



National Institute for Occupational Health



P250/05

National Institute for Occupational Health

Executive Director: **Prof Mary Ross**

Overview

The National Institute for Occupational Health (NIOH), South Africa's major centre for occupational health, celebrates its 50th anniversary in 2006. From its inception as the Pneumoconiosis Research Institute within the SAIMR in 1956, it has grown from a centre devoted to occupational lung pathology in deceased miners to encompass multidisciplinary research, training and service to support all workforces. Through these activities, the main focus is on developing and supporting effective occupational health services in South Africa. In collaboration with the national Department of Health, which is the primary funder of the Institute, the NIOH serves the various stakeholders involved in occupational health, including the State in its broader context of central and provincial government departments and academic institutions, labour and industry within South Africa, as well as in the South African Development Community (SADC) region. The NIOH provides advice and assistance, conducts research and develops capacity through teaching and training. The staff complement is approximately 90 people, of whom about half are scientific and technical, tasked with promoting healthy conditions in the workplace and improving occupational health for the estimated 11.5 million workers in South Africa.

The NIOH houses the national library, the ILO centre for information and the SADC clearing house for occupational health. It has longstanding associations with a number of international organisations through both formal agreements and informal collaboration and many sections and individuals within NIOH have collaborative research, service and training projects with organisations such as the WHO, ILO, NIOSH (USA), the HSL (UK), the University of Birmingham Institute of Occupational and Environmental Medicine (UK), the Swedish National Institute for Working Life, the Swedish

National Institute of Public Health and the Fogarty International Center, USA.

During the reporting period, the NIOH actively realigned its functions, organisational structure and operation to complete the integration into the NHLS systems. Within the NIOH, an emphasis was placed on 'walking the talk' by developing, implementing and promoting an exemplary occupational health and safety system and quality assurance. The NIOH made great progress both internally with the completion of risk assessments in all the sections, and in supporting the NHLS with the analysis of health and safety reports. The NIOH aims to achieve and maintain health and safety indicators in line with international benchmarks and to provide occupational health expertise to assist the NHLS with risk assessments, health and safety data analysis and policies. The quality function was established in early 2005 to fast track the accreditation process and excellent progress was made by the NIOH personnel with physical laboratory improvements, documentation and training. The NIOH reference laboratories in immunology and analytical services have been prepared for accreditation in 2006. NIOH activities are coordinated through regular heads of sections, research, health and safety and quality assurance committee meetings. A monthly research forum is held to showcase research from different sections and encourage multidisciplinary involvement.

Highlights

After the recognition of the NIOH as a WHO Collaborating Centre in Occupational Health in January 2005, the NIOH had the honour of hosting the planning workshop for the collaborating centres network in September. This was a very successful event and three NIOH staff became involved in activity areas for planning the global agenda in occupational health research.

It was a very successful year for the staff with Prof J Murray receiving an associate professorship and



Prof D Rees a teaching award from the University of the Witwatersrand, Dr D Kielkowski becoming a National Research Foundation-rated researcher and Dr M Gulumian receiving the Astrazeneca award for her contribution to toxicology in a developing country. Ms S Chauhan Sawry received her MSc (Epidemiology and Biostatistics) degree and the W Harding Le Riche medal in Epidemiology from the University of the Witwatersrand, and Ms J Mkhize received her Biomedical Technology Diploma from the Cape Peninsula University of Technology; Ms T Singh and Ms M Mabe were awarded postgraduate bursaries from the Allergy Society of South Africa. Two members of the administration staff obtained their matriculation certificates after study through an NHLS bursary. The publication rate was two papers per month with many in prestigious peer reviewed journals.

New facilities were commissioned including the P3 microbiology laboratory, the X-ray diffraction unit and the organic chemistry unit, the Polley Dust Duct was re-commissioned as part of a Mine Health and Safety Council research grant, and refurbishment to improve the safety and appearance of the institute was started. The planning phase for moving the Pathology Division to the old medical school building was completed and the NHLS will fund the refurbishment and transfer of the pathology function.

The research projects within the Work and Health in Southern Africa (WAHSA) programme for the SADC regions commenced. As part of the "Strategic Programme in Occupational Safety & Health, Phase I, 2004 - 2008" funded by the Swedish International Development Cooperation Agency, the NIOH is specifically involved in training of health and safety professionals, improving the access to information and action on silica, silicosis and tuberculosis, the latter in collaboration with Zambia. A further development was an initiative to involve Mozambique which involved exchange visits to explore collaboration. The WAHSA programme has numerous synergies with other existing programmes in the SADC region, such as the Fogarty International Centre/University of Michigan training programme in southern Africa; the WHO/ILO African Joint Effort; the Global Elimination of Silicosis Programme and the Mine Health and Safety Council research projects on dust measurement, awareness materials, biomarkers, silica particles and clay mining and brick making. A functional audit of the clearing house was

conducted by a WAHSA team and their report is the basis for a restructuring of the information services to optimise the library, resource centre and clearing house functions. Progress has also been made in planning the amalgamation of the libraries within the NHLS.

The NIOH launched its website in June 2005 and is currently collating all the research conducted over the last 50 years to present on the web along with research reports, presentations and information to retain site visitors. The NIOH staff organised a number of seminars, research project launches and workshops during the year. The Webster Day, in November 2005, comprised a very successful workshop on compensation with speakers from a range of stakeholders and academic institutions.

The NIOH contributed significantly to capacity development within the formal education system and informal training of a wide variety of groups and individuals plus continuous professional development for occupational health professionals. During the past year, the NIOH staff supervised 40 postgraduate research projects, and taught and examined postgraduate and undergraduate students at tertiary institutions throughout South Africa.

Occupational health has been established as a cluster within the national Department of Health and, during its jubilee year, the NIOH will be focusing on the development of sustainable occupational health services within the provinces as part of a national initiative from the Department of Health. Collaboration with the Department of Labour culminated in a successful workshop on control banding in March at which the NIOH staff made a major contribution. An alliance has been made with the State forensic laboratories which provide NIOH with post mortem facilities while the NIOH provides training facilities for students and postgraduates. Dr F Fox, Chief Medical Officer of Mondi and a specialist in occupational medicine, spent time with the NIOH to support the clinical services and development of policies.

PATHOLOGY DIVISION

Head: Prof J Murray

The Pathology Division provides services, conducts research and surveillance, and is involved in teaching and training in two

broad areas, histopathology and electron microscopy.

Histopathology, mortuary services and surveillance

Head: Dr S Seopela

In terms of the Occupational Diseases in Mines & Works Act (Act 78 of 1973), the Pathology section fulfils the statutory requirement of examining the cardio-respiratory organs of deceased miners, a service utilised by 80% of families of men who die while in mining service. To streamline the compensation process, the NIOH, Mines Bureau for Occupational Diseases and the Compensation Commissioner for Occupational Diseases, are linked by a computer network. Information from the service is made accessible by the Pathology database (PATHAUT).

PATHAUT data contain unique information on disease trends in the mining industry. The data are invaluable and an important national resource for disease surveillance, which is also utilised in international collaborative studies. Detailed annual reports are produced giving demographic data and disease rates. During 2005, 1876 cases came to autopsy compared with 2056 cases in 2004, 2318 in 2003, 2518 in 2002 and 2529 during 2001. The sustained decrease possibly reflects both the decline in mine workers employed and decreased mortality due to the availability of anti-retroviral therapy within the industry. In 2004, the overall disease rate for tuberculosis was 239 per 1000 autopsies, for emphysema 211 per 1000, and for silicosis 210 per 1000. These rates show an increased disease burden for tuberculosis, emphysema and silicosis which in 2003 were 223, 190, and 189 per 1000 autopsies, respectively.

The Pathology section is also a national reference centre for lung pathology. Specimens for diagnosis, consultation and review are received from many centres in South Africa.

Teaching and training is a major function of this section. These activities include the training of registrars, supervising MPH students and teaching the DTM&H and the DOH courses of the universities of Pretoria and the Witwatersrand. Prof Murray is an Associate Professor in the School of Public Health, University of the Witwatersrand and Dr Seopela holds an honorary appointment at the University of Stellenbosch. Groups of nurses and occupational hygienists are taught at the NIOH and numerous lectures and workshops are presented to healthcare professionals in the provinces. A monthly clinico-pathology meeting is held with respiratory physicians from teaching hospitals.

Electron microscopy

Head: Dr J Phillips

The Pathology Division provides a scanning electron microscopy (SEM) service for occupational disease and environmental monitoring. Tissues, dusts, fumes and fibres are analysed to determine possible adverse health effects. Analyses are carried out for other sections of the NIOH, Government departments, as well as private industries and laboratories. In 2005, 366 specimens were analysed, compared to 384 in 2003. SEM provides morphological data and this is combined with energy dispersive spectroscopy for analysis of the chemical composition of the specimen.

Research

Research continues to be an important focus. The projects are relevant to South African workers and are therefore of national importance. Several projects involve collaboration and the division continues to forge links nationally and internationally between the NIOH and scientists and institutions acknowledged as world leaders in their fields of study including University of Pretoria; School of Pathology of the University of the Witwatersrand; Public Health and Clinical Medicine; University of Stellenbosch; CSIR Miningtek; London School of Hygiene and Tropical Medicine in London; Health and Safety Laboratory, and Occupational and Environmental Lung Injury Centre, Sheffield University, UK; Brooklyn College, City University of New York, USA; Mount Sinai Medical School New York: USA; National Institute for Occupational Safety and Health, USA; Dokkyo University School of Medicine, Japan; London School of Hygiene and Tropical Medicine; Clinical Trials Unit, Medical Research Council UK; University of Edinburgh Medical School, Edinburgh, UK; Institute für Umweltmedizinische Forschung GmbH, Düsseldorf, Germany.

The NIOH staff establishment and outputs are supplemented by personnel and visiting researchers funded by a number of local and international organisations. Current research funders are: Colt Foundation, UK; International Environmental Research Foundation, USA; National Institute of Occupational Health, USA; Mine Health and Safety Council, South Africa.

The results of completed studies have been widely disseminated through research reports, publications and regional seminars to the various stakeholders.

Major completed and ongoing research projects are:

Adverse health effects of noise and vibration in the South African mining industry

This collaborative project with the CSIR, Stellenbosch University and the Health and Safety Laboratory, Sheffield, U.K. was completed this year. The project included the

deployment of a hearing conservation programme at two mines and the follow up of a cohort of gold miners with hand arm vibration syndrome (HAVS), identified in a previous study. A rapid diagnostic screening tool for HAVS was developed and the effect of temperature on HAVS prevalence was researched. The research studies, along with reviews of best practice related to reducing the effects of occupational vibration and noise have been incorporated into a CD which is being launched later in 2006.

The association between SV40, asbestos and malignant mesothelioma

The collaborative study with Brooklyn College, City University of New York and the Medical School, Mount Sinai Hospital, New York, examined the association between asbestos, SV40 and malignant mesothelioma. The NIOH has contributed to the evidence that there does not appear to be a causal role for SV40 in mesothelioma and important publications have resulted from the research.

Effect of HIV on morbidity and mortality in South African gold miners

In collaboration with Gold Fields Ltd, the London School of Hygiene and Tropical Medicine and the Clinical Trials Unit, Medical Research Council UK, a retrospective cohort study of long term survival of nearly 2000 HIV-positive gold miners with a known date of diagnosis continues. One aspect, the effect of HIV on work-related injury rates, has been completed, and it was found that soon after the first positive test for HIV infection, the rate of injuries overall increased, but the effect was less for severe injuries. There was only weak evidence for injury rates increasing with duration of infection. The increased injury rate may reflect direct effects of infection as well as behavioural change once HIV is diagnosed. In another component of the research, it has been demonstrated that the risk of developing tuberculosis doubles within the first year after seroconversion.

Respiratory disease in South African platinum miners: an autopsy study

There are more than 100 000 workers currently employed in the platinum mining industry in South Africa and there is a paucity of data on the occupational respiratory health of platinum miners. Research has been initiated to investigate respiratory diseases that are compensable under the Occupational Diseases in Mines and Works Act by comparing three groups of workers coming to autopsy at the NIOH: those with exclusive exposure in the platinum mining industry, those with exclusive exposure in the gold mining industry, and those with exposure in both the platinum and gold mining industries.

OCCUPATIONAL MEDICINE AND EPIDEMIOLOGY DIVISION

Head: Prof D Rees

This division comprises three sections: Occupational Medicine, Epidemiology and Surveillance, and Immunology and Microbiology. Prof Rees has a joint appointment with the University of the Witwatersrand as Professor of Occupational Medicine in the School of Public Health.

Occupational Medicine Section

Head: Dr S Kgalamono

The Occupational Medicine Section consists of two units, the Occupational Medicine Referral Clinic and the Ergonomics Unit. As well as providing clinical and ergonomic services, the division contributes to information and capacity development, health hazard evaluations and conducts research. There is a reciprocal relationship with other sections of the NIOH, providing clinical services for their routine functions and research, and utilising their expertise in specialised areas when required.

Teaching and training is an important function of this section. Staff organised and lectured on the University of the Witwatersrand postgraduate Diploma in Occupational Health (DOH), presented in four block weeks at the NIOH each year. Twenty-eight of 31 students graduated in December 2005. Staff also lectured to the DOH class of Pretoria University. The division ran the ergonomics module for the Master of Public Health (MPH) Occupational Hygiene course, and made presentations to this and the MPH Management course. Occupational health topics were presented to doctors and nurses at local metro clinics, and presentations on lung function testing and latex allergy were made to Limpopo Department of Health officials. In various other presentations, at different forums, topics included needle stick injuries, latex allergy, occupational radiology, occupational musculoskeletal disorders and ergonomics. The Occupational Medicine division also maintains close collaborative contacts with numerous health-related national and provincial government departments, hospitals and clinics, and trade unions.

The Occupational Medicine Division hosted the Webster Memorial Day seminar, an annual event in memory of Prof I Webster, Director 1966-1983. This year the topic was "South African Workers Compensation System", and was attended by 123 delegates from private companies and government departments.

Occupational Medicine Referral Clinic

A total of 311 workers were assessed at the clinic. A wide variety of occupational exposures were represented, the most frequent were asbestos related (108). There were 85 occupational asthma and COPD cases, 43 cases were silica-related. Other conditions seen were latex allergy, dermatitis, non-specific pneumoconiosis and HAVS. Other exposures included manganese, chrome and vanadium. During 2005, a specialist occupational dermatology referral clinic was established in collaboration with the immunology section.

The clinic benefits from assessment of chest radiographs by an experienced occupational chest radiologist. In support of the National Elimination of Silicosis Campaign, mobile chest X-ray surveys were focused on ceramic industries to assess the prevalence of silicosis and pulmonary TB in workers with more than 10 years exposure to silica dust. In addition, the division has established a referral system from workplaces other than those that refer patients to NIOH. Clients ranged from breweries, brick manufacturers, quarries, power stations and refractories to chemical industries. This service is being developed to enhance the contribution of NIOH towards occupational health.

Developing X-ray reading skills also forms part of ongoing teaching in occupational health. Weekly teaching of occupational radiology continued at the Department of Radiology, Johannesburg Hospital, and sessions were run at NIOH for all interested medical practitioners. Topics and cases were based on patients presenting to the NIOH clinic and the Medical Bureau for Occupational Diseases.

Ergonomics Unit

The Ergonomics Unit is equipped with hand arm vibration syndrome (HAVS) assessment equipment and ergonomic tool boxes, identifies ergonomic risk factors at workplaces and makes recommendations to mitigate ergonomic hazards. Four ergonomic workplace risk assessments were initiated by employers in 2005, as a result of the worker/s experiencing musculoskeletal problems. Ergonomic risk factors were identified, and recommendations made to reduce or eliminate these risks.

Research in this section included:

An ergonomics audit in South African public hospitals

The national Department of Health and the WHO initiated this project, the first of its kind in South Africa. It was developed to determine the prevalence of musculoskeletal pain among female nurses working at intensive care and trauma units and to identify ergonomic risk factors. A pilot study to test methods and feasibility is being conducted at Helen Joseph Hospital.

Prevention of needle stick injury and transmission of HIV in healthcare workers

This collaborative project involving the WHO, International Council of Nurses, Department of Health, Democratic Nurses Organisation of South Africa and the NIOH was completed at Pretoria Academic Hospital and Skinner Street Clinic in Pretoria. Results indicated that needle stick injuries are common and underreported and that universal precautions are not widely practised. A training material 'toolkit' developed by the Blood Safety and Clinical Technology "Safe Injection Global Network" was piloted and is being adapted for South African conditions.

SAMOS, a surveillance system for occupational musculoskeletal problems, was discontinued, because of low reporting response from medical practitioners.

Epidemiology and Surveillance Section

Head: Dr D Kielkowski

The main functions of the section are surveillance, research and teaching of occupational epidemiology. The section provides epidemiological and biostatistics support for all sections of NIOH and conducts operational research, particularly disease surveillance and provision of occupational health services in the industry.

Teaching activities included teaching epidemiology and biostatistics at postgraduate level, supervision of research projects for higher degrees, lectures, and small group tutorials for the occupational health practitioners registered for the Diploma in Occupational Health. Ad hoc lectures were presented when requested by outside organisations and teaching institutions.

Research projects are carried out in areas of national importance such as occupational disease surveillance, occupational health indicators and health hazard evaluations. The objective is to provide information on patterns of occupational disease in South Africa, risk factors responsible for disease and to assess the scope of occupational health service and practice by developing and using occupational health indicators relevant for South Africa.

Surveillance and Research

The surveillance of work-related and occupational respiratory disease in South Africa (SORDSA) has been discontinued after a decade in operation, and final data analysis published. Discussions continued with the Department of Labour and representatives of the Compensation Commissioner regarding the introduction of a new, comprehensive surveillance programme to include all

occupational disease, Reporting of Occupational Disease in South Africa (RODISA). A pilot project to test methodology has commenced.

A study is underway to establish a reference range of normal levels of trace elements and metals amongst Witwatersrand white-collar workers, without occupational exposure to these elements. Questionnaire information on residential exposures, hobbies, medication and diet, and samples of urine and blood were collected from each participant.

A long-term mortality study continues in order to estimate asbestos cancer risk among the population born in the Prieska district during 1916-1936, and exposed to asbestos from childhood. To date, of 2390 subjects in the study, 879 (37%) are presumed to be alive; of those who had died, 175 (12%) died of cancer. Among the cancer deaths, there were 38 lung and 37 mesothelioma cases reported. An unusual pattern is emerging in this population, where a very rare type of cancer, mesothelioma, occurs with similar frequency to a very common type, namely lung cancer. All mesothelioma cases and some lung cancers could be attributed to asbestos exposure. The ratio of lung cancer and mesothelioma was 2:1 in males and females, respectively.

A project on ethylene oxide (EtO) exposure, and adverse reproductive effects was completed, and the research team visited main public hospitals in KwaZulu-Natal and Western Cape to inform them about the risks of exposure to EtO during gas sterilisation. A meeting with the Gauteng Department of Health was organised to brief hospital management about safety issues in public hospitals in Gauteng.

An occupational health agenda for South Africa is being developed. A research protocol was developed for a new collaborative project to study occupational reproductive health risks of pesticide use and agriculture activities, in collaboration with the University of the North-West. Funding for this research will be sought from the National Research Foundation (NRF) to fund researchers and support their applications for MSc and PhD studies.

Immunology and Microbiology Section

Head: **Ms T Singh**

The section comprises three units, Occupational Allergy, Occupational Microbiology and Bioaerosol Monitoring. All units were involved in specific and collaborative NIOH surveys in assessment and control of risks in different industries. Joint initiatives were the upgrade of laboratories and offices, implementation of quality management, production of a promotional brochure for the section,

development of a waste management plan for the NIOH, and development of the NIOH case series initiative. Staff from this section play a large part in the administration of the NIOH research committee, and all participated in teaching within the institute, on postgraduate health-related university courses, and at several other venues in industry, clinics, and healthcare facilities.

Occupational Allergy Unit

Allergies in the workplace are a significant source of illness and cases are now more readily identified using specialised tests. The unit also offers a unique service, the processing of actual workplace agents to test exposed workers, where applicable. Occupational allergy cases diagnosed are viewed as sentinel cases, for further investigation to identify other workers at risk.

Skin prick testing of 98 patients showed an increased number to be atopic. The most common occupational allergens tested for were bakery products and spices. Patch tests were conducted for 132 patients (mainly from the mining industry), of whom 76% were positive. Based on results from the various tests, recommendations were made for workplace modifications to avoid or reduce the levels of exposure. Nineteen queries related to occupational allergies were handled.

Major accomplishments were:

- establishment of a comprehensive occupational skin disease clinic, including the services of an experienced occupational health dermatologist;
- retrospective computerisation of patch test records to map trends in occupational allergies;
- obtaining permission to use the British contact dermatitis database as a model; and
- a guide on contact dermatitis for healthcare professionals has been produced and following extensive national and international review, publication is expected later in 2006.

Occupational Microbiology

A long-term focus is on *Legionella* testing, and the unit supports the Legionella Action Group. In this area of speciality, 18 samples were analysed for *Legionella*, and companies advised on appropriate actions where necessary. The unit also completed a book on *Legionella*, which will be published in 2006. An interactive CD on *Legionella* has also been completed, which will assist the user with specific information relatively quickly.

Microbiological risk assessments were involved in two surveys conducted in the Gauteng region. The unit was also involved in 11 risk assessments of the NIOH, providing information and assistance with implementing a hazardous biological agents programme for the organisation. Thirteen other queries regarding hazardous biological agents were

handled.

Bioaerosol Monitoring

The unit was developed to focus on hazardous biological agents in the workplace. During the year, five queries were handled, leading to three workplace health hazard evaluations, in collaboration with other NIOH sections. Recommendations were made to the companies investigated, and the appropriate measures were instituted. Follow up measurements were conducted to ensure that levels were within acceptable limits. A total of 44 air samples were tested for total bacterial and mould counts. In an attempt to establish a method for detecting airborne latex protein, 272 samples were analysed. The analysis included protein estimations and detection of clinically relevant latex proteins.

The Bioaerosol Monitoring Unit is working on a draft information booklet on bioaerosols, "The influence of airborne hazardous biological agents in the workplace", which will inform and discuss what bioaerosols are, in which industries they are commonly found, the potential risks and monitoring tools. The unit has initiated a NIOH discussion forum, a tool to be used for discussions on occupational health topics such as bioaerosols, occupational allergies and ergonomics for all NHLS staff with network access.

Research Projects

Latex exposure of healthcare workers is a problem in hospitals. The success of a latex exposure management programme, implemented in a Johannesburg hospital, is being assessed using a telephonic follow up of subjects in a previous prevalence study of latex sensitivity conducted in 1998. Another project on latex to establish a reliable technique for detecting latex aeroallergens from air samples is also underway.

A collaborative study with NIOSH on detection of airborne *Mycobacterium tuberculosis* (MTB) is being developed as a pilot study using an existing NIOSH method. The aim will be to investigate the presence of airborne MTB and identify health risks to patients and staff in healthcare settings.

Sensitisation to soybean and dust exposure measurement is being investigated in an ongoing collaborative project with the Health and Safety Laboratory (HSL, UK). Results to date indicate a high level of sensitisation to soybean, but few cases of work-related respiratory symptoms. Use of specialised tests of sensitisation is recommended, together with clinical history when determining whether symptoms are work-related.

Work-related asthma associated with endotoxin exposure is being investigated amongst dental workers in South Africa. The hypothesis that a major proportion of asthma is based on

neutrophilic airway inflammation, triggered by environmental exposure, possibly bacterial endotoxin among others, will be explored. An important possible benefit derived from the study may be to detect risks in settings thought to be safe.

OCCUPATIONAL HYGIENE AND ANALYTICAL SERVICES

Head: Prof M Ross

This division comprises three sections: Occupational Hygiene; Analytical Services; and Toxicology and Biochemistry.

Occupational Hygiene Section

Head: Mr R Ferrie

The section continued to offer technical services, undertook applied research, provided a specialised hygiene service, collaborated with local and international health professionals; participated in educating and training specialists, health and safety representatives, and workers in occupational health issues; and provided information on occupational health legislation, hazards and control measures.

As a Department of Labour Approved Inspection Authority (AIA) for physical, biological and chemical stressors, the section's main functions include: monitoring workplace conditions to assess worker exposure to chemical and physical hazards; audits of occupational health and safety systems; occupational hygiene surveys and health risk assessments and advising on preventing or reducing occupational illnesses or conditions in workplaces. Occupational health surveys conducted included: chemical exposure in a metal coating company, and risk assessments of various forensic, medical and technical services laboratories, and an occupational health review of a major hospital. Progress in implementing occupational health controls at a manganese smelter was reviewed on behalf of the Department of Labour.

The section has been involved in various technical committees and standard-generating groups representing the NIOH and the national Department of Health. One member of staff represents southern Africa on the Board of the International Occupational Hygiene Association. There is also representation on the Examining Board of the Southern African Institute for Occupational Hygiene, the Department of Labour's Technical Committee No 7 set up to review legislated occupational exposure limits and the SABS/ISO Technical Committee No 8 on Mechanical Vibration and Shock.

The section has carried out specialised testing for asbestos fibres and crystalline silica using X-ray diffraction (XRD) for many years. A top quality facility for the analysis and quality assurance of the direct-on-filter analysis of respirable crystalline silica has now been developed that will have a major impact on the mining industry and the mining regulator by ensuring reliable accuracy of air-monitoring results. Once again, standard dust clouds for testing dust monitors can be produced following the recommissioning of the Polley Dust Duct.

Research Projects

An investigation of hexamethylene diisocyanate (HDI) in spray painting was completed, and submitted as a research report for an MSc degree. A pilot study in the clay brick industry was completed. The report indicated a need for further research in this industry.

A dust measurement and analysis track commenced for the Mine Health and Safety Council five-year Silicosis Elimination Programme and included exchange visits, seminars and mine surveys with international collaborators from the Health and Safety Laboratory and local experts.

A project to pilot a silica control technique (Silica Essentials) on quarries is underway. The aim is to provide a cost-effective method of controlling the exposure of quarry workers to respirable crystalline silica.

The section also contributed to research by participation and support of research projects within the NIOH and externally.

Analytical Services

Head: Ms I Naik

The core function of Analytical Services is to render specialised analytical services in environmental and biological monitoring to support the practice of occupational and environmental health to industries and the public sector. During 2005, the section also supported research projects of national importance, academic institutes, and continued the national quality assurance scheme for blood lead and cadmium for laboratories countrywide.

Many types of samples are analysed, for routine diagnostic purposes, and for research projects including body fluids and tissues, filters, water, soil and charcoal absorption tubes. A total of 8029 analyses were performed, for toxic metals (mainly for lead, cadmium, mercury, manganese, copper, nickel, chromium, aluminium, vanadium, cobalt, molybdenum, antimony, thallium, arsenic and tungsten) in biological and air samples. Organic assays included trichloroethylene, trichloroacetic acid, mandelic acid, toluene, styrene, phenol, o-cresol, MEK, MIBK, methyl

hippuric acid, hexane, xylene, lindane and hydroxypyrene in biological and/or air samples.

To meet the continuous challenge to increase analytical capacity, new methods were developed and offered as routine tests. These included estimation of beryllium levels in urine, and various organic substances: 2-phenylphenol, hydroxypyrene, 1-naphthol and formic acid and isocyanates in urine and lindane in serum.

Research Projects

Samples were collected and analysed for a project on the establishment of reference concentrations of trace elements in human blood and urine in a non-exposed population, from both Gauteng and North West provinces.

The section collaborated with the MRC on three studies: blood lead levels in children from remote villages in Northern Cape; examining the association between blood manganese and lead levels in schoolchildren, and a preliminary study of lead concentrations in domestic paint in Johannesburg. The health status and risk factors associated with adverse health outcomes among the Durban South community were researched in collaboration with a division of the Nelson Mandela School of Medicine.

September 2005 was a very busy month for the section. It saw the official opening of the new organic chemistry laboratory and visiting scientists from the UK and the USA who presented three talks during a day seminar on "Biological Monitoring of chemical exposures in the workplace", for 145 health professionals from various industries and organisations. In addition, a workshop on "Hygienists guide to biological monitoring" was presented at the IOHA 2005 conference.

Staff continued towards preparing the laboratory for SANAS ISO 15189 accreditation, and 19 tests performed in Analytical Services were certified by international proficiency testing schemes.

Five technician students underwent in-service training, and staff members continued personal development by attending various courses and conferences.

Toxicology and Biochemistry

Head: Dr M Gulumian

The section has continued to conduct research, teach and train undergraduate and postgraduate students, provide specialised services as well as consultation to governmental departments and to industry.

Teaching and training included general in-service training of

students, and project training of postgraduate students from the universities of Johannesburg and the Witwatersrand.

Established methods were used to provide service in the assessment of the toxicology and genotoxicity of medicinal plants investigated at the University of Pretoria. In addition, the levels of DNA damage were investigated in a number of diseases as contracted research.

Research Projects

Research on particles featured prominently in the research programme of the section. It included projects on biomarkers of silicosis and surface activity of crystalline silica dust collected from South African gold mines. In addition, two new projects were initiated to investigate inflammation and apoptosis induced by crystalline silica as well as protection offered by South African herbal extracts with antioxidant activity against silica-induced genotoxicity. Finally, a project investigating the role of silica in the increased susceptibility to infection by *Mycobacterium tuberculosis* was also initiated. Projects on glue sniffing and investigation of the biomarkers of genotoxicity in scleroderma continued.

Training and International Collaboration

Head: Ms C Nogueira

Linked to Support Services, this section supports and coordinates training programmes run by the NIOH, organises programmes for international visitors, represents NIOH management at various meetings and forums, and facilitates human resource management functions for NIOH staff members.

Primary goals of the section are the promotion of occupational health and safety, and development of human resources in this discipline, in the SADC region. These goals are achieved through international programmes.

The focus of the University of Michigan/Fogarty International Center Programme for Research and Training in Environmental and Occupational Health in the SADC region is to enhance regional efforts in research training, and to foster stronger inter-institutional ties in environmental and occupational health research within the SADC region. It has been in operation for two five-year cycles; the funding proposal for renewal will be submitted in mid-2006 for a possible third five-year cycle. The programme has funded short-term training, postgraduate studies and research projects, was responsible for over 30 publications and more than 60 conference presentations, and regional and international fora.

The Sida-WAHSa (Work & Health in Southern Africa) Programme is a 12-year programme launched in October 2004 in Botswana. It has synergies with other Occupational Health and Safety Programmes in the SADC region, e.g. WHO/ILO African Joint Effort, Global Elimination in Silicosis Programme. The overall purpose of the programme is to contribute to poverty reduction by social and economic development in the SADC region through improvements in occupational safety and health. Phase I (2004-2008) of the Sida-WAHSa Programme is organised into 10 overall activities. As part of one of these activities, 'Action on Silica, Silicosis and TB', two major training interventions were organised and facilitated by the Occupational Health, Safety & Research Bureau in Kitwe, Zambia, in conjunction with the NIOH, and conducted during the course of 2005.

As a new WHO Collaborating Centre (awarded in January 2005), the NIOH was tasked with organising the WHO Collaborating Centres in Occupational Health, Strategy Planning Meeting for the new Global Work Plan of the next five years, 2006-2010. Following the meeting, three NIOH staff members were appointed into temporary management of three of the six activity areas identified for 2006-2010.

Publications

Chapters in books

Leggat P, Ross M, Goldsmid J. Introduction to travel medicine. In: P Leggat, J Goldsmid (eds). *Primer of travel medicine* (3rd ed, revised). Australasian College of Tropical Medicine Publications, 2005

Monographs and guidelines

Leggat P, Ross M. Scope of travel medicine. In: Brink G (ed). *A Guide to the Practice of Travel Medicine* (1st ed). Durban, SASTM Publications, 2005, 4-5

Ross M. Occupational Health and the traveller. In: Brink G (ed). *A Guide to the Practice of Travel Medicine* (1st ed). Durban, SASTM Publications, 2005, 42-44

Ross M, Leggat P. Research and travel medicine. In: Brink G (ed). *A Guide to the Practice of Travel Medicine* (1st ed). Durban, SASTM Publications, 2005, 45-46

Journal articles

Calverley AE, Murray J. South Africa's mines - treasure chest or Pandora's box? *S Afr J Sci* 2005, **101**, 109-112

Gulumian M. An update on the detoxification processes for silica particles and asbestos fibres: Successes and limitations. *J Toxicol Environ Health B Crit Rev* 2005, **8**, 453-483

Gulumian M, Ginsberg C, Stewart M. Africa's present and future needs in toxicology education: Southern African perspective. *Toxicol Appl Pharmacol* 2005, **207**, S728-S734

Manfredi JM, Dong J, Liu WJ, Resnick-Silverman L, Qiao R, Chahinian P, Saric M, Gibbs AR, Phillips JL, Murray J, Axten CW, Nolan RP, Aaronson SA. Evidence against a role for SV40 in human mesothelioma. *Cancer Res* 2005, **65**, 2602-2609

Murray J, Sonnenberg P, Nelson G, Shearer S, Bester A, Begley A, Glynn JR. Effect of HIV on work-related injury rates in South African gold miners. *AIDS* 2005, **19**, 2019-2024

Murray J, Nelson G, Ndlovu N, Ross M, Shearer S, Barnes D. Occupational diseases in South African miners. (Letter) *Occup Health SA* 2005, **11**(2), 4

Naidoo RN, Robins TG, Murray J. Respiratory outcomes among South African coal miners at autopsy. *Am J Ind Med* 2005, **48**, 217-224

Nyantumbu B, Kgalamono S. Hand-arm vibration syndrome. *Occup Health Southern Africa* 2005, **11**(4), 27-33

Rees D, Bartie C, Fox F, Jeebhay M, Mansoor N. Is smoking cessation stressed enough in the prevention of occupational allergy? *Occup Health Southern Africa* 2005, **11**(2), 18-21

Rollin HB, Mathee A, Levin J, Theodorou P, Wewers F. Blood manganese concentrations among first-grade school children in two South African cities. *Environmental Research* 2005, **97**(1), 93-99

Ross MH, Maarschalk T. The pregnant traveller. *Continuing Medical Education Journal* 2005, **23**(3), 139-140

Ross MH, Murray J, Kielkowski D. Smoking and occupational health in miners. *Occup Health Southern Africa* 2005, **11**(6), 21

Singh T, Coogan MM. Isolation of pathogenic *Legionella* species and legionella-laden amoebae in dental unit water lines. *J Hosp. Infect* 2005, **61**(3), 257-262

Singh T, Kgalamono S. Occupational latex allergy: a stepwise approach. *Occup Health Southern Africa* 2005, **11**(2), 7-11

Steenkamp V, Gouws MC, Gulumian M, Elgorashi EE, Van Staden J. Studies on antibacterial, anti-inflammatory and antioxidant activity of herbal remedies used in the treatment of benign prostatic hyperplasia and prostatitis. *J Ethnopharmacol* 2006, publication ahead of print) http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=16122891

Tikly M, Gulumian M, Marshall S. Lack of association of eNOS (G894T) and p22phox NADPH oxidase subunit (C242T) polymorphisms with systemic sclerosis in a cohort of French Caucasian patients. *Clin Chim Acta* 2005, **358**, 196-197

Tikly M, Channa K, Theodorou P, Gulumian M. Lipid peroxidation and trace elements in systemic sclerosis. *Clin Rheumatol* 2005, **25**, 1-5

Conference Proceedings

Brink GK, Ross MH, De Frey A. Travel medicine and family practice in South Africa the need for education. In: *Book of Proceedings of the 16th Conference of the Association of Health Care Professionals*, 20-23 August, London, England, The British Library, London, 2005

Gulumian M, Semano M, Vallyathan V. Surface activity of silica dusts collected from different mines in South Africa. In: *Proceedings of the IOHA 6th International Scientific Conference*. www.saioh.org/ioha2005/ September 2005, Pilanesberg, South Africa, 2005

Renton K.A, Evans PG, Johnston J.R. Primary reduction of silica dust exposure in quarries in two provinces, Gauteng and Western Cape: assessment of exposure and evaluation of control measures. In: *Proceedings of the IOHA 6th International Scientific Conference*. September 2005, Pilanesberg, South Africa, 2005. (http://www.saioh.org/ioha2005/Proceedings/PT/SSI/I2_3PPTweb.pdf)

Ross MH. Occupational health in the health care sector. Keynote address. In: *Proceedings of the IOHA 6th International Scientific Conference*. www.saioh.org/ioha2005/ September 2005, Pilanesberg, South Africa, 2005

Ross MH. The National Institute for Occupational Health and research in the South African mining industry. In: *Proceedings of the 31st International Conference of the Safety in Mines Research Institutes*, 2-5 October, Brisbane, Australia, 2005

Reports to industry

Phillips JL, Nelson G. Best practices in preventing adverse effects of noise and vibration: an integrated technology transfer programme of project outcomes and deliverables pertaining to noise and vibration. Final Report Health 806. Safety in Mines Research Advisory Committee 2005.

NIOH internal research reports

3/2005. Fourie A, Kirsten Z. Report on a provincial visit to Limpopo.

4/2005. Calverley A. Occupational health provision in South African industries.

5/2005. Sesoko N, Papo T, Semano B. Report on the NOSHCON 2005 conference.

6/2005. Nyantumbu B, Dyosi S. Ergonomic risk assessment at a food and beverage company.

7/2005. Ndlovu N, Murray J, Candy G, Nelson G. Pathology division report: demographic data and disease rates in January to December 2004. *NIOH Report*

8/2005. Mello P. Quartz and other toxic air pollutants from gold mine waste dumps.

Conference Presentations

International

International Symposium on Environmental Monitoring and Silica Dust Exposure Assessment, Wuhan, China, 14-17 April 2005

Murray J, Hnizdo E. Development of radiological and autopsy silicosis in a cohort of South African gold miners.

10th International Conference on Occupational Diseases, Beijing, China, 19-22 April 2005

Murray J, Hnizdo E. Development of silicosis in a cohort of South African gold miners -radiological and autopsy-based study.

Murray J, Rees D. The elimination of silicosis in South Africa.

Murray J, Gulumian M, Downs K, Girdler-Brown B, Donaldson K, Castranova V, Vallyathan V, Borm P, Ndlovu N, Ross MH. Biomarkers for the prediction and early detection of silicosis.

Nelson G, Murray J, Ross M. Silicosis in South African platinum miners - case control study.

Ross M, Murray J, Nelson G. Indicators for setting priorities for occupational respiratory disease in the South African mining industry.

9th International Conference of the International Society of Travel Medicine, Lisbon, Portugal, May 2005

Ross MH, De Frey A, Leggat P, Kielkowski D. The fortunate 500: an academic path to travel medicine in South Africa.

International Union for the Scientific Study of Population, XXVth International Population Conference, France, 18-23 July 2005

Glynn JR, Sonnenburg P, Nelson G, Bester A, Shearer S, Murray J. The effect of HIV on adult mortality: evidence from a large cohort of South African gold miners with known dates of seroconversion and 10 years of follow-up.

3rd Circular of 13th International Clay Conference, Waseda University, Tokyo, Japan, 21-27 August 2005

Ross M, Phillips JL, Murray J, Nolan RP. Claysphere: past, present a future. Mineral fibres and asbestos-related disease.

17th World Congress of Epidemiology, Bangkok, Thailand, 21-25 August 2005

Sawry S, Kielkowski D, Murray J. Attribution of lung cancer to asbestos exposure in miners in South Africa.

Cape to Cairo Safari Conference, Potchefstroom, South Africa, 16-18 September 2005

Masoka X, Gulumian M. Research expertise at the NIOH to investigate the nutritional values of South African food plants.

International Occupational Hygiene Association, Pilanesberg, South Africa, 19-23 September 2005

Gulumian M, Semano M, Vallyathan V. Surface activity of silica dusts collected from different mines in South Africa.

Ndlovu N, Murray J, Candy G, Nelson G. Pathaut as a tool for surveillance in the South African mining industry.

Phillips JL, Nelson G, Ross M. Noise and vibration in the mining industry.

Ross MH. Occupational health in the healthcare sector.

Ross MH. Hepatitis and the healthcare worker.

Semano M, Ntente S, Hearne G, Gulumian M. Differences in surface activity of erionite fibres collected from various localities.

31st International Conference of the Safety in Mines Research Institutes, Brisbane, Australia, October 2005

Ross MH. The National Institute for Occupational Health and research in the South African mining industry.

Mechanisms of action of inhaled fibres, particles and nanoparticles in lung and cardiovascular disease, Research Triangle Park, North Carolina, USA, 25-28 October 2005

Gulumian M, Wallace W, Vallyathan V. Properties of South African gold mine silica particles and occupational exposure limits.

Gulumian M, Semano M, Ntente S, Hearne G. Erionite samples from different origins show different activities in relation to iron.

CHEST 2005, the 71st Annual International Assembly of the American College of Chest Physicians Montreal, Quebec, Canada, 28 October-3 November 2005

Richard GA, Grimmer H, Ramoroka C, Hopley M, Gulumian M. Decreased antioxidants, increased reactive oxidants and increased lipid peroxidation in irradiated total parenteral solutions increase oxidant generation in critically ill patients.

International Roundtable: Health, Food and Environment, 26th African Health Science Congress, Cairo, Egypt, 28 November-1 December 2005

Leshwedi M, Gulumian M, Steenkamp V. The anti-oxidant properties of *Salacia lepoclada*, *Pachycarpus rigidus* and *Warburgia salutaris*: their possible use as therapeutic agents in silica-induced DNA damage.

Society for Risk Analysis Annual Meeting, Orlando, Florida, USA, 4-7 December 2005

Gulumian M, Faustman EM. The science of risk assessment in South Africa: Is there any urgency?

National

NOSHCON Conference on Occupational Safety and Health, April 2005, Pilansberg, South Africa

Ross MH, Rees DJ. The role of the National Institute for Occupational Health in global occupational health.

Mine Medical Officers Association 8th Annual Congress, Ohrigstad, 6 May 2005

Downs K, Girdler-Brown B, Murray J, Malindi N, Ndlovu N, Gulumian M. Update on silicosis biomarkers.

Murray J, Nelson G. HIV/AIDS and occupational accidents.

Ndlovu N, Seopela S. Autopsy database. Is this a useful tool for disease surveillance?

Nelson G. Clinical trials - Applied ethics.

Phillips JI, Nelson G. SIMRAC launch: Health 806. An integrated technology transfer programme for noise and vibration.

ALLSA Pre-conference workshop, 26 August 2005

Fourie A. Do we need local allergens to test for sensitisation?

Fogarty International Centre: Environmental & Research in Southern Africa Conference 2005, Johannesburg, 10-11 September 2005

Singh T, Duse A, Jeebhay M. Work-related asthma associated with endotoxin exposure in dental workers in South Africa.

SASOM Annual General Meeting and Seminar: Advances in Occupational Medicine, University of Stellenbosch, Tygerberg Campus, 18 November 2005

Murray J. Effect of HIV on work-related injuries in South African gold miners.

Philips JJ. Noise and vibration in the mining industry.

National Influenza Symposium, 8 March 2006, Johannesburg

Ross M. Influenza and occupational health.

Control banding workshop for Chief Directorate: Occupational Health & Safety, 22-23 March 2006

Cantrell T. Control banding in the chemical industry.

Ferrie R. The pros and cons of control banding.

Renton K. Pilot projects in control banding.

Occupational Health and Safety Colloquium, 29-31 March 2006

Kgalamono S. Training in occupational health.

Ross M. Services offered by NIOH.

Local

University of the Witwatersrand, School of Public Health Research Day, 18 May 2005

Fourie A. Tests of sensitisation for workers exposed to soybean.

Ndlovu N, Sawry S, Schneider H, Kielkowski D. Assessment of the role of occupational health and safety committees in healthcare facilities in Gauteng.



