that in the United Kingdom in view of the large quantities of cyanide used in the local gold mining industry.

The use of solutions A and B[4] is no longer recommended.

The use of 500ml 1% Sodium Thiosulphate for treating ingested cyanide remains questionable.

The use of amyl nitrite for inhaled cyanide by nursing and medical staff continues to be used although there is little scientific evidence that it is of significant benefit.

The availability and administration of **oxygen** is essential.

Kelocyanor[5] is the only proven cyanide antidote and is to be administered only under the following conditions:

- For seriously ill confirmed cyanide poisoning cases
- It is only to be given by medical staff trained in the use and application thereof
- The casualty has to be hospitalised in an intensive care unit and observed for 24-48 hours

The enclosed summary guideline on the emergency treatment of cyanide poisoning for first aiders, nursing and medical staff will hopefully provide additional assistance and support in the handling of suspect cases or casualties of cyanide poisoning.

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Table - Cyanide poisoning treatment (summary guideline)

Remove the casualty from the contaminated area and also all contaminated clothing, and wash spillages off the body.

Do not give amyl nitrite to a patient if there is any suspicion that the patient may be suffering from other conditions, e.g. heart attack or stroke

Stages and symptoms of cyanide poisoning	First Aid treatment	Nursing and medical treatment
Stage 1 No immediate distress - with/without 1 Headache 2 Breath may smell of bitter almond 3 Dizziness 4 Nausea, occasional vomiting 5 Rapid breathing	1 Following cyanide inhalation - give oxygen at 10 litres/minute and get nursing/medical assistance immediately 2 Following cyanide in eyes - wash eyes with pure water for 10 minutes and continue with item 1 3 Following cyanide ingestion - give 500 ml of 1% sodium thiosulphate to drink (if the patient is conscious) and induce vomiting and continue with item 1	1 Administer oxygen at 10 litres/minute 2 Observe for deterioration
Stage 2 **Distressed** 1 Rapid breathing, becoming difficult 2 Pain in area around heart 3 Distress 4 Weakness in arms and legs	1 The trained Paramedic breaks an amyl nitrite ampoule in a gauze swab and holds under the patient's nose for 15 seconds 2 Give oxygen for 15 seconds at 10 litres/minute 3 Continuously monitor the pulse. Stop amyl nitrite if the pulse weakens or BP drops below 80 mm Hg systolic, and continue giving oxygen. 4 Repeat steps 1 and 2 until the breathing becomes undistressed (Use a new ampoule every 3-5 minutes with a maximum of 4 ampoules) 5 Maintain administration of oxygen at 10 litres/minute until medical assistance is obtained	1 Administer oxygen at 10 litre/minute 2 Administer amyl nitrite as described under First Aid 3 Monitor blood pressure continuously and stop amyl nitrite if blood pressue drops below 80 mm Hg/systolic
Stage 3 **Unconscious and breathing** 1 Severe distress (prior to losing consciousness) 2 Convulsions 3 Jaws may be clenched 4 Unconsciousness	**Note: Nothing to drink to the unconscious patient** 1 Ensure an open airway by inserting a plastic airway 2 Treat as for Stage 2	**Treatment by nursing staff** (Awaiting arrival of doctor) 1 Start intravenous infusion of 50 ml/50% sodium thiosulphate in 200 ml of dextrose as soon as possible (to run in over 10 minutes) 2 Administer oxygen at 10 litres/minute Doctor wil decide on specific antidotes as for **stage 4**
Stage 4 **Unconscious - not breathing** 1 Sudden collapse 2 Convulsions 3 Unconsciousness 4 Cessation of breathing 5 Death can occur within 1 to 15 minutes	1 Ensure open airway 2 Start resuscitation with automatic resuscitator switched to 100% oxygen. If an automatic resuscitator is unavailable, mouth to mouth resuscitation must be given through an airway fitted with a non-return valve 3 If unassisted breathing starts, remove mask and administer amyl nitrite as under stage 2 4 Administer oxygen at 10 litres/minute 5 Observe for deterioration and start cardiopulmonary resuscitation if pulse is absent	**Treatment by nursing staff** Start treatment as for **stage 3** **Treatment by medical doctor** Treatment of choice for **verified** cases of cyanide poisoning is intravenous administration of Kelocyanor. **Method:** Inject 20 ml of Kelocyanor intravenously over 5 minutes followed by 50ml of 50% dextrose. Can be repeated after 5 minutes, if little improvement **Caution** Severe anaphylaxis can occur: Methemoglobinemia can develop from using amyl & sodium nitrite Administer 1% methylene blue (1-2 mg/Kg) IV over 5 - 10 minutes. Observe the patient for 24 to 48 hours after initial recovery

Selecting biomonitoring action levels for occupationally exposed populations

David Rees, C Panter, M Felix, R Weiner, J Wilford

Biomonitoring action levels establish acceptable exposure limits based on observed concentrations of an agent or metabolite in a biological sample, or based on a biologic effect (e.g. enzyme dysfunction). Biomonitoring action levels are fundamental tools of occupational medicine practice because they can provide a rational and systematic alarm system to trigger improved hazard control.

These action levels can also be very dangerous. Inappropriate levels will obscure rather than uncover hazardous workplace conditions. If statutory standards do not apply to a particular hazard, then a standard needs to be selected. The problem is simply that an occupational health practitioner can shop around for an action level that suits the exposure conditions of the workplace, rather than one which protects exposed workers. Economic considerations may be used by companies to drive up the action levels unless practitioners adhere firmly to rational selection guidelines. This article suggests such guidelines for comment.

1. Biomonitoring action levels should be at or lower than current South African statutory standards or guidelines.

2. If no statutory standards or guidelines exist then a level recommended by a recognised occupational health and safety agency should be selected. Appropriate agencies to consider would include ILO, WHO, UK HSE, ACGIH, or European Union. Industry recommended that standards which are higher than those recommended by recognised occupational health and safety agencies should not qualify for selection.

3. In a few instances, it may be appropriate to select a level higher than one recommended by statute or a recognised agency, or a recommended level may not exist. In these cases, the following should apply:

3.1 The selected level should be based on a careful and comprehensive review of the scientific literature.

3.2 If the biomonitoring action level selected exceeds a recognised recommended level a detailed rationale, based on health effects and not on economic considerations, should be compiled.

3.3 The selected level should be subjected to peer review. Peer review should take the form of a written submission to a formally constituted SASOM sub-committee. The proposed levels should be presented to workers for appraisal and, ideally, formal acceptance.

4. If a company selects a level exceeding a statutory or recognised level, or one selected as in 3 above, then the occupational medicine practitioner should not participate in applying or recognising the adopted level.

Biological monitoring and medical surveillance are the critical services brought by occupational medicine to the workplace. A rational and scientific process of standard selection, subject to peer review, is urgently required to strengthen the practice of occupational medicine and improve the quality of care. Occupational health practitioners are, unfortunately, viewed with suspicion by many in organised labour. Good science and transparent processes can help to change this perception.

David Rees, Clifford Panter, Marianne Felix, Renay Weiner, Jane Wilford,

NCOH, Department of Health and Department of Community Health, University of the Witwatersrand, Johannesburg

Jenny Acutt

Jenny Acutt of the Pretoria Professional Society for Occupational Health Nurses, is the first member of the sub-region to be nominated for honorary Life membership and she can be very proud of her achievements.

Jenny started her career in occupational health nursing in 1972 as an industrial nurse at Lever Brothers in Salisbury, "Rhodesia". She has professional qualifications in many areas of nursing (including nurse educator) and is at present studying for a Masters degree - on Occupational Health for health care professionals.

Her professional activities include SA Nursing Association branch activities, serving as the educational representative on SASOHN from 1986-1994 and active participation on sub-regional level of the professional society. She has been a dependable, loyal and enthusiastic member of her sub-region.

In her humility Jenny does not talk much about her international "connections" which reflect an intense commitment to occupational health nursing.

1. Since 1987 she has been a member of three scientific committees of the ICOH

2. Member of the American Association of OHN

Jenny has not only presented papers at various congresses/seminars, but,since 1986,has had many articles printed and co-written chapters for publication.

In 1987 Jenny was co-sponsored by SASOHN to attend the ICOH International Congress on Occupational Health in Australia and packed her bags again in 1990 to attend the WHO Workshop on Education and Training in Amsterdam.

These are only a few highlights of a very interesting and stimulating professional career.

However, one of Jenny's greatest achievements is undoubtedly the Distance Learning Course in occupational health nursing. This course was initiated in 1983 as a project by the (then) Northern Transvaal sub-region, with Jenny playing the major role in its design. After a few years, despite holding down a full time job, Jenny was virtually running the course on her own and it was decided to hand it over to her in its entirety. For the last five years the course has been offered through Wits University, with Jenny holding the position of part-time lecturer and still being responsible for the course.

The benefit of distance learning cannot be underestimated. Many OHNs cannot take time off work, are unable to leave their families for full-time study, or are just too far away to attend any sort of classes. This course has fulfilled a great need. There are surely OHNs reading this article who have derived benefit and been able to further their studies through this course.

We salute Jenny for her foresight. We pay tribute to her hard work and the sacrifices she has made in the interest of occupational health nursing. The distance learning course will (for many years to come) be of benefit to OHNs all over Southern Africa.

Jenny Acutt is more than qualified to have this honour of Life Membership bestowed upon her.

Case Study

A case of hypersensitivity pneumonia in a printer

JS Sapire, D Bartie, L Roodt, J Wilford

Abstract

In May 1995, a 42 year old male developed hypersensitivity pneumonia following exposure to humidifier vapour in a printing works in Johannesburg. An investigation of the printing works was undertaken by the National Centre for Occupational Health (NCOH). Protozoa, Gram negative bacteria and *Legionella* species were found to be present in water samples taken from the humidifiers in the print shop. Immunological testing on blood samples taken from the patient did not reveal the causative agent, but symptoms and chest X-ray findings improved following removal from exposure. There has been no re-occurrence of his symptoms since his return to work, following cleaning of the humidifiers and positive retesting for clearance of the organisms.

Case Report

A 42 year old man began work in a printing works in Johannesburg at the end of May 1995. The works consists of a double storey building with the print-shop on the ground floor and the dark room and offices on the floor above. The print shop is approximately 15 m by 10 m with an entrance on the east side. Two spray humidifiers are in use, one located above the entrance, the second on the south wall, on the opposite side of the room. A fine spray mist can be seen coming from the humidifiers.

On the Monday of the second week at his new place of work, he noticed tightness in his chest and generalised body aches. His symptoms progressed over the next three weeks to a productive cough with mucous secretion, chills, shortness of breath and a weight loss of four kilograms. He was initially treated with antibiotics but with no response. He was previously a well man with no history of atopy, allergy or asthma. He had smoked from the age of 17 to 28, an 11 pack-year history.

After five weeks at work, with no improvement of his symptoms, he was seen by a pulmonologist. Clinical examination, including chest findings, was essentially normal, despite an X-ray which showed a diffuse infiltration of the lungs, with coarse confluent nodular shadowing bilaterally. (Figure 1) The lung functions showed normal lung volumes and a normal single breath diffusion study. The gases however showed a mild hypoxia, with a Po_2 of 53,2 mmHg.

***JS Sapire, D Bartie, L Roodt, J** Wilford*
National Centre for Occupational Health, Johannesburg

The patient was referred to the NCOH Occupational Medicine Clinic to evaluate the work-relatedness of the condition. Haematological, biochemical and serology studies were done but were not helpful in the diagnosis. This included negative testing for antibodies to *L. pneumophila* serogroups 1-6 by indirect mmuno-fluorescence. Humidifier fever was suspected. The patient was removed from the workplace, treated with a course of corticosteroids and watched clinically. A repeat X-ray done following removal from the exposure at work, showed complete clearing of the infiltrate. His clinical symptoms improved as well. These features are in keeping with an immunological lung reaction (hypersensitivity pneumonia) to some environmental or occupational allergen or toxin. The poor response to antibiotics, followed by an excellent response to steroids, supports this diagnosis.

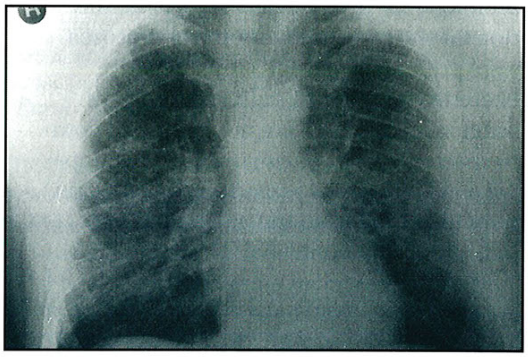

Figure II: chest radiograph shows diffused infiltration of the lungs with coarse confluent nodular shadowing bilaterally

The NCOH Immunology and Micro-biology sections and the Clinic investigated the printing works. Humidifiers are routinely used in the printing industry to

maintain the correct humidity of the ambient air so that the paper will not warp. Two spray humidifiers, of the mechanical atomizer type, were used in this work-site. These were second hand humidifiers and were installed in 1989 and had never been cleaned since. On inspection, the water in the humidifiers was slightly turbid and a thick slime layer (biofilm) lined the water containers of the humidifiers.A water sample from each of the humidifiers was collected in sterile bottles and was tested, qualitatively and quantitatively for the presence of *Legionella pneumophila* serogroups 1-4 and *Legionella micdadei* by culture and direct immunofluorescence, using a standard most probable number (MNP) technique. In addition to this, 50 ml of each sample was centrifuged and 0,1 ml of the sediment plated out onto blood agar for identification of bacteria other than *Legionella*. The rest of the sediment was used for microscopic examination for the presence of protozoa.Protozoa were present (++), and Gram negative bacteria (+++) were cultured from both water samples, but were not identified down to species level. *L. pneumophila* serogroups 1-4 and *L. micdadei* organisms (4,210/litre) were identified from the one humidifier, indicating poor control of the system.

A water treatment company was approached to visit the workplace with an employee of the NCOH. The importance of regular cleaning, treatment and maintenance of the humidifiers was explained to management. The actual cleaning of the system consisted of scrubbing out the humidifiers to remove the slime layer and the subsequent addition of chlorine. After one month, a follow-up sample was collected from the humidifier and tested for the presence of *Legionella* as before. The number of *Legionella* bacteria present in the humidifier had reduced to 710/litre, indicating that the treatment was adequate.

Discussion

Introduction

Hypersensitivity pneumonia is one of a number of inhalation illnesses associated with contaminated humidifiers or air conditioning systems, occurring in industries requiring carefully controlled humidity, such as printing, stationery and the manufacture of textiles.[1,2,3] These illnesses range from the milder humidifier fever to the more severe forms of hypersensitivity and *Legionella* pneumonia. Humidifier fever is the most widely recognised occupational disease in workers exposed to spray humidifiers. It is characterised by an influenza like illness, with constitutional symptoms of fever, chills, headache, malaise, anorexia and occasional polyuria and less commonly respiratory tract symptoms of cough, chest tightness and dyspnoea.[3] Attempts have been made to distinguish between humidifier fever and hypersensitivity pneumonia. One of the differentiating features is their symptom periodicity. In humidifier fever, symptoms are most severe on the first day of the working week, improving rapidly over the remainder of the week. They reoccur on re-exposure after an absence of work, usually after weekends, giving rise to the synonym "Monday night fever" or "Monday Chills".[2] In hypersensitivity pneumonia, symptoms tend to increase in severity with continued exposure to the allergen. Symptoms include cough, rigors, sweating, fever, marked anorexia, muscle and joint pains and occasional nausea and vomiting.[1] Continued exposure may lead to chronic fibrotic lung disease. Humidifier fever can also be distinguished from hypersensitivity pneumonia in that symptoms are more constitutional than respiratory, there is an absence of chronic symptoms of cough and dyspnoea on exertion and lung function and chest X-ray are usually normal.[3] Despite the differences, there remains enormous overlap between the two syndromes and in some studies humidifier fever is thought to be a milder form of hypersensitivity pneumonia.

Aetiology

Neither the cause nor the mechanism of humidifier fever or hypersensitivity pneumonia is known. The specific pathogens remain to be identified, but the excessive growth of microorganisms within the humidification system seems to be the factor common to all outbreaks.[3] Several causes have been postulated on the basis of serological testing, including *Bacillus subtilis*,[4] thermophillic actinomyocetes, mould fungi,[5] bacterial endotoxin, amoeba and *Naegleria gruberi*.[2] *Thermoactinomyces vulgaris* and *Micropolyspora faeni* are thought to be the most common humidifier organisms to induce hypersensitivity pneumonia.

Diagnosis

Diagnosis will depend on the clinician's ability to recognise the characteristic clinical features in the presence of exposure to humidifier vapour, usually in the workplace.

Immunological and physiological examinations may also be useful, but may often yield negative results. In many cases, removal of the patient from exposure, with disappearance of the symptoms, may be the only form of diagnosis. Finally, if other methods have been ineffective, a provocation of the clinical symptoms by controlled exposure challenge can be considered.[5]

Conclusion

In the case described here, no causative organism was established. However, the X-ray changes, his rapid improvement after removal from exposure, the evidence of microorganisms in the humidifier water and the absence of recurrence of symptoms after re-exposure to the cleaned humidifiers was enough to confirm the diagnosis of humidifier induced hypersensitivity pneumonia.

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Industrial mercury use within the Gauteng Province

R Weiner, M Ross

A survey was conducted to assess current industrial mercury use and monitoring practices within the Gauteng area. Although methodological problems were encountered, the results suggest that monitoring practices, particularly of mercury-in-air, are poor. This is supported by the NCOH clinic experience of assessing overexposed workers. Improved regulation of mercury users by enforcement of the Occupational Health and Safety Act and its regulations is a necessary part of decreasing the risk of illness amongst workers.

Introduction

In South Africa, mercury exposure, highlighted by the fatal cases of mercury toxicity in KwaZulu-Natal, has emerged as an important occupational health issue in the past few years. The National Centre for Occupational Health (NCOH) has been receiving numerous requests from both the mining industry and non-mining mercury using industry for occupational hygiene surveys, mercury measurements, and medical referrals to the occupational medicine clinic have increased.

To ascertain the extent and distribution of the mercury hazard within a workplace, as well as to assess the effectiveness of engineering controls, measurement of mercury levels both in the working environment and in exposed workers (biological monitoring) is required. Biological monitoring involves the measurement of mercury levels in blood or urine of exposed workers, so that excessive exposure can be detected by comparison with an established "safe" standard or biological monitoring action level. There were no statutory standards for biological or environmental mercury levels in South Africa until recently. However, the Hazardous Chemical Substances Regulations[1] were promulgated in August 1995 and include Occupational Exposure Levels for mercury in air as well as Biological Exposure Indices from mercury in blood and urine.

In 1993, a small survey was undertaken by the NCOH to investigate the current status of monitoring practices in one geographical area.[2] The broad objectives were to identify industrial sectors which use mercury in one Gauteng region and to establish the extent and nature of monitoring practices in these workplaces.

Methods

Postal questionnaires were sent to workplaces registered as mercury users with the Department of Labour's Gauteng South Office (previously PWV south, one of the three PWV regions). All 58 workplaces registered with this office were contacted by telephone prior to mailing the questionnaire. Twenty-four of the 58 workplaces either claimed to no longer use mercury or had closed down. Questionnaires were sent to the remaining thirty-four workplaces.

Results

The response rate after two mailings was 73,5%. Of the 25 respondents, 10 said that mercury was used at their workplace, while the remainder stated that they were not users or did not provide sufficient information to confirm use.

Mercury users

Mercury was used in a number of different settings. These included the pharmaceutical industry (used as a reagent), paint production (used as an anti-bacterial), the treatment of hazardous waste, the manufacture of tubes for fluorescent lights and the manufacture of brass products.

Monitoring practices

Of the ten mercury users, five conducted biological monitoring, and only two measured mercury in workplace air. Biological monitoring programmes were introduced relatively recently - only one prior to 1990 and the remainder thereafter. Frequency of

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monitoring varied from monthly to yearly and one workplace did only pre-employment measurements. The major reason given for not monitoring was that only small amounts of mercury were used at the workplace and therefore monitoring was thought to be unnecessary.

Discussion and recommendations

A major limitation of the methodology of this study was the unreliable nature of the Department of Labour Gauteng South records pertaining to registered mercury users. This can be attributed to the absence of a mechanism for routine updating of the high risk substance list. A reliable computerised data-base needs to be established for mercury (and other high risk substances) users. In addition to the available registration information, users could be iden-tified from supplies, factory inspections and records of the Compensation Commissioner's office.

A range of occupational settings was reported by the survey respondents. The NCOH clinic has had referrals from several other users both within and outside the study area. These have included producers of chlorine (mercury used as a catalyst) and thiomersal (a mercury based preservative for pharmaceutical products); a goldmine and a jeweller (mercury used for gold extraction). This suggests that mercury is being used for industrial purposes in more than a few isolated settings.

A response bias could be expected whereby the respondents were likely to be those diligent in their monitoring practices. However, respondents included those whose industrial hygiene practices were particularly poor and we believe that this may reflect the lack of attention that heavy metal monitoring has received in South Africa. The survey suggests that unmonitored exposure is a problem in the study area and that mercury could pose a health risk to workers. This finding is surprising in view of the high profile nature of the mercury hazard and is borne out by the referrals of overexposed workers to the NCOH clinic.

Improving the occupational health of mercury exposed workers requires the enactment and implementation of appropriate legislation. The Hazardous Chemical Substances Regulations, which contain specific standards and guidelines for mercury users, may improve surveillance of exposed workers and workplaces potentially c7ontaminated with mercury. However, the long list of chemicals which are included in the legislation will make enforcement very difficult. While current occupational health and safety legislation hinges on the principle of self-regulation, a more direct approach, for example selective mercury in air measurement by the inspectorate, may be necessary for substances as toxic as mercury, at least until adequate control is demonstrated. The introduction of detailed mercury regulations, similar to those for lead, may better assist in the rigorous control of mercury use and exposure. A concurrent awareness campaign for employers and workers on the hazards and prevention of mercury exposure would complement legislation.

The above short report is based on an article currently in press in the South African Medical Journal. The authors thank the editor of the SAMJ for granting permission to publish this work in Occupational Health Southern Africa.

Acknowledgements

The authors thank Drs D Rees and M Felix for their helpful comments on earlier versions of this manuscript.

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Drs. du Buisson & Partners Vennote
PATOLOË/PATHOLOGISTS

AMMONIA

Ammonia is used in great quantities in the manufacture of agricultural fertilizers; also as a refrigerant to produce an anti-oxidant atmosphere in metal furnaces and lastly in a number of synthetic processes in the chemical industry.

Toxic Effects

Due to caustic action

skin - burns
- enough absorption will produce systemic symptoms

The Ammonia Vapour causes
- conjunctival irritation if splashed in eye
- keratitis will follow
- ulceration of cornea
- corneal opacities
- blindness

Inhalation of Vapour causes
- chemical bronchitis
- dyspnoea
- pulmonary oedema
- cough - frothy sputum
- blood stained sputum
- tachycardia
- pain and oedema in mouth and throat with ulceration of mucosa
- hoarseness, conjunctivitis and lacrimation

Treatment

- Mild cases recover promptly on removal from exposure
- Burns on skin should be treated by copious washing with water and a buffered phosphate solution
- Splashes in the eyes are treated by irrigation and corticosteroid drugs
- Severe systemic effects will require hospitalisation

Preventative Care

- Workers must be made aware of dangers in that particular area
- Protective clothing must be worn, specifically goggles to prevent effects from splashing
- Adequate ventilation of work area is essential
- Men who are required to repair plant where the concentration of ammonia may be high must wear respirators

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Executive Screening
Regular management cadre screens to timeously detect quiescent ailments.

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Biological Monitoring
Workers are often exposed to dangerous fumes, dust and heavy metals. It is important to regularly check on physical well-being and occupational diseases.

Information on Health Hazards
Specialised inspection of working areas to identify potential factors that can influence the health of a worker. Educational brochures are available to inform workers about the importance of wearing protective clothing and equipment

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Pathologists can give guidance on solving occupational hazards. Personal evaluation by pathologists enables the interpretation of results.

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Contact telephone number: (011) 394-4902

Occupational Health and the Internet

Access to relevant information is always a crucial aspect in Occupational Health. Recent developments in computer technology and the Internet have meant that opportunities for information dissemination have been greatly improved over the last few years.

The Occupational Health Programme of the Department of Community Health (University of Natal), has embarked on a joint project together with the Computer Services Department of the University. The objective of this exercise is to create a National Archive of locally produced documents which then becomes available to all within the discipline of occupational health, both nationally and internationally. To this end, we seek your assistance. We would appreciate your forwarding us any documents, either of policy or of a clinical nature that you feel would be relevant to be placed in such an archive.

The means of accessing this information would be the FILE TRANSFER PROTOCOL facility available through the Internet. We would appreciate your forwarding us these documents on a floppy/ stiffy disk in a plain text format. If you prefer, this information could be electronically mailed to our e-mail address, indicated below.

In addition to the above project, the Department has also created a Web Site. This provides access for people within Southern Africa to international Occupational Health sites throughout the world. These include the International Labour Organisation, NIOSH, the Occupational Safety and Health Administration (USA) and the Canadian Centre for Occupational Health and Safety. You can access this Site at the Web Site address listed below.

We look forward to your co-operation in this project and we hope that it will become an important resource in occupational health for Southern Africa.

Your sincerely,

Dr Rajen Naidoo, Occupational Health Programme, Department of Community Health.

e-mail address:
naidoon@med.und.ac.za
Web Site:http//www.und.ac.za/ und/med/comhlth/occ_hlth.html

Safety Boots

SASOM has had a request from one of its members regarding an incident which created some Industrial Relations problems:

"The incident arose when an employee refused to wear socks with his safety boots in the hot humid Durban environment. He was then issued with a written warning after which he went to his own medical practitioner who sent a letter stating he had intractable athlete's foot and that he should not wear socks with his safety boots.

I would have thought that wearing of socks is in fact preventive, helps to absorb the sweat and prevents maceration of the skin."

DR M D BAKER, Johannesburg.

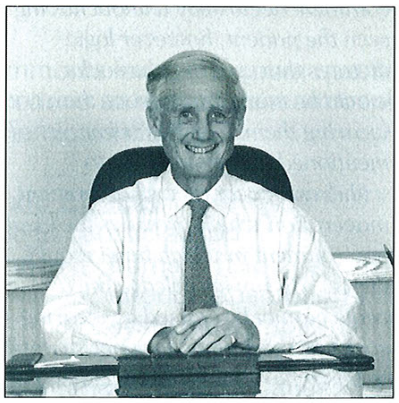
In response Dr Robert Weiss, Honorary Secretary of the Dermatological Society of South Africa replies:

"The question arose as to whether athlete's foot would be aggravated by wearing socks or not wearing them as claimed by his medical practitioner.

Obviously it is difficult to comment accurately without having seen the patient, however logic dictates that wearing the socks would be more appropriate than not wearing them. As has been mentioned this would help to withdraw sweat as well as prevent maceration which provides the ideal environment in which fungi would thrive. To my knowledge tinea pedis cannot be caused by wearing socks as the fungus does not survive in this type of material. In either case if athlete's foot has been proven on culture results, it can be adequately treated both with topical as well as with oral antifungals which are highly effective and should be able to control the condition completely. If the problem is more one of sweating with subsequent irritation, it is usually alleviated by wearing of not only one pair but perhaps two pairs of cotton socks which may control the problem.

The wearing of safety boots without socks would firstly increase the possibility of a contact dermatitis to a substance in the shoe itself as well as increasing the possibility of athlete's foot due to creating a micro environment which is conducive to their growth."

Joint venture provides cost effective health care solutions



Dr Derrick Burns, Occupational Care S A

Occupational Care South Africa (OCSA) is a newly formed joint venture company between Cape based Health Care Consulting Services (HCCS) and the Medicross Health Care Group. It combines the extensive occupational health expertise and experience of the multidisciplinary HCCS team with the backup services of a rapidly expanding Primary Health Care and emergency treatment network. Such a strategic joint venture is ideally positioned to meet the unique needs of South African workers and their employers for a professional and fully comprehensive Occupational Health service, which includes cost effective primary health care based on managed health principles.

OCSA provides a comprehensive and integrated spectrum of services which include Occupational Medicine, health risk assessment, emergency services (in most centres on a 24 hour basis), treatment and rehabilitation of injured workers, health promotion and education, strategic management and primary health care. Through a close association with the national pathology network of Du Buisson and partners it is also able to provide an expert biological monitoring service in most areas.

In a recent interview, Dr Derrick Burns newly appointed Chief Executive of OCSA said "It is OCSA's aim to deliver a truly comprehensive benchmark service, tailored to the changing needs of the South African workplace and based on professionalism, expertise and good management information systems. I believe that OCSA has the right team of experts and access to the kind of resources necessary to make this happen. The South African need is so great and the potential market so large as to make it essential that both large and smaller health care providers work together in providing cost-effective health care solutions in the workplace. OCSA will welcome the opportunity of working with all colleagues who share this vision".

OCSA

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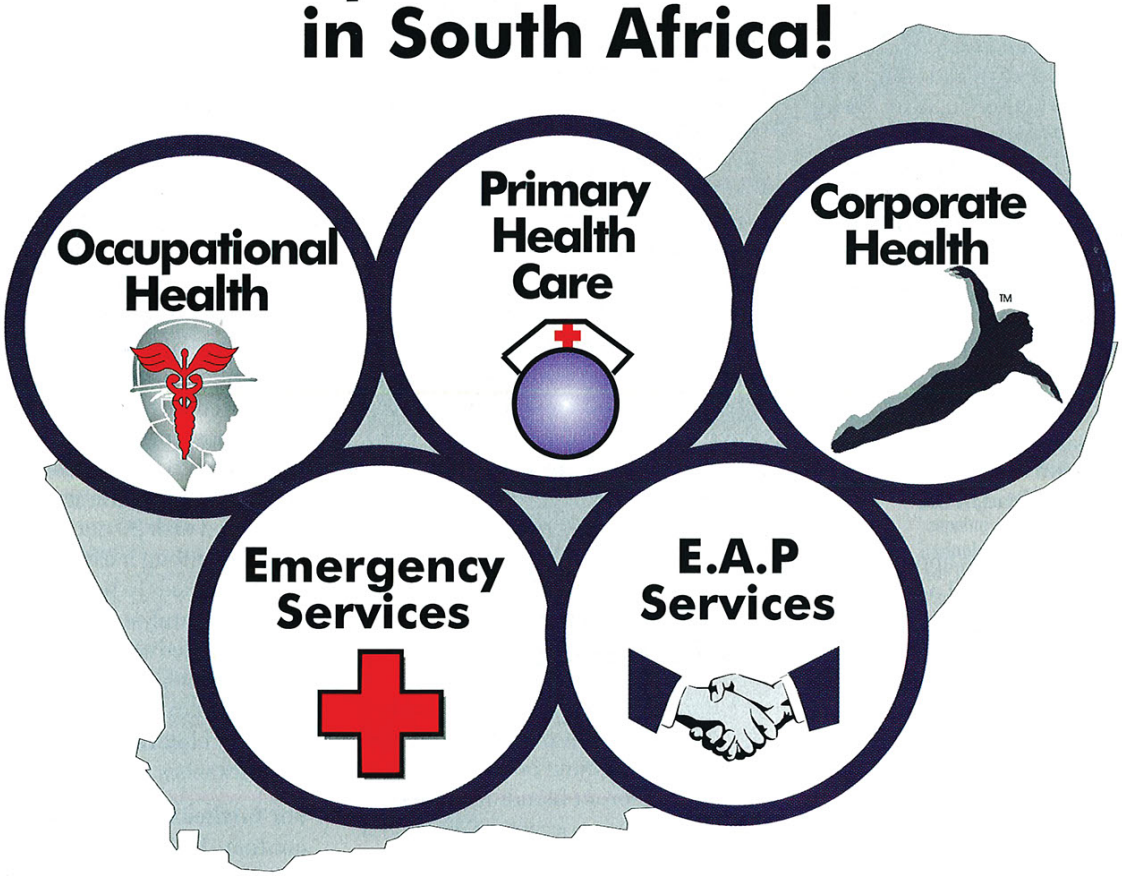

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Unleaded petrol, the environment and health

In the 1930's and 40's when car engine technology was in its infancy, a small percentage of lead was added to petrol to increase its octane rating thereby allowing improvements in engine efficiency and fuel consumption. Because lead compounds are toxic when their concentration in the human body exceeds certain limits, the lead content of petrol has been reduced on a world wide basis. Leaded petrol on sale in South Africa contains no more than 0.4 grams of lead per litre compared to 0.8 grams per litre 10 years ago.

Unleaded petrol contains no more than 0.013 grams per litre. Although it is manufactured without the addition of lead there is a small allowance in the specification to allow for the accumula-tion of lead in the distribution system.

The government has approved the introduction of unleaded petrol at pumps throughout the country from February 1996. The reason for this is that car manufacturers can import the latest technology in engines, instead of continuing with expensive, less fuel efficient old technology engines.

Environmental concerns

Another important reason is that unleaded petrol can also contribute to a cleaner environment because it will enable South African manufacturers to fit new cars with an emissions control system, such as a catalytic converter, that removes harmful exhaust gases when fitted to a car's exhaust system. This technology requires unleaded petrol since lead would permanently damage the catalyst.

Overseas, unleaded petrol was introduced to enable catalytic converters to be used effectively giving a cleaner environment. Today over 80 per cent of all petrol sold world wide is unleaded.

Unleaded petrol is much more environmentally friendly than leaded petrol when used with a catalytic converter. Even without a catalytic converter it is less polluting.

Initially catalytic converters will not be compulsory in South Africa. However, as more and more cars are equipped with converters, they will have an increasingly positive effect on the environment. It is, therefore, expected that laws requiring the fitting of catalytic converters to cars will be phased in with time as is currently happening in Europe

Health concerns

Removing or reducing the lead levels require that petrol is produced by different refining processes and made of different blending components to achieve octane levels similar to those of leaded petrol. However, there are people who believe that lead will be replaced by benzene or oxygen-based octane boosters that will give rise to emissions more dangerous than those resulting from the use of leaded petrol.

This is not strictly true. Apart from the lead content, there is no significant difference between the composition of the 95 octane unleaded petrol and 97 octane leaded petrol. Benzene is not a petrol additive. It is a constituent of crude oil and , as such is naturally present and levels are closely monitored and held below the accepted specifications. It is also formed during the combustion of petrol in car engines.

As a pure chemical, benzene is a cancer-causing substance and in high concentration can cause blood related diseases. While about 80 per cent of ambient air levels of benzene are associated with cars, smoking is the single most important source. A smoker of 20 cigarettes a day takes in about 300 micrograms of benzene, compared with 20 micrograms for someone filling a car with petrol.

Differences in benzene emissions from non catalyst cars running on 97 octane leaded or 95 octane unleaded petrol are negligible and will have no significant impact on the health of adults or children under normal circumstances.

For further information, please contact: P Cronje of Shell SA.

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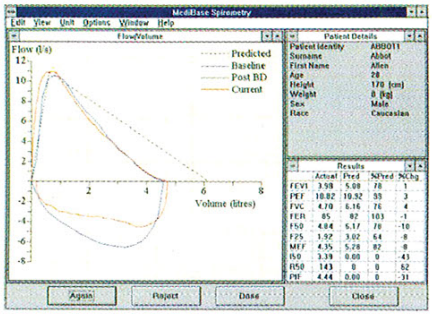
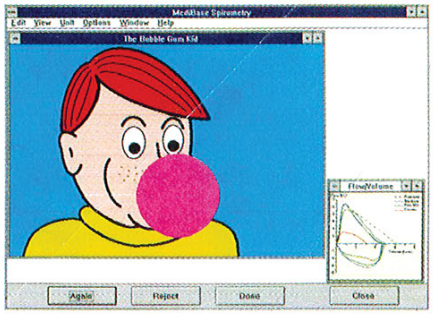
Micro Medical

MediBase

MediBase™ is a full-featured medical database system, capable of real-time spirometry data capture and analysis. It is designed to run under Microsoft Windows™ and provides a high degree of flexibility allowing it to be used on its own or integrated with hospital database systems.





The MediBase modular system can be expanded to include options such as Bronchoscopy. Documents, photographs and other graphic items can be embedded within patient records using the OLE feature, and access to existing database records is simplified using ODBC.

TOTAL

ENVIRONMENTAL CHARTER

TOTAL recognises that the protection of our environment is essential for the long-term survival of its business.

To safeguard both our environment and our business we shall :

- Set standards and provide the necessary resources to prevent or minimise damage to our environment.
- Train all our employees to be aware of their responsibility for protecting our environment. Compliance with our environmental programme will be assessed in the individual appraisals of relevant employees.
- Draw up and rehearse contingency plans to cope with possible threats to our immediate environment.
- Continue to improve our environmental performance and conduct regular environmental audits to measure this improvement.
- Ensure that contractors comply with our internal standards and that our business partners environmental performance is acceptable to TOTAL.
- Contribute to the benefit of the environment beyond the scope of our operations. This will include actions such as :
  - providing customers with information on proper use and disposal of our products;
  - encouraging open internal and external communication on environmental issues.

We will pay due care to the environmental consequences of all our business decisions striving to keep a healthy balance between the needs of our business and the needs of our environment.

TOTAL