

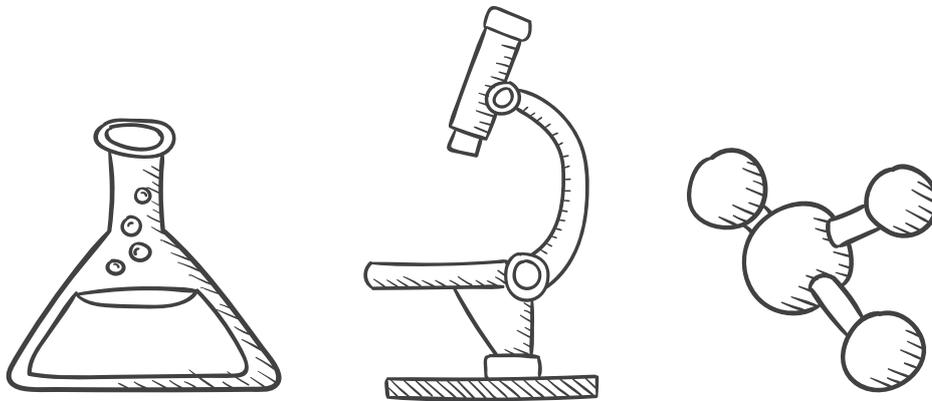
National Institute for Occupational Health Annual Review

2014/15



**NATIONAL HEALTH
LABORATORY SERVICE**

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH



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Occupational Health
Annual Review
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List of Abbreviations

ABSA	American Biological Safety Association
AFRICA	Asbestos Fibre Regular Informal Counting Arrangement
AIA	Approved Inspection Authority
AIMS	Asbestos in Materials International Quality Assurance Scheme
ALK	Anaplastic Lymphoma Kinase
APHL	Association of Public Health Laboratories
ARAOH	African Regional Association for Occupational Health
BODI-SA	Burden of Occupational Disease and Injury in South Africa
CAIA	Chemical and Allied Industries Association
CANSA	Cancer Association of South Africa
CCOD	Compensation Commissioner for Occupational Diseases
CDC	Centers for Disease Control and Prevention, US
CERG	Cancer Epidemiology Research Group
CHIETA	Chemical Industries Education and Training Authority
CSIR	Council for Scientific and Industrial Research
CUPID	Cultural and Psychological Influences on Disability
DAAF	Department of Agriculture, Forestry and Fisheries
DHET	Department of Higher Education and Training
DoH	Department of Health
DOH	Diploma in Occupational Health
DOMH	Diploma in Occupational Medicine and Health
DST	Department of Science and Technology
DUT	Durban University of Technology
EGFR	Epidermal Growth Factor Receptors
EOC	Emergency Operations Centre
EQA	External Quality Assurance
ESBB	European, Middle Eastern and African Society for Biopreservation and Biobanking
EVD	Ebola Virus Disease
FELTP	Field Epidemiology and Laboratory Training Programme
GEMP	Graduate Entry Medical Programme
G-EQUAS	German External Quality Assessment Scheme
GLP	Good Laboratory Practice
HCW	Health Care Worker
HPCSA	Health Professionals Council of South Africa
HSL	Health and Safety Laboratory, UK
HSR	Health and Safety Representative
HWSETA	Health and Welfare Sector Education and Training Authority
IARC	International Agency for Research on Cancer
IEUBK	Integrated Exposure Uptake Biokinetic Model
ILO	International Labour Organization

IOM	Institute for Occupational Medicine, UK
IRIS	Integrated Risk Information System
ISBER	International Society of Biobanking and Biorepositories
JCS	Johannesburg Cancer Study
IUTOX	International Union of Toxicology
LAMP	Lead and Multi-element Proficiency programme, US
MADCaP	Men of African Descent and Carcinoma of the Prostate Consortium
MBOD	Medical Bureau for Occupational Diseases
MHSC	Mine Health and Safety Council
MMed	Masters in Medicine Degree
MMPA	Mine Medical Professionals Association
MNORT	Multi-sectoral National Outbreak Response Team
MPH	Masters in Public Health Degree
MRC	Medical Research Council of South Africa
NAPC	National Academic Pathology Committee
NCR	National Cancer Registry
NDoH	National Department of Health
NHI	National Health Insurance
NHLS	National Health Laboratory Service
NICD	National Institute for Communicable Diseases
NIOH	National Institute for Occupational Health
NIOSH-CDC	National Institute for Occupational Safety and Health (US)
NRF	National Research Foundation
NSDA	Negotiated Service Delivery Agreement
NUM	National Union of Mineworkers
ODMWA	Occupational Diseases in Mines and Works Act
OECD	Organization for Economic Co-operation and Development
OH&S	Occupational Health and Safety
OHASIS	Occupational Health and Safety Information System
OHP	Occupational Health Professionals
OHS	Occupational Health and Safety Act
OPCW	Organisation for the Prohibition of Chemical Weapons
PATHAUT	Pathology Disease Surveillance Database
PHASA	Public Health Association of South Africa
PHC	Primary Healthcare
PPE	Personal Protective Equipment
PRISA	Public Relations Institute of Southern Africa
RPE	Respiratory Protective Equipment
RPHC	Re-engineered Primary Healthcare
RSR	Railway Safety Regulator
SABS	South African Bureau of Standards
SACNASP	SA Council for Natural Scientific Professions
SADC	Southern African Development Community

SAFELTP	South African Field Epidemiology Training Programme
SAIOH	South African Institute for Occupational Hygiene
SANAS	South African National Accreditation System
SANDF	South African National Defence Force
SAQA	South African Qualifications Authority
SASOHN	South African Society of Occupational Health Nurses
SASOM	South African Society of Occupational Medicine
SHE	Safety, Health and Environment
SLA	Service Level Agreement
SOT	Society for Occupational Toxicology
UCT	University of Cape Town
UNISA	University of South Africa
UP	University of Pretoria
UVGI	Ultraviolet Germicidal Irradiation
VHF	Viral Haemorrhagic Fever
WHO	World Health Organization
WRC	Water Research Commission



NIOH Director's Overview

Dr Sophia Kisting

In the third quarter of 2014 there were approximately 15 million people in employment in South Africa [Statistics South Africa, 2014]. About 11 million of them were in non-agricultural formal employment, 690 000 in formal agricultural work, 2.3 million in non-agricultural informal jobs and 1.3 million working in private households [Statistics South Africa, 2014]. The largest industrial sector employer was community and social services (3.5 million), followed by trade (3.2 million). About 1.7 million people worked in manufacturing and 1.2 million in construction. Mining employed about 0.5 million people based on Statistics South Africa's *Quarterly Employment Statistics* of September 2014. These figures, however, do not fully reflect the number of people who engaged in various forms of income generation within the extended world of work.

There is no recent and reliable research on occupational health service coverage for workers in South Africa. However, it is unlikely that coverage has changed substantially from that described by Jeebhay and Jacobs¹ in 1999 and Adams *et al.*² in 2007: about 11–18% of private sector employers, excluding mines, provided workplace-based services, with larger employers more likely to have these services. It is assumed that coverage in the agricultural and construction sectors is low and that informal economy workers have little if any access to services. Probably the most established services are at large mines, although preventive activities may be inadequate. The provision of occupational health services within the public sector is very largely confined to public servants, despite the intention in the mid-1990s to establish public-sector occupational health services for under-served populations³.

South Africa thus has large numbers of workers in many industrial sectors who are inadequately protected from workplace hazards. Aspects of occupational health and safety (OH&S), designed to prevent disease and injuries, are likely to be lacking. Consequently, the need for OH&S services, including the specialised services of the National Institute for Occupational Health (NIOH), is substantial in many sectors. There are major gaps with regards to decent work, the persuasion of a greater preventive approach as well workplace gender concerns. In addition, there is very little policy coherence for workers perceived to be more vulnerable to workplace exposures. They include workers with disabilities, migrant workers, seasonal workers, domestic workers, workers in the informal economy and workers in non-standard forms of works e.g. sub-contracted workers. Appropriately, the NIOH, along with partners in and out of government, undertook a very wide range of activities to address OH&S needs in many industrial sectors. These activities

- 1 Adams S, Ehrlich R, Ismail N, Quail Z, Jeebhay M. Occupational health challenges facing the Department of Health. *South African Health Review*. 2012; 13: 67–82.
- 2 Jeebhay M, Jacobs B. Occupational health services in South Africa, Chapter 19. *South African Health Review*. 1999; 257–276.
- 3 Department of Health. 1996. Report of the Committee on Occupational Health. Pretoria: Department of Health.

“The NIOH’s research aims are to generate knowledge for preventive action and impact on key occupational health issues, especially those facing South Africa and the region”

covered policy advice and technical support to government departments, unions and employers; research and surveillance; teaching and training; information services; and the provision of specialised laboratory services.

Cancer is a large concern worldwide, even in low- and middle-income countries with high burdens of other causes of morbidity. It is essential to establish the types of cancer, their distribution (geographically and by age and sex) and trends in incidence so that resources can be allocated appropriately, and so that interventions are targeted correctly. The National Cancer Registry's (NCR) cancer statistics, which are the main source for the country, are thus very important. A large and sustained effort is being made by the NCR to produce these statistics. The NCR continues to conduct vital cancer research, much of it involving multi-country collaboration, and to contribute to knowledge on cancer in South Africa and internationally. Concerted efforts are being made within the NCR to move towards community-based cancer registries.

Two aspects of the NIOH's work are highlighted in this report: research and specialised services.

Research

The NIOH's research aims are to generate knowledge for preventive action and impact on key occupational health issues, especially those facing South Africa and the region. Taken together, the research projects of each division described in this report are testimony to the many occupational health issues requiring new knowledge, but also to the scope of the NIOH and NCR's research efforts.

Among the topics under investigation during the reporting period were:

- Lung disease in miners and control of dust in mining
- Work-related tuberculosis, including ultraviolet germicidal irradiation in controlling
- Transmission, and tuberculosis in healthcare and mining
- Silica exposure in farming, and silica in mine waste dumps and platinum mine dust
- Occupational allergies among poultry workers
- Microbiological issues in the healthcare setting
- Occupational health and safety in the informal economy, including waste reclaimers
- The impact of a surveillance tool on occupational health practice
- Respirator fit testing
- Surveys in a number of industries.

It is notable that the research programme has developed over the past few years to include aspects of 'modern' working life that were not traditionally research areas of the NIOH. Examples are the influence of occupations on cancer in women (breast cancer specifically), the psychosocial and cultural determinants of musculoskeletal disorders, occupational stress (specifically the utility in South Africa of a widely used measurement tool), and a large programme on incidental and engineered nanoparticles – the toxicity of the particles and risk assessment approaches make up a substantial part of the programme. It is our fervent wish to increase our preventive research capacity to positively impact the working lives of women and men in the world of work. We believe that the creation of new knowledge through inclusive intervention research at workplaces will help inform policy coherence and result in greater workplace equity and a greater emphasis on prevention.

Specialised services

The NIOH provides laboratory-based, discipline-specific information services to clients in many industrial sectors and government agencies. The institute's laboratory services include asbestos identification and counting; diagnostic lung pathology; analytical chemistry (e.g. for biological monitoring specimens); the identification of components of dusts (respirable crystalline silica in particular); microbial air sampling; allergy diagnostics; nanoparticles and in-vitro risk assessments. Among the discipline-specific services are occupational medicine, occupational hygiene, occupational toxicology, immunology and microbiology, and occupational epidemiology. Information services are a core service of many national institutes of health around the world, partly because there is a scarcity of sources of information elsewhere, as is the case in South Africa. The extent and diversity of information services offered by the NIOH, many of them of limited availability elsewhere in the country, is obvious from this report.

Looking to 2016 and beyond, the NIOH plans to contribute more to addressing the decent work deficit in our country, and to support efforts related to inequality at work. It is imperative that the NIOH supports all efforts to nurture a culture of greater prevention of occupational injuries and diseases, as well as non-communicable diseases that may be exacerbated

by conditions of work. Important areas that will require more attention relates to gender concerns at work; workers who may be considered more vulnerable, including migrants, subcontractors and workers with disabilities. There needs to be a greater focus on OHS in training and teaching (especially in ways that contribute to building a culture of prevention), as well as support for the development of OH&S within the National Health Insurance (NHI) System and the restructured primary healthcare system.

Retirees

Prof. John Carol Anthony Davies (Tony) left the NIOH and Johannesburg in 2014.

Tony was the Director of the National Centre for Occupational Health (now the NIOH) and Professor of Occupational Health, University of the Witwatersrand from 1983 until 1996. After he retired, he continued to work hard on important occupational health issues.

Tony reinvigorated research at the NIOH. When he arrived research output was low, with little attention to many of the pressing issues of the day. Tony inspired many young researchers, which resulted in the first projects on HIV around mining communities, the first descriptions of the large disease burdens in former black gold miners and on the fate of injured miners who returned to labour-sending areas.

Tony was a great supporter of Pathology Disease Surveillance Database (PATHAUT), the database of details of autopsies of deceased miners. PATHAUT has become a major research and surveillance asset – hundreds of papers have been published using PATHAUT data and its annual reports provide the only systematic surveillance data of occupational lung disease in miners.

Quite remarkably, after he retired, Tony and his wife, Deirdre, spent many months in Limpopo where he examined former asbestos miners and their spouses. He submitted thousands of cases for compensation while doing this work.

Tony has actively participated in major occupational health legal matters, including the Cape asbestos case which resulted in trust funds with millions of Rand to compensate people with asbestos-related diseases. Tony was one of the Leon Commission's commissioners, a commission which resulted in great improvements to occupational health laws for miners. His main contribution was probably to inspire people and to create an environment in which they felt they could achieve important things and contribute to improved working conditions.

After 30 years of dedicated service at the NHLS, Dr Danuta Kielkowski (PhD) retired in December 2014. Dr Kielkowski provided invaluable expertise, first to the Epidemiology Section at the NIOH and thereafter as Deputy Director of the NCR. Danuta's work on death certification and occupational disease surveillance, as well as her asbestos and reproductive health research, are just some of the highlights of her long and productive career. She made an invaluable contribution to the growth and strengthening of occupational epidemiology in South Africa, in the Africa region and beyond. She has published widely on occupational health and her scientific rigour has contributed immensely to new knowledge in public health in South Africa and beyond. Above all Danuta exemplifies the beautiful spirit of national and international collaboration to address major health concerns through collective research. She has published extensively in peer reviewed journals but also wrote technical reports which had a direct impact on public health policy. She has supervised, nurtured and enthused numerous young epidemiologists and is widely respected for the collegial and inclusive manner in which she shared her skills.

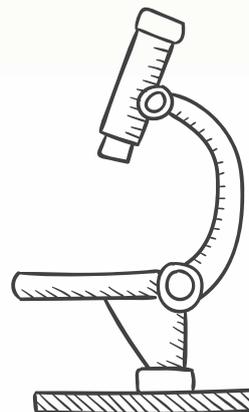
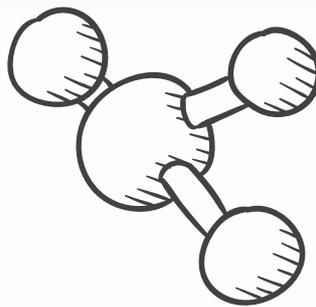
Sister Gloria Mokwatle, who has been working with NCR/CERG as a research nurse since 1997, retired in February 2015. Prior to working on the Johannesburg Cancer Study (JCS), she was the Head Recovery and Theatre Nurse at the Harley Clinic. Sister Mokwatle has shown true dedication and attention to detail during her time with us. She would interact with cancer patients, obtaining informed consent prior to an interview or having blood drawn for research purposes. She was a frequent participant in SASCRO/SASMO conferences, showcasing her knowledge and experience from working in a public sector hospital and with cancer patients. Her efforts have greatly enhanced the quality of the data received for the JCS and she will be missed. We wish her well in her retirement.

Mr Famanda Knoxman Mthombeni began working for the NIOH, the then National Centre for Occupational Health (NCOH), in 1984 as a cleaner. He worked for 30 years as a loyal dedicated employee and during his time at NIOH studied towards and completed his ABET (Adult Based Education and Training) course. He came to join us at the NIOH for a fond farewell where his dignity and generosity of spirit humbled us all. His unwavering sense of solidarity, good work ethics and sense of humour will be greatly missed by all that had the pleasure of working with him.

Pathology Division



Acting Head: Dr Naseema Vorajee





The origins of the Pathology Division lie in the Pneumoconiosis Research Unit that was founded in 1956. Its focus remains on occupational lung disease, and its service work provides material for teaching, research and surveillance. Service work includes an autopsy service, a referral centre for lung biopsies obtained at surgery, and analytical electron microscopy services. In 2014, all the laboratories within the Pathology Division maintained their accreditation status with SANAS in accordance with the recognised international standard, ISO 15189:2007.

Diagnostic services

Autopsies

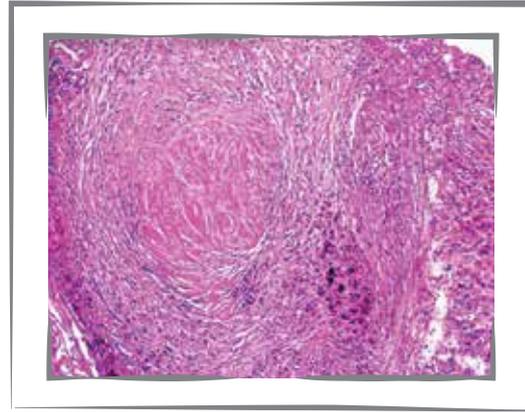
In terms of the Occupational Diseases in Mines and Works Act, Act No. 78 of 1973, the Pathology Division continues to carry out the statutory requirement of examining the cardio-respiratory organs of deceased miners. A pathology report on each such examination is sent to the mines' Medical Bureau for Occupational Diseases to assist with the compensation process for families of deceased mine workers.

In 2014, 1 063 autopsies were carried out in terms of the Act. This is a decrease on the 1 190 autopsies performed in 2013. To promote the use of the autopsy service, presentations and workshops were held for stakeholders on request. A team of representatives of the division participated in a World TB Day event organised by the North West provincial government. This was held at Kanana township stadium and more than 45 000 people attended. The event was addressed by the Premier, the Minister of Health and the Deputy State President. The team engaged with over 250 miners and their relatives who were keen to know the relationship between TB and silicosis. Over 500 pamphlets and 100 lung-removal consent forms were distributed to stakeholders.

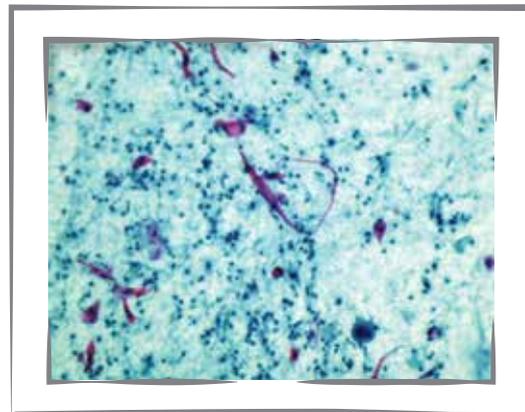
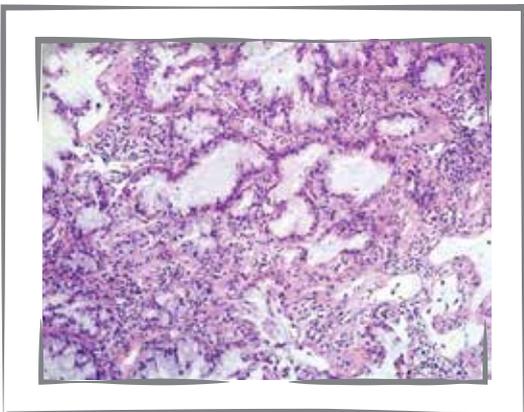
The autopsy service generates a great deal of information about the lungs that are examined. Approximately 200 items of information are carefully recorded by the examining pathologists, which is entered into the Pathology Disease Surveillance Database (PATHAUT), which is a national resource and contains unique information about disease in the mining industry. The database has been and continues to be used extensively for research in association with local and international collaborators, and over 150 peer-reviewed publications have been produced using the data. The database has been maintained since 1975, and is used to show disease trends in the mining industry. It is also an important tool for disease surveillance. Detailed disease surveillance reports compiled from the PATHAUT database and giving demographic data and disease rates, are produced annually. These are made available in the public domain through the NIOH website (http://www.nioh.ac.za/?page=pathology_disease_surveillance_reports&id=162).

Surgical pathology

The division has vast experience in lung pathology and is recognised as a centre of excellence. A diagnostic service is offered to satisfy the demand for opinions on lung biopsies, fine needle aspirates and bronchial washings. Diagnostic requests and consultations are received from clinicians at academic hospitals served by the National Health Laboratory Service (NHLS) and from the private sector. The demand for this service is increasing and in 2014, 743 surgical specimens were received. To improve this service to clinicians, the quality of the pathology report was enhanced by incorporating colour photomicrographs in the body of the report. Important diagnostic features are graphically highlighted for the referring clinicians. To improve the turnaround time of the service, reports are emailed to referring clinicians on request.



Colour photomicrographs graphically highlighting diagnostic features. Shown here are non-neoplastic conditions histology: (L) hydatid cyst and (R) silicosis



Colour photomicrographs graphically highlighting diagnostic features. Shown here are neoplastic conditions: (L) histology – mucinous adenocarcinoma and (R) cytology – squamous cell carcinoma

Electron microscopy

The Electron Microscopy Section functions within the division and is headed by Prof. JI Phillips, a National Research Foundation (NRF) rated scientist. The section supplements the service work of the Pathology Division by determining the asbestos fibre concentrations in lung tissue to assist with diagnoses of asbestos-related disease.

The section carries out qualitative and quantitative analyses for the presence of asbestos fibres. Analyses are conducted on bulk materials or air samples obtained from filters. These analyses are performed for other divisions of the NIOH and external clients, including national, provincial and local government, non-governmental organisations, universities and private businesses. The section participates in an external quality assurance scheme and has maintained its satisfactory rating in the Asbestos in Materials (AIMS) international quality assurance scheme, co-ordinated by the Health and Safety Laboratory (HSL) in the UK.

The service to analyse samples for asbestos was first offered in 2003. Since then, data generated from the samples submitted for analysis have been stored and entered into a database. This database is unique in South Africa and its interrogation provides information about the legacy of asbestos in the country.



Research

Research relevant to the health of South African workers is carried out by members of the Pathology Division staff. Material and data from the service work of the division provide a considerable amount of information for research projects. Current areas of interest centre on diseases of the lung, in particular with respect to dust, especially silica and asbestos. Tuberculosis is a particular problem in the mining industry and is a focus area for research. During the course of the year, Prof. AJ Murray and Prof. JI Phillips were asked by the editors of scientific journals to be peer reviewers for research articles. Staff in the division co-authored seven articles published in peer-reviewed journals and a peer-reviewed chapter in a book. Prof. Phillips chairs the NIOH Research Forum and is a member of both the NHLS Research Development Committee and the NHLS Research Subcommittee of the National Academic Pathology Committee (NAPC).

Dr Naseema Vorajee is registered for a Masters Degree in Medicine (Anatomical Pathology) with the University of the Witwatersrand. The study received ethics approval and involves the use of immunohistochemical techniques to study epidermal growth factor receptors (EGFR) and anaplastic lymphoma kinase (ALK) mutations in adenocarcinomas of the lung in South African patients.

The division collaborates with other divisions within the NIOH and assists with projects that involve the enumeration and identification of asbestos. Links are also fostered with local and international institutions, such as the Council for Scientific and Industrial Research (CSIR); the University of the Witwatersrand – Schools of Pathology, Public Health, Clinical Medicine and Archaeology; the University of Johannesburg – Faculty of Health Sciences; the HSL, UK; the Occupational and Environmental Lung Injury Centre, Sheffield University, UK; the University of Wales, UK; Harlan Laboratories, Switzerland; Dokkyo University School of Medicine, Japan; the London School of Hygiene and Tropical Medicine, University College, London, UK; and Brooklyn College, City University of New York, US.

During the reporting period, the division received visitors from various local and international institutions, including Prof. K Honma (Dokkyo University, Japan) and Prof. B Racette (University of Washington in St Louis, MO, US).

Teaching and training

The division plays a role in teaching and training through formal lecturing to professional bodies, universities and teaching hospitals. Staff members participate in the mentoring, teaching and supervision of Masters students at the University of the Witwatersrand and the University of Johannesburg. Teaching is also given to Diploma in Occupational Health (DOH) students, medical students and allied medical students from the University of the Witwatersrand. Prof. Phillips moderates examinations and chairs the Faculty of Health Sciences Academic Advisory Committee of the University of Johannesburg. Dr Vorajee actively participates in and presents cases at regular clinical pathology meetings with doctors from the Johannesburg teaching hospitals. Registrars in pathology also rotate through the division as part of their specialist training. Specialised small group training is given to healthcare professionals, organised labour, and mortuary and funeral parlour staff. In collaboration with trade unions, members of the Pathology Division have conducted workshops focusing on lung disease. Prof. Murray is an Associate Professor in the School of Public Health and Prof. Phillips is a Visiting Professor in the Faculty of Health Sciences at the University of Johannesburg.



Outreach provided to the National Union of Mineworkers (NUM) on TB, silicosis and compensation processes in Welkom on 6 February 2015. (L–R): Sam Rikhotso (NIOH), Simphiwe Ntshinga (NUM), Daniel Afrika (NIOH Pathology) and Sam Matlelai (NUM)



Occupational Medicine and Epidemiology Division

Head: Prof. David Rees





During the reporting period, the Epidemiology and Surveillance Section was added to the division, which now comprises Occupational Medicine, Immunology and Microbiology, and Epidemiology and Surveillance.

The Occupational Medicine Section was active in teaching and training during the reporting period. The section had four occupational medicine registrars, one of whom, Dr Odette Abrahams, qualified, thus adding to the growing pool of specialists in South Africa. All 27 doctors enrolled for the Diploma in Occupational Health successfully completed the programme. The section's staff taught courses at the universities of Pretoria, KwaZulu-Natal and the Free State, and a seminar was hosted to review the teaching of occupational health and medicine at diploma level at all universities in South Africa. Together with the NIOH's Occupational Hygiene Division, the Masters Degree in Public Health (MPH) in the field of occupational hygiene remains an important aspect of the division's work.

The section is a valuable platform for the training of public health medicine and occupational medicine registrars. Registrars rotated through the section from the universities of Limpopo, Pretoria and the Witwatersrand, and one from the University of British Columbia, Canada.

Importantly, the section developed curricula for the training of primary healthcare nurses and for the Railway Safety Regulator, and contributed to a number of training programmes, among them the radiology of occupational lung conditions and occupational cancer.

Along with its service work, support of postgraduate students and teaching and training, the Immunology and Microbiology Section's contribution to activities regarding work-related infection is notable. Infections are one of the major causes of occupational disease, including the increasing number of TB infections among healthcare workers. Research projects include skin irritation from scrubbing and hand washing in healthcare workers, ultraviolet germicidal irradiation in controlling the transmission of TB in healthcare settings, and free-living amoebae and amoebae-resistant bacteria in water in healthcare institutions. The section's focus on testing the efficacy of intervention and preventive strategies in TB control continued, and included providing expert technical support to committees and programmes, such as the Ultraviolet Germicidal Irradiation (UVGI) Technical Team, the Legionella Action Group and the National Research Foundation (NRF).

A major development in the Epidemiology and Surveillance Section is the Burden of Occupational Disease and Injury in South Africa (BODI-SA) Project. The Project, under the leadership of Dr Pieter de Jager and in collaboration with local and international agencies, will use established methodologies to estimate the national burden of selected diseases attributable to workplace exposures in South Africa. The informal economy has become another focus of the section. It continues to support a large number of postgraduate students with statistical advice and analysis.

Occupational Medicine

The Occupational Medicine Section has two primary functions, namely Occupational Medicine Services (including a referral clinic) and the Ergonomics Unit. The Occupational Medicine Services Section provides support to public and private enterprises in the form of advice, assistance with policy development, and a clinical assessment of cases suspected of suffering from occupational diseases. It also contributes to patient management to prevent occupational diseases and to control occupational hazards. The Ergonomics Unit studies how workplace factors and people can interact efficiently to maximise productivity and reduce discomfort.

The referral clinic, being the largest of the three specialist referral clinics in the country, provides a clinical service for private and public entities within South Africa and the Southern African Development Community (SADC) region. This service includes assistance with submissions for compensation for those with compensable diseases.

All cases are seen as sentinel events, provoking a thorough investigation at the workplace to assess possible causes of the disease and provide advice on workplace modification to prevent further exposure to other employees. Furthermore, cases are assisted with submissions for compensation and medical management.

In collaboration with other sections within the NIOH, the section's staff members provide support to other service components, such as reports for government departments and occupational health services within the NHLS, and support for the provision of occupational health services at the provincial level. The need for assistance to the trade unions regarding members who need a second medical opinion or for assistance with disputes between employers and employees regarding exposures and ill health continue to grow.

Although most cases referred to the clinic suffer from lung diseases, work-related musculoskeletal and mental disorders are also on the rise. Those with musculo-skeletal disorders from vibration exposure go through a vigorous investigation process within the Ergonomics Unit, using special equipment to assess the presence of hand-arm vibration syndrome. The unit is the only centre of its kind to do so in southern Africa.

Mental health in the workplace was identified as one of the key areas in which a gap exists in addressing the growing burden of mental illness in South African workers. This led to the establishment of a Workplace Mental Health Unit within the NIOH, which will provide services to South African employees to address preventable aspects of occupational stress. A psychologist has been recruited to begin research on tools to identify organisational risk factors for occupational stress in South African workplaces and to recommend the necessary interventions.

Highlights of the year

The past year has been an active one for the Occupational Medicine Section. Two registrars, under the supervision of the Occupational Medicine staff, completed their MMed degrees with distinction. Dr S Kgalamono served as Acting Executive Director of the NIOH while recruitment for a new director was under way.

Some members of the section also serve on expert panels or committees. Ms B Nyantumbu-Mkhize is part of the Department of Labour's Ergonomics Technical Committee, which is developing ergonomics regulations for South Africa. Dr S Kgalamono is part of the editorial team of the *Occupational Health Southern Africa Journal*.

The section provided substantial support to the NHLS Safety, Health and Environment (SHE) Programme in numerous ways. While the National Institute for Communicable Diseases (NICD) nurse was on extended leave, the NIOH nurse provided the service in her absence. Furthermore, doctors in the section and the team have been involved in policy development



Head: Dr Spo Kgalamono



and staff job profiling sessions. The team also responded to numerous internal incidents of complaints about exposures or occupational medicine issues, including injury-on-duty incidents. Site visits were conducted in collaboration with the Occupational Hygiene Division and the psychologist.

Another highlight was the successful completion of the Diploma in Occupational Health (DOH) course by 27 doctors. A 100% pass rate was achieved, with three students obtaining distinctions, including one of the section's registrars.

Services

Occupational Medicine Section staff continued to provide occupational medicine practitioner services for the NHLS Occupational Health Services, as well as occupational medicine technical support and advice on occupational health matters. The support includes:

- Revision of health and safety policies
- Drafting of new policies
- Handling of individual queries around employees suspected of having contracted occupational diseases from laboratory exposures
- Support to occupational health nurses and safety officers in all the regions
- Clinical management and follow-up of confirmed cases.

Extra support was offered to the Medical Bureau for Occupational Diseases (MBOD) in various activities, including the training of staff at one-stop service sites, as well as participation in the Medical Reviewing Authority and the Joint Committee for the Certification of Cases of Occupational Diseases.

Apart from conducting clinical assessments of workers referred for suspected occupational diseases and possible compensation, the section also provided professional consultation and advisory services on occupational health to the national and provincial Departments of Health, Correctional Services, Minerals and Labour, the Defence Force and the Gauteng Forensic Pathology Services. Registrars in the section developed a medical surveillance programme for the Chris Hani Baragwanath Hospital for drivers and Radiology Department staff members. Skills transfer and capacity building on conducting medical surveillance were also done.

In the year under review, various trade unions sought medical assistance for their members, including the review of compensation decisions and appeals. Doctors within the section provided them with relevant information and made suggestions for conducting workshops for shop stewards and other union members on issues such as compensation processes and the health effects of exposures that affect workers directly.

Clinical services remain a major focus for the section. Altogether 225 workers were assessed during the year (see table), most of whom were cases with occupational respiratory diseases. Of the rest, a small proportion had musculoskeletal problems and occupational skin allergies. All workers assessed were regarded as sentinel events, provoking a thorough investigation at the workplace to assess the possible causes of diseases and to offer advice on workplace modification to prevent the further exposure of workers. Workers with compensable diseases were assisted with submissions for compensation.

Cases assessed at the referral clinic in the 2014/15 financial year

Occupational diseases	No. of cases
Occupational asthma, work-aggravated asthma	55
Chronic obstructive pulmonary disease	30
Asbestos pleural diseases, asbestosis, mesothelioma	27
Silicosis and silica TB	22
Allergic rhinitis, rhino sinusitis	9
Hand-arm vibration syndrome	4
Work-related upper limb disorder	1
Scleroderma	1
Nasal septum ulceration (chrome exposure)	1
Non-occupational	12
NHLS medical surveillance	27
Cases under review	36
Total	225

Special service

Mental health in the workplace

Mental disorders have a high prevalence and are a leading cause of disability in many countries, including South Africa. The burden of these disorders is underestimated, despite strong evidence regarding their social impact. South Africa lacks the capacity to deal with work-related mental health issues, and public health services are overburdened and unable to respond to current demands.

A psychologist with experience in mental health issues has been recruited. She started with policy formulation for guidance on what the section can contribute given the limited resources. A needs analysis will follow before she researches tools appropriate for identifying risk factors for occupational stress in the South African context. It is hoped that this will provide guidance on interventions applicable to the NHLS and the broader South African workforce. The psychologist also assists in strengthening human resource capacity in dealing with mental ill health within the NHLS in terms of assessments, management and accommodation in the workplace.

Research

A number of staff within the Occupational Medicine Section have contributed to research. Dr S Kgalamono is a member of the editorial team of the *Occupational Health Southern Africa Journal* and was also involved in supervising a MMed research project on occupational stress for the University of the Witwatersrand. The two registrars are currently conducting research in partial fulfilment of their MMed studies.

Current research projects

Compensable occupational lung diseases in current miners and ex-miners in South Africa, 2003–2012

The Occupational Diseases in Mines and Works Act (ODMWA), No. 78 of 1973 (as amended in 1993), provides for compensation of occupational lung diseases in living and deceased miners and ex-miners. The Certification Committee determines whether or not there is a compensable disease, the type of disease and the extent thereof.

Certification data constitute a valuable source of information on occupational diseases in the mining industry. This study will use the information to describe the nature and source of compensable occupational diseases in the mining industry, and to examine trends over time and the time taken to process claims.

Conclusion: The preliminary analysis already shows that the burden of tuberculosis in living current miners and ex-miners is high and contributed more than 60% to the compensable occupational lung diseases during this period, irrespective of the commodity and gender.



Completed projects

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

This was the first study in South Africa to look for an association between breast cancer and occupations in black women. Breast cancer is one of the most common forms of malignancy experienced by women in South Africa and its incidence is increasing. Approximately 6 million women work in South Africa and some of them are likely to be exposed to carcinogenic agents during their daily working lives. Many occupational carcinogens to the breast have been described and there is some evidence suggesting that many more synthetic chemicals used in different industries may also have carcinogenic properties that have not yet been fully explored.

This study identified occupations that place black women at risk of breast cancer in the South African context. Furthermore, it assessed whether there was an association between shift work (a known carcinogen to the breast) and breast cancer in black women in South Africa. The findings of the study are of particular significance in the local context, given that women are entering the workforce in increasing numbers, possibly putting more of them at risk.

Results: With regard to occupation, the bivariate analyses showed significant odds ratios (ORs) for breast cancer in the occupational categories of health, education, social services, retail, hospitality, construction, food, textile and manufacturing, with the highest OR in education (OR: 2.33, 95% CI: 1.44–3.78) and social services (OR: 2.39, 95% CI: 1.24–4.58), followed by office workers (OR: 2.17, 95% CI: 1.47–3.20) and health workers (OR: 2.01, 95% CI: 1.33–3.04). Agriculture (OR: 0.55, 95% CI: 0.32–0.94) and domestic workers (OR: 0.96, 95% CI: 0.75–1.22) had ORs of less than one. Following the adjustments for possible confounders, however, no statistically significant ORs were found between specific occupations and breast cancer, except for manufacturing, office workers and health workers, when compared with the group that had never worked.

Conclusions: The bivariate analyses identified elevated ORs for breast cancer in some occupations, but in multivariate analyses no statistically significant ORs were found. Nevertheless, ORs above one were found for the occupational categories of manufacturing, office workers and health workers. This study reports a strong association between breast cancer and shift work, which is supported by the literature, although shift work still remains necessary for the functioning of many industries. Many gaps still exist, however, and this study has tried to address one of the neglected areas of occupational risks for the development of breast cancer.

Dr S Kgalamono and Dr M Ndaba contributed to an abstract submitted to the Public Health Association of South Africa (PHASA), in collaboration with the NICD, on lessons learnt from medical surveillance of students in the South African Field Epidemiology Training Programmes (SAFELTP).

Teaching and training

Both formal and informal training activities have been used to strengthen capacity development and create awareness of occupational health among employers, workers and trade unions, health professionals, government departments and institutions, and other stakeholders.

Undergraduate training

Staff in the Occupational Medicine Section contributed to the Graduate Entry Medical Programme (GEMP) at the University of the Witwatersrand.

Informal training was conducted for small groups of workers, union members, occupational health nurses and occupational medicine practitioners on specific topics.

A training programme was developed for training primary healthcare nurses in the recognition of occupational diseases and related issues, and in appropriate referral to the next level of care.

Postgraduate training

The Occupational Medicine Section offers opportunities for practical training of public health and occupational medicine registrars, and clinical skills refinement for other healthcare workers. Every year, public health registrars from the universities of Pretoria, the Witwatersrand and Limpopo rotate through the clinical services for experiential learning in occupational health.

Other postgraduate teaching activities include the formal Diploma and Masters courses in the Schools of Public Health at the universities of the Free State, Pretoria and the Witwatersrand. Teaching commitments include the planning of specific courses, lecturing, marking assignments, setting examinations and general support to students. Staff also provided oversight over and teaching to the Masters in Public Health (MPH) curriculum in the field of occupational hygiene. Staff within the section supervised three PhDs, two MMeds and two MPH research reports.

Within the reporting period, the NIOH was evaluated as a training site for registrars and was granted accreditation for the next five years by the Health Professions Council of South Africa (HPCSA).

The NIOH was approached by the Railway Safety Regulator (RSR) as a service provider of choice to develop a curriculum for training occupational health nurses and doctors in railway-specific hazards. The RSR realises that the hazards in the railway industry are unique to the industry and as such training of their occupational health practitioners should be tailor-made to the industry. A training programme was drafted and adopted by the RSR, and pilot will commence later in 2015 after development of training material and assessment tools has been completed. About seven training sessions will be conducted.

Performance targets

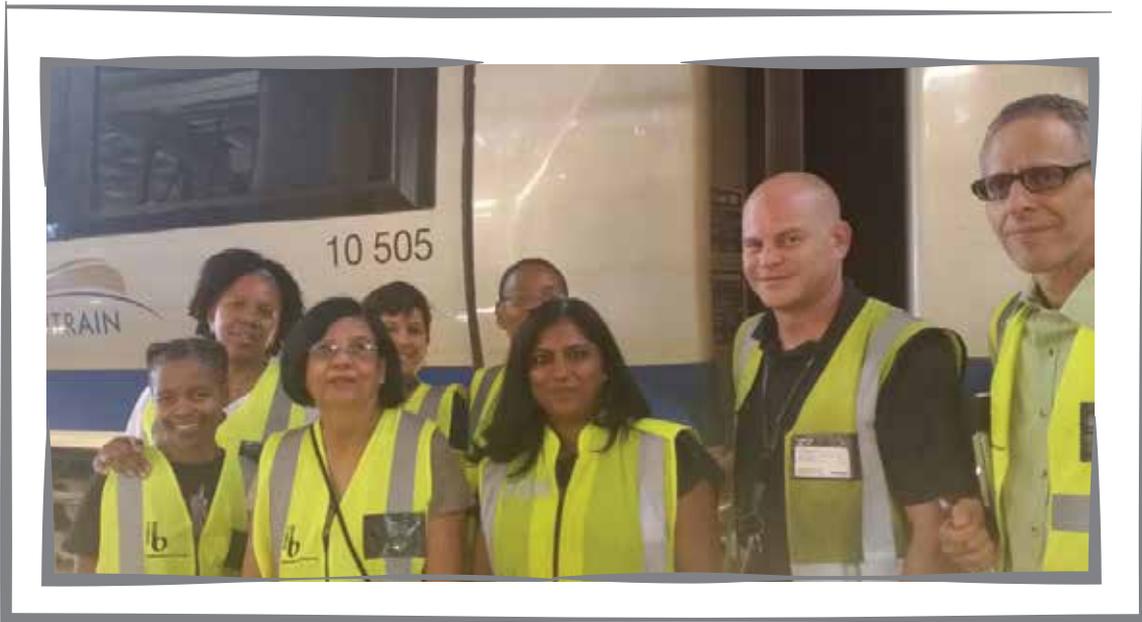
The section's annual performance targets for the year were met, and in some instances exceeded. Contributions to overall NIOH targets were met in the following areas: four government departments supported, five Medical Reviewing Authority meetings held and two meetings of the Joint Committee for the Certification of Cases of Occupational Diseases held.

The target of 175 clinical assessments of workers conducted was exceeded by 20% and 225 workers were assessed. Support for postgraduate training was maintained at three universities. A target of two activities was expected in support of the MBOD. Five committee meetings were held, benefit medical examinations at one-stop services were conducted and assistance in the launch of the Carletonville One-Stop Service was provided by several staff members. Furthermore, the staff assisted in recruiting a doctor for the one-stop services and in conducting interviews as subject matter experts. Six, instead of two, meetings were held with trade unions, to provide advice and technical support. One research activity was expected; however one research project was completed and two research activities were initiated within the section.

Professional development

Honours

Dr O Abrahams successfully completed the speciality programme (college examinations and an MMed) and is now a qualified occupational medicine specialist.



Railway Safety Regulator project site visit. Back row (L–R): Dr Spo Kgalamono; Dr Odette Abrahams; Ms Busi Nyantumbu Mkhize. Front row (L–R): Ms Sindi Dyosi; Mrs Ina Naik; Ms Jacintha McLeod; Gautrain Representative and Mr Gabriel Mizan

Currently, three occupational medicine registrars are being trained in occupational medicine. One is employed in a full-time capacity by the NHLS and is in her final year of training, and two are supernumerary registrars in their third and final years respectively.

Human resource constraints

Mental health services were limited by the availability of a psychologist, social worker and occupational therapist, who are integral components of the multidisciplinary team essential to develop and maintain such services.

The Ergonomics Unit currently has only one staff member, who heads the unit. It has been particularly difficult to recruit and retain appropriately qualified health professionals as this is a scarce skill in South Africa.

Future plans

Other than aiming to run an effective and efficient service, the future plan is to concentrate on two strategic areas. Firstly, expansion of the Mental Health Unit is high on the list. The newly recruited psychologist will do a needs analysis at the NHLS and will work closely with the Human Resources Department to develop policies and plans for the service. Secondly, networks with psychologist and psychiatrist organisations will be established for collaborative work within the public health system.

The recruitment of one more registrar will relieve the load on the service and afford the section time to conduct more research and produce more articles.

Ergonomics Unit

The Ergonomics Unit has been in existence for nearly ten years. It was formally established in May 2005 to fill the gap in the occupational health services provided by the NIOH. It has since been involved in the provision of ergonomic services to South African workplaces, the teaching and training of occupational health professionals, undergraduate and postgraduate students, including workers, and the execution of ergonomics-related research. The unit contributes to the occupational health systems of the NHLS and also supports the NHLS Safety, Health and Environment (SHE) Programme. The services of the unit are benefiting not only South African workers, but also workers in the SADC region.

A highlight during the period under review was the acceptance by Ms B Nyantumbu-Mkhize of a nomination for membership of the Ergonomics Technical Committee by the Chief Inspector of the Department of Labour. The mandate of the Ergonomics Technical committee is to develop ergonomics regulations for South Africa. The committee has successfully reached its first milestone of determining the scope of the regulations, which was accepted by the Advisory Council for Occupational Health and Safety, formed under the Occupational Health and Safety (OHS) Act, No. 85 of 1993. The ergonomics regulations will fill a gap in the legislative framework of South Africa by contributing to the improved performance and well-being of the South African workforce. Ergonomics is considered a scarce skill in South Africa. In order to change this status, there needs to be a concerted effort to promote and raise awareness about the field.

Services

The services offered by the unit are mainly ergonomic risk assessments, which are carried out to identify ergonomic risk factors in the work environment. These risk factors may result in the occurrence of musculoskeletal disorders in exposed workers. After the assessment has been completed, the findings with recommendations are compiled in a comprehensive report.

During the period under review, eight risk assessments were carried out. Three were conducted at the NHLS, two at government departments, another two at private companies and one in a company outside the borders of South Africa. The unit provided detailed ergonomic recommendations for the work environments where the assessments were done.

These included

- **Call Centre:** The centre had to be redesigned to incorporate proper ergonomic principles and to be able to accommodate a specified number of call centre agents
- **Transport Department:** The results of the risk assessment done at this government department may be used to develop a medical surveillance programme for bus drivers
- **Office:** In one case a worker complained of musculoskeletal problems, and in another a worker had developed an upper limb musculoskeletal disorder
- **Laboratories:** In one of the environments assessed, an audit query had been raised and in the other the suitability of the laboratory environment for use as office space needed to be established
- **Car component manufacturing:** In this company one worker had developed an upper limb musculoskeletal disorder and the Department of Labour was investigating the case for work-relatedness of the condition
- **Port:** The port's company, situated in one of the SADC countries, wanted to incorporate ergonomic principles in its work environment and operations. The quality of the risk assessment conducted resulted in the Ergonomics Unit being given an assignment to develop an ergonomics training manual to be used to train workers in the fundamental principles of ergonomics.

Teaching and training

Training on ergonomics is hard to find in South Africa. Consequently, there are few ergonomics specialists. The Ergonomics Unit therefore makes teaching and training on ergonomics in the country a priority strategic objective. At the NHLS, employees are trained to raise awareness about ergonomics and also to capacitate them to be able to identify ergonomics risk factors and to recognise the symptoms of musculoskeletal disorders. The public health registrars on rotation in the Occupational Medicine Section are introduced to ergonomics by the unit. Ergonomics is also taught at various universities to postgraduate students doing a DOH and at undergraduate level to Bachelor of Technology (BTech) students.

During the period under review, ergonomics was taught to doctors enrolled for a two-year, part-time DOH at the universities of the Witwatersrand and Pretoria. Most of the third-year BTech students (53) from the university of Johannesburg underwent experiential learning on ergonomics. Primary healthcare nurses at Raheema Moosa Training College were taught ergonomics



for the first time since the inception of the unit. NHLS employees from one of the laboratories received training in ergonomics; this was done after an ergonomic risk assessment had been carried out at the laboratory. Recommendations were also supplied to the laboratory for implementation.

During the second quarter, the Ergonomics Unit was involved in facilitating a workshop on *Developing Occupational Health Services in South Africa* organised by the World Health Organization (WHO), in partnership with the Department of Health and the Medical Bureau of Occupational Diseases (MBOD).

Research

Research within the unit is ongoing, with its involvement in the Cultural and Psychological Influences on Disability (CUPID) Project. This project has attracted attention from a local researcher working for an international organisation (Global Health for Social Change) regarding a questionnaire that formed part of the project. The questionnaire is in the public domain and as such can be used by any interested researchers. The Ergonomics Unit was consulted on the purpose of the survey design and correct utilisation.

The unit contributed to research through the work carried out by the Editorial Board of the *Curationis Journal for Nurses*. The Board is responsible for promoting the journal and ensuring that high-quality and scholarly articles are submitted for publication. The Ergonomics Unit facilitated a research methods course through the Epidemiology Section to build capacity for research in nurses affiliated to the Nurses Democratic Union of South Africa, and 20 nurses received such training during the year.

The unit also conducted a literature review of medical surveillance systems on musculoskeletal disorders. The information was used to structure a system that would be suitable for South Africa. A milestone in the development of ergonomics regulations has been reached in that draft regulations have been produced for submission to the Advisory Council on Occupational Health and Safety.

Performance targets

The performance of the unit exceeded the targets set for the provision of services and teaching and training activities, as shown in the figure below. The services exceeded the target by 33% as eight ergonomic risk assessments were completed instead of six. Regarding teaching and training, four activities were expected, but seven were accomplished, which is an increase of 75%.

Unit performance in the year under review



Plans for the future

The unit is constrained by a shortage of staff. In order to increase and expand its services, more staff are needed. In the near future one medical scientist will be recruited. A training programme has been developed for training primary healthcare nurses in the recognition of occupational diseases and related issues, and in appropriate referral to the next level of care.

Professional Development

Postgraduates enrolled: one PhD at the University of the Witwatersrand.

Immunology and Microbiology

Air and water are two of life's basic commodities which impact on the well-being of individuals, including workers who may be exposed to contaminated water sources and surfaces, and poor air quality while at work. With increasing work demands, many workers are being exposed to biological and chemical contaminants for longer periods of time, thus increasing the duration of exposure. Work-related infections, occupational asthma and skin disorders continue to be among the top ten occupational diseases reported. Although the increasing number of infection-control devices is testament to efforts to reduce exposure and prevent diseases, current regulations and standards for some devices do result in products of inferior quality being sold. Ineffective devices give a false sense of security, impacting negatively on infection, prevention and control measures. The increasing number of hospital-acquired infections is indicative of the risk of hazardous biological agents, and the need for early detection, rapid testing and environmental monitoring (including the monitoring and evaluation of engineering controls) to reduce biological and other contaminants is clear. The Immunology and Microbiology Section supports the Department of Health's (DoH) fight against TB and other hospital-acquired airborne infections, and focuses on testing the efficacy of intervention and prevention strategies. The section also focuses on allergies by providing tailored diagnostics for the clinical management of workers. Allergies may not be debilitating, but can affect the quality of life of workers. The section provides expert technical support to various committees and programmes, as well as telephonic consultations to entities such as the NRF, the HPCSA, the Ultraviolet Germicidal Irradiation (UVGI) Task Team, the Water Research Commission (WRC) and the South African Bureau of Standards (SABS).



Head: Dr Tanusha Singh

Diagnostic services

During the period under review, the section provided capacity for the investigation of occupation-related respiratory and skin diseases, and met its service targets. The mobile skin allergy service was extended in the Gauteng Region to include skin prick testing. More dermatologists are requesting allergy testing, which testifies to the increasing awareness of the benefits of patch testing. A new IgG test was developed for isocyanate exposure, and sentinel cases were followed up through health hazard evaluations of the workplace. The skin prick testing mobile service was extended to mining companies to test for sensitivity to platinum and nickel. Indoor air quality assessments were conducted for hazardous biological agents in different workplaces to establish risk profiles, which provide a basis for the recommendation of appropriate prevention and control strategies. These workplaces included healthcare facilities, animal facilities and the manufacturing industry.

Microbial indoor air quality assessments were conducted in an array of industries. Such assessments provide the impetus to reduce airborne transmission of bacteria and fungi. Several UVGI devices were assessed for their efficacy in reducing airborne contaminants. Staff also participated in National UVGI Technical Task Team discussions and contributed to the development of a draft, evidence-based UVGI guideline, *Evidence-based guideline for Ultraviolet Germicidal Irradiation (UVGI) room air disinfection*, for South Africa. The task team consists of representatives from different stakeholders, including the CSIR, the University of Pretoria (UP), the University of Cape Town (UCT), the DoH, the NIOH, the Centers for Disease Control and Prevention (CDC, US), and Brigham and Women's Hospital, Boston, US.

As part of its routine services, the laboratory also provided sterility testing of nanoparticle samples. Phase II renovations of the Bioaerosol Laboratory were completed, as part of the revitalisation plan. The section continued to offer the amoeba-resistant bacteria (ARB) test, coupled with assessments of water distribution systems and associated risks to workers. It also contributed to reviewing the waste disposal operating procedure for Gauteng Health. The section, in partnership with Buckman Laboratories, co-hosted the Legionella Workshop during the second quarter. The aim of the workshop was to discuss and summarise the concerns raised from industry about the recently published South African National Standard for Legionella (SANS 893).



The section maintained its SANAS accreditation, under ISO 15189:2007 for eight consecutive years and once again obtained excellent results for proficiency testing for advanced mycology, organised by the NICD. The section also provided support, on request, to the NHLS SHE Programme, highlighting the NIOH's commitment to improving safety in the workplace. All feedback forms received from patients were positive, testifying to the quality of the testing service to clients. The section also met 99% of its targeted turnaround times during the period under review.

Research

The section was involved in several self-initiated research and collaborative projects in the areas of occupational allergies, bioaerosols and waterborne pathogens. A summary of the key projects is presented below. Collaboration with national and international partners included the University of British Columbia (UBC, Canada); the CDC's TB Unit, and Brigham and Women's Hospital (US); the CSIR; UP; UCT; and the Medical Research Council of South Africa (MRC).

Effect of hand washing and scrubbing on bacterial flora and skin irritation in HCWs

Study team: A Fourie¹, O Matuka¹, B Binta¹, Z Kirsten¹, H Carman², A Mayekiso², C Nattey¹, T Singh¹

¹National Institute for Occupational Health, ²Private dermatology consultant

Sampling was completed at the Charlotte Maxeke Johannesburg Academic, Helen Joseph and Garden City Hospitals. Laboratory analyses of 400 samples were conducted and the data captured. Questionnaires were captured and the data cleaned. Data are currently being analysed.

Allergic sensitisation and work-related asthma among poultry workers in South Africa

Study team: T Singh¹, O Matuka¹, E Ratshikhopha¹, C Nattey¹, P Daya², M Jeebhay³, R Baatjies³, A Lopata⁴, K Renton¹

¹National Institute for Occupational Health, ²University of the Witwatersrand, ³University of Cape Town, ⁴Royal Melbourne Institute of Technology

All samples were analysed and data captured. The 232 respiratory questionnaires, lung function and exhaled nitrogen oxide (NIOX) questionnaires were doubled, captured and validated. The data were shared with our UCT collaborators for analysis. The statistical analysis is currently being done and will be completed in 2016.

Ultraviolet germicidal irradiation (UVGI) in controlling transmission of Mycobacterium tuberculosis (TB) in healthcare settings

Collaborative study team: T Singh¹, O Matuka¹, P de Jager², T van Rensburg², W Leuschner³, M Poluta⁴, M Mphathele⁵, O Kgasha¹, B Binta¹, R Stolper², D Meyer⁶, M Zungu¹, B Kistnasamy¹, G Sekobe¹

¹National Institute for Occupational Health, ²CSIR, University of Pretoria, ³University of Cape Town, ⁴Medical Research Council, ⁵Private consultant on UVGI

UVGI fixtures were assessed for efficacy under the CDC/CSIR sub-contract award. The viability of airborne samples will also be assessed in this project. We have experienced time delays with the project due to technical errors and instrument problems. The Bioaerosol Laboratory obtained permission from provincial health departments to conduct the UVGI study across health facilities in Gauteng, KwaZulu-Natal, the Free State and the Eastern Cape. Dr T Singh attended and presented on the UVGI National Study at the National Occupational Health meeting sponsored by the WHO from 1–4 July 2014. The section hosted several UVGI meetings with various stakeholders, including industry, to discuss activities related to UVGI innovation, a red flag study, guidelines, accreditation of testing laboratories, risk assessments, etc. The section also hosted a UVGI collaboration meeting attended by Dr E Nardell (Brigham and Women's Hospital, US) and Ms Sonya Milonova (Boston, US), as well as Ms P de Jager, Mr T van Reenen and Mr J Nice (CSIR, Pretoria). In addition, section staff attended an international UVGI guidelines meeting, held at the CSIR and chaired by Prof. E Nardell. Dr T Singh and Ms O Matuka attended a project meeting at the Airborne Infection Research Facility at the Santa TB Hospital in Witbank to discuss phase 2 of the guinea pig study (environmental TB monitoring and intervention using polymerase chain reaction (PCR)). Dr T Singh was awarded funds from the NHLS Research Trust for the UVGI study effective December 2014–2017.

An investigation into the presence and impact of free-living amoebae and amoeba-resistant bacteria on drinking water production, storage and distribution on healthcare institutions in Gauteng province, South Africa

Study team: C Bartie¹, TG Barnard², P Muchesa² (DTech student)

¹NIOH, ²University of Johannesburg

Sampling was conducted at the Intensive Care Unit (ICU) in a public sector institution and microbiological testing was completed. A walkthrough of the approved sites was done and sampling has started. The study team attended several WRC reference group meetings, and Dr D Bartie was invited to serve on the Reference Group for the WRC project number K5/2366. Funding is being provided by the WRC.

Research outputs

Other research-related activities included reviewing proposals for funders (NHLS Research Trust, the NRF and the MRC), examining dissertations/theses, reviewing manuscripts for scientific journals (*International Journal of Microbiology and Epidemiology Research*, *Occupational and Environmental Medicine* and *British Journal of Applied Science and Technology*) and staff attendance at various scientific forums. Dr D Bartie was appointed as Treasurer of the Legionella Action Group and will work with the group to raise awareness of legionellosis in clinical settings.

Teaching and training

Teaching and training remained a priority of the section and included presentations at formal workshops, *ad hoc* training and presentations to the NIOH and to national and international visitors (these included occupational health registrars, occupational health practitioners and visitors from the Centres for Disease Control and Prevention, Harvard University and Brigham and Women's Hospital, Boston, US). Dr T Singh, Ms A Fourie, Ms E Ratshikhopha and Ms O Matuka contributed to the teaching activities for the immunology syllabus of second- and third-year medical students of the University of the Witwatersrand. This included lecturing, examining, facilitating and invigilating. Prof. C Bartie contributed to student supervision and Ms Z Kirsten lectured to students from the University of Johannesburg.

The section continued to support the microbiology intern training module for medical scientists, which is accredited by the HPCSA. The section is accredited to train four students through this training module and envisages increasing this capacity in the new financial year. Ms B Binta is currently training under this programme, and Dr T Singh reviewed intern medical scientist portfolios for the HPCSA.

Despite the austerity measures in place during the period under review, the section continued to invest in its largest asset, namely its staff, through up-skilling them on various topics. These included: Minimum Information for Publication of Quantitative Real-Time Experiments (MIQE); ergonomics training; a workshop on sustainability in the chemical industry; a nanotoxicology workshop; teaching portfolio; hazardous biological agents; preparing a good lecture; a biosecurity workshop; biorisk management training; and atopic dermatitis.

The Immunology and Microbiology Section hosted an Occupational Allergy Awareness Day during World Allergy Awareness Week (7–13 April 2014), which was well attended. Allergy testing was performed on the day and awareness was raised through the marketing of an online allergy quiz.

Honours

Ms B Binta has been awarded her MSc Med by the University of the Witwatersrand, Department: Clinical Microbiology and Infectious Diseases. The title of her dissertation was *The prevalence of β -lactamase producing anaerobic oral bacteria and the genes responsible for this enzyme production in patients with chronic periodontitis*.

Mr P Malaka was awarded an MTech degree by the University of Johannesburg, Water and Health Research Centre. The title of his dissertation was *The occurrence of free-living amoebae and amoeba-resistant bacteria in the drinking water of Johannesburg city, South Africa*.

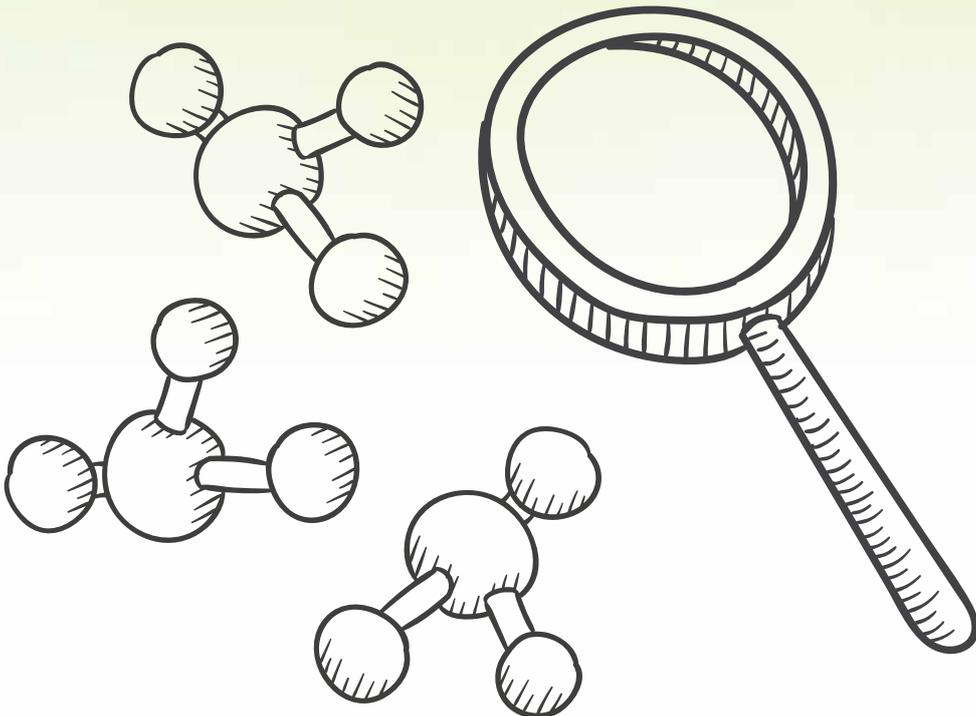
Professional development

Postgraduates enrolled: seven (two MSc students at the University of the Witwatersrand and University of Limpopo, two MTech students at the University of Johannesburg and three DTech students at the University of Johannesburg).



Epidemiology and Surveillance Section

Acting Head: Dr Kerry Wilson



During the period under review, the Epidemiology and Surveillance Section continued its support of NIOH research projects. This included data management, analysis and interpretation. The section aims to provide support where complex data analyses and interpretation are required in occupational health to allow NIOH research projects to have the impact needed to change policy.

Services

The Epidemiology Section continues to provide support to the NCR in the cancer tables calculations. During the reporting period, the NCR's data was analysed to provide official public data tables for the Registry for 2007 and 2008. These tables were released in 2014 and are very important for the planning of service provision and the understanding of the incidence of cancer in South Africa.

Support for the Medical Bureau for Occupational Diseases (MBOD) and the Joint Committee for the Certification of Cases of Occupational Diseases (CCOD) regarding data management and analysis was a key output of the section during the year. It involved data analysis for presentations and workshops to improve delivery of services by the MBOD and CCOD's service delivery. Analyses were carried out on 200 000 claims files captured in a large project for the MBOD and CCOD for the accurate calculation of liabilities of the fund. Cleaning of the data captured is ongoing and will allow the establishment of a mine workers' database. Such a database will improve service delivery and target provision of the required services for benefit medical exams and initiation of the claims process. The section also supported the second phase of the verification project of the MBOD through assistance in developing the terms of reference and support of the tender process. This project will provide key information for the improvement of compensation services.

During the period under review, Dr Pieter de Jager, Public Health Registrar, supported the DST Nanotechnology Baseline Study. He also conducted a national descriptive cross-sectional study to identify institutions involved in nanotechnology in South Africa. The methods used in nanomaterial synthesis, the human resources and equipment available to conduct physicochemical characterisation, health and safety practices, nanomaterial-related waste management, funding sources and industry-wide priorities, were evaluated. Site visits were conducted to gain a better understanding of health and occupational health risk assessment practices. A database was developed of all institutions currently involved in nanotechnology. The findings were presented to the Department of Science and Technology.

Dr De Jager also supported various studies in collaboration with the University of the Witwatersrand, the NICD and the Medical Research Council (MRC), namely: *Corruption in the South African healthcare sector*, *Nosocomial outbreak of NDM-1 producing Gram-negative bacteria*, and *Lead exposure in recreational shooters*. He also took the lead in the ports-of-entry health stream during the establishment of the Emergency Operations Centre (EOC) at the NICD during the Ebola outbreak. Dr De Jager developed a port readiness evaluation tool and conducted a number of port visits to assess readiness for the detection, containment and management of suspected Ebola virus disease (EVD).

Dr Kerry Wilson supported the largest healthcare workers' health study in South Africa, conducted by the Federation for Professional Development, with the cleaning and analysis of the collected occupational health data. This project captured information from an often marginalised group of healthcare workers – the community health workers. These workers often only have matric or lower educational qualifications, and work in communities. They are therefore greatly exposed to communicable diseases, and, to make matters worse, they have little access to personal protective equipment (PPE) to reduce exposure.

Research

OHASIS baseline survey

A second follow-up survey was conducted of selected representative NHLS staff on the Occupational Health and Safety Information System (OHASIS) was conducted. Since the first survey OHASIS has been implemented more widely across the organisation. The second survey was therefore developed to assess whether the system has resulted in improvements in health and safety among staff.

Cancer research

Mr C Nattey analysed data used in presentations made by NCR staff at congresses, specifically on childhood and adolescent cancers. The section also conducted literature reviews for research and management by the NCR.



Two new large research projects have been initiated in the section:

Burden of Occupational Disease and Injury in South Africa

At the request of Dr Kisting, and in collaboration with the SAMRC, Dr Pieter de Jager and the Epidemiology and Surveillance Section initiated a study to estimate the national burden of occupational disease and injury in South Africa (BODI-SA). The BODI-SA Project aims to estimate the burden of disease attributable to workplace exposure in South Africa by sex, age and economic sector. The project will involve extensive collaboration with external partners and will conduct systematic reviews to estimate attributable fractions of various workplace exposures. A list of occupational diseases and injuries has already been compiled, based on findings from a national survey of occupational medicine specialists. This list will be used to help decide which occupational diseases and injuries burden should be quantified first. The study will initially focus on noise exposure and tuberculosis. Findings from the BODI-SA Project will aid in setting priorities for both research and policy regarding occupational health and safety in South Africa.

Informal workers' occupational health

A research paper on the OH&S of informal workers in South Africa was developed. This research was initiated as a result of the many health risks faced by informal workers and the fact that these workers are often neglected, despite being an important part of the economy in developing countries. The study began with a review paper to establish what work has been done and what is currently being done to improve the lives of informal workers. The NIOH will use the information in this paper to start a research project and surveillance system in collaboration with interested external stakeholders.

Teaching and training

Teaching and training are core functions of the section. The main teaching conducted in 2014 was a one-week course in Basic Epidemiology and Statistics with a few refresher sessions for the students studying for their Diploma in Occupational Health at the University of the Witwatersrand. A one-day course was conducted for Denosa members and staff on Research Methodology and Proposal Writing and Referencing. The section supported the FELTP course on field epidemiology through presentations to the students. Lectures were also given by staff of the Graduate Entry Medical Programme (GEMP) at the University of the Witwatersrand; lectures on Health Systems Management were given to the Masters in Public Health (MPH) students and lectures on Health Economics and Health Systems Financing were given to the MMed students.

Dr K Wilson is supervising a MPH student from the University of the Witwatersrand who is doing a research project on respirator fit testing. Consultations on biostatistics were provided to School of Public Health students, also from the University of the Witwatersrand. Introductory lectures on epidemiology were given at the universities of the Witwatersrand and Pretoria. Mr Vusi Ntlebi gave lectures and provided project support at the University of Johannesburg in the Department of Environmental Health.

Professional development

Honours

Dr Kerry Wilson completed her PhD, which was awarded in 2015.

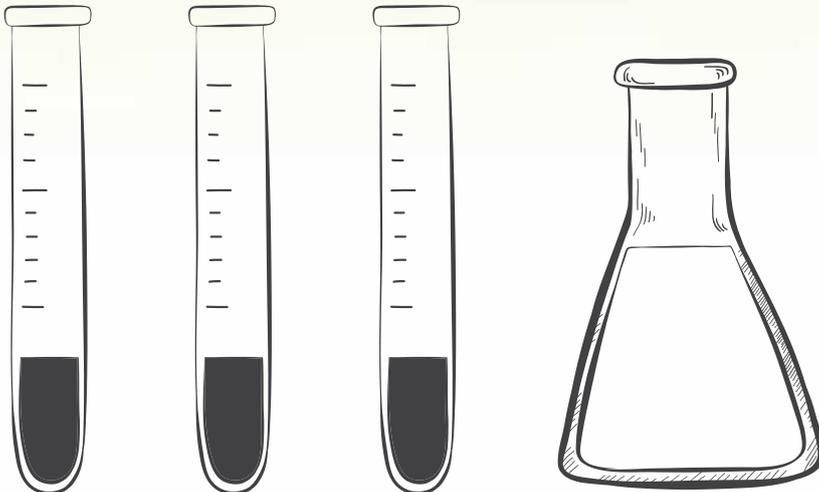
Human resources

The section continued to face human resource constraints during the period under review. However, a public health specialist was appointed. The section consists of only four staff members, therefore their ability to initiate and conduct independent research and produce publications is limited.

Quality Assurance



Manager: Mr Bonginkosi Duma





Services

Quality remains a priority at the NIOH with three laboratories (Analytical Services, Immunology and Microbiology, and Pathology) maintaining their quality and competency standards (ISO 15189). During the period under review, the NIOH managed to transit smoothly from ISO 15189:2007 to ISO 15189:2012. This standard requires that quality indicators are put in place and more work, together with additional documentation, is expected to be produced by the laboratories for accreditation. The quality indicators include the turnaround time, performance and participation in external quality assurance (QA) schemes, and internal quality controls. According to the updated ISO 15189 standard, laboratories are no longer required to report annually whether they have passed or failed the laboratory quality controls; instead the performance of laboratory quality controls must be checked and verified throughout the year. During the last quarter, SANAS audited the Immunology, Pathology and Analytical Laboratories on the new ISO 15189:2012 standard. The auditors commented on the improvement that the NIOH has achieved this year in terms of the number of non-conformances, which decreased compared with the last financial year. This decrease is a direct result of extra effort made by the laboratories' staff, despite difficulties faced with staffing and austerity measures within the NHLS. Staff members had to ensure that quality management systems were maintained.

Laboratories within the institute continue to hold monthly accreditation meetings during which they identify challenges faced that could affect the overall quality of the tests provided. Internal audits continue every year (whether external audits occur or not) under ISO 15189 (Immunology); ISO 17025 (Microbiology); ISO 15189 and ISO 17025 (Analytical Services); ISO 17020 & ISO 17025 (Occupational Hygiene); ISO 15189 and ISO 17025 (Pathology); ISO 9001 (NCR); and GLP (OECD – Toxicology). This helps to maintain the quality system in place at the NIOH and NCR.

Quality assurance developments within the institute include the final stages of preparation for compliance with the Good Laboratory Practice (GLP) standards of the Organization for Economic Co-operation and Development (OECD) for the Toxicology Laboratories. During the second quarter, these laboratories were visited by Mr S Phophi (SANAS Field Manager) in an attempt to help us better understand the requirements for accreditation and to provide input into what further information and research is required within the section for successful accreditation.

SANAS audited the Occupational Hygiene Division for pre-assessment of ISO 17020:2012 as part of the new standard for Approved Inspection Authority (AIA) laboratories. This pre-assessment occurred during the third quarter of the period under review and no non-conformances were raised. However, areas where improvement could occur and systems could be strengthened were identified and indicated to Hygiene Laboratory staff. This new standard for occupational hygiene is part of the requirement by the Inspection Authority of the Department of Labour (DoL) to ensure that AIA laboratories are accredited before they receive a government licence to conduct occupational hygiene surveys. The initial assessment for the standard will be done in June 2015.

Professional development

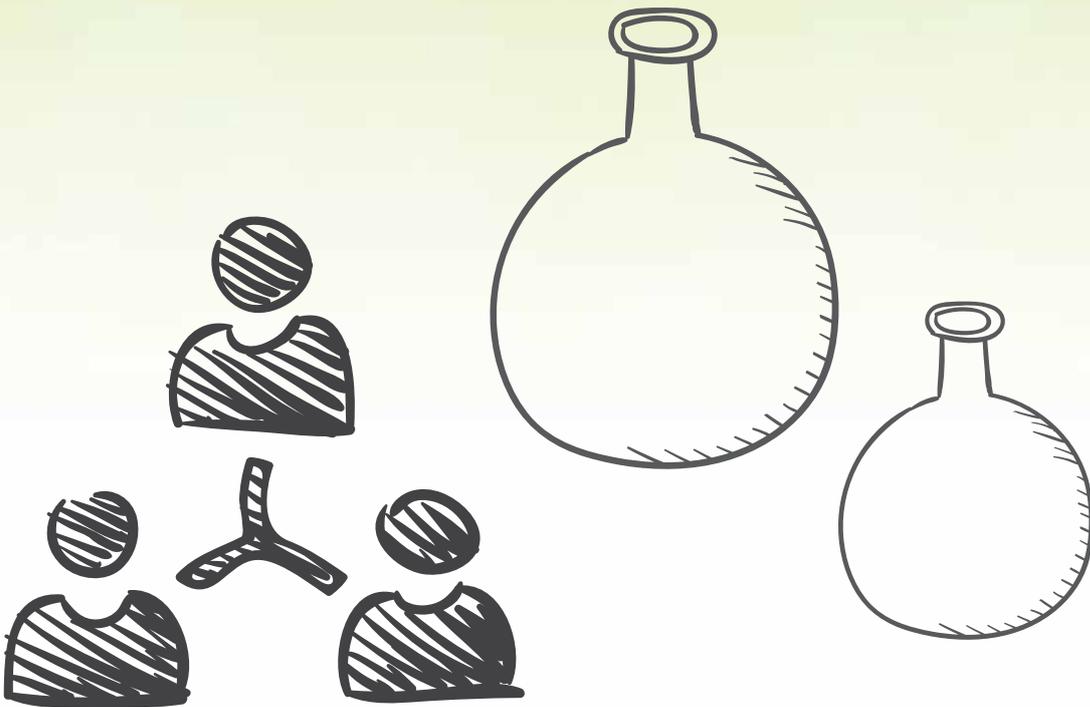
Section staff attended a two-day QA workshop in Pretoria in June 2014. The workshop looked at proficiency testing schemes and problems encountered during the operations in a laboratory that affect quality. This was followed by a three-day QA training session in Kempton Park in July 2014, for ISO 15189:2012. The NIOH's QA has also continued to be recognised among the SADC countries: Mr B Duma was requested to give a presentation at the Botswana Quality Conference in October 2014 and in Namibia in March 2015 on the importance of having QA systems in the workplace. This has helped to strengthen stakeholder relations in QA with neighbouring countries.

The strength of the quality system within the NIOH resulted in a number of NIOH staff being requested to be part of SANAS technical staff. During the last financial year, two staff members served as SANAS technical auditors and in the period under review this number grew to six. This demonstrates the confidence that SANAS has in NIOH staff capabilities and knowledge. This year the NIOH braced itself for a possible three accreditations with SANAS on ISO 15189 (current), ISO 7020 (June 2015) and ISO 17025 (later in the year). It anticipates that, by the end of the next financial year, it will have three different accreditation standards approved and in place.



NHLS Biobank

Manager: Mr Bonginkosi Duma





Services

Requests for the NHLS National Biobank's services continues to grow every year. The NHLS is still a member of the International Society of Biobanking and Biorepositories (ISBER) on which it is represented by Mr B Duma, and is part of the two working groups of ISBER. The NHLS is also part of the European, Middle East and Africa Society for Biorepository and Biobanks (ESSB) as part of the African Working Group.

The National Biobank, represented by Mr B Duma, arranged several meetings with the South African Military Health Services, the medical arm of the South African National Defence Force (SANDF), to collect over half a million samples for storing in the Biobank. Several meetings were held with SANDF generals and NHLS executives to finalise this Service Level Agreement (SLA). The Biobank was also subjected to security checks conducted by Defence Intelligence to ensure that the facility is secure for the storage of biomaterial. The SANDF was satisfied with the facility, but recommended further security measures on which the NHLS began implementation. The Biobank has now begun increasing its capacity from 160 000 samples to a million due to an increase in the demand for storage space by external clients. The SANDF project commenced during the last quarter of the period under review, and over 235 000 samples have already been collected. Daily collections continued at the SANDF collection site in Richmond, Johannesburg.

The Biobank stores biological specimens for research from both NHLS laboratories and external clients. The facility maintains a high level of security and constant monitoring of ultra-low freezer temperatures and environmental conditions, to ensure that specimens remain preserved optimally and in line with international standards/practice. With the increasing demand for freezer space as a result of newly fostered links and projects, the National Biobank has future plans to renovate identified buildings within the NHLS premises to cater for the growing demand. At present, these buildings are undergoing health and safety audits prior to occupancy.

The Biobank ensures the stability of its freezers' temperatures by using its 20 000 litre diesel generator as backup when electricity shortages occur. The capacity of this generator allows equipment to run uninterrupted for a month should electricity supply become a longer-term problem.

During the period under review, a website domain was registered for the National Biobank, which can be accessed via the following URL: <http://www.nationalbiobank.nhls.ac.za>. The website serves as an ideal platform for stakeholder relations and communication relating to the Biobank, including sharing services on offer, new developments within the repository, as well as the latest news in the medical field. It contains information about the Biobank and is currently embedded within the NHLS website, accessible via: <http://www.nhls.ac.za>. There is also a link through which Biobank staff can be contacted directly by clients when there is a special request or information is required. In addition to the website, an independent logo was generated, with the assistance of the Marketing and Communications Section within the NIOH and NHLS.

Professional development

The National Biobank continues to expand and during the period under review it employed a new medical scientist, Ms N Tlotleng. Ms Tlotleng is finalising her PhD at the University of the Witwatersrand, in the Department of Molecular Medicine and Haematology; her research topic is *In vitro toxicity of gold nanoparticles*. The medical scientist continues to work directly with the project and is also on the project site on a daily basis. The Biobank will continue to employ more staff as the number of projects grows.

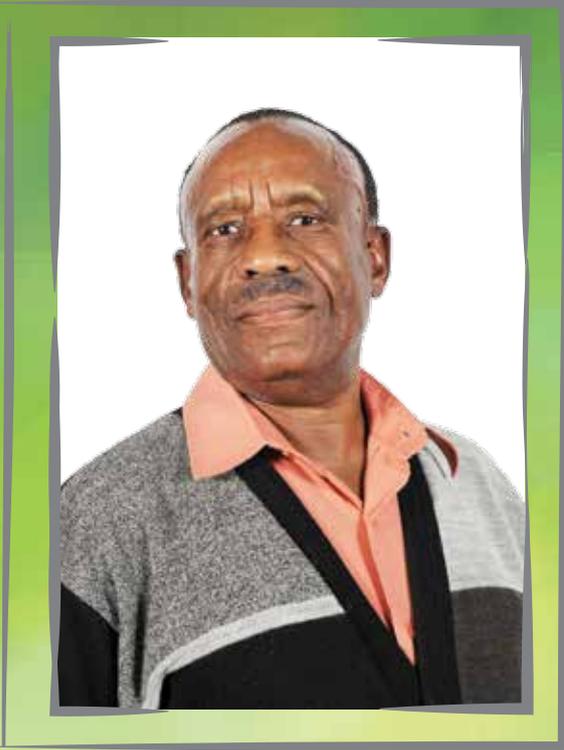
Biobank staff are part of the ESSB, and Mr B Duma participates actively in the Education and Training Committee of the society. Since the beginning of 2014, the NHLS has been participating in various committees of the Biobank Cohort Network (BCNet), under the World Health Organization (WHO).

During August 2014, there was a follow-up meeting and visit by the ESSB representative, Ms Rita Lawlor (past President of the ESSB) to the Biobank. Ms Lawlor also held a meeting with NHLS Research Manager, Dr B Malope-Kgokong, to try to establish a research working relationship with the NHLS.

Mr B Duma received several expressions of interest from universities that want to work with the Biobank. The Biobank is also currently holding talks with a UK-based company that wants to use its services. Mr Duma continues to sit on the Animal Biobank Advisory Committee based at the Pretoria Zoo under the management of the National Zoological Gardens (NZG). In addition, Mr Duma made a presentation at the South African Human Genome Project in Pretoria.

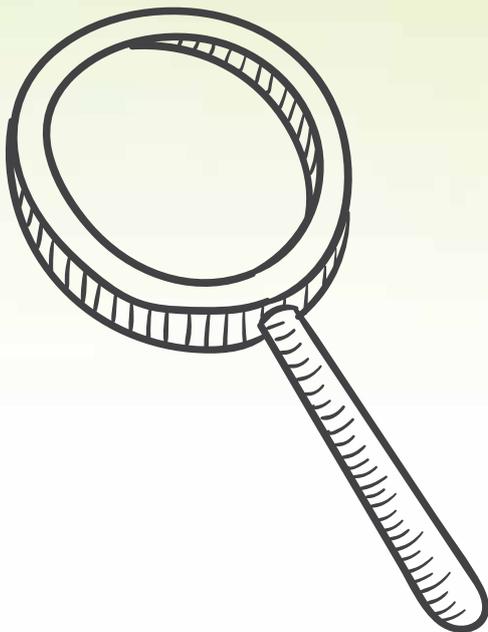


Ms Rita Lawlor, past President of the ESSB, with Mr Bonginkosi Duma at the Union Buildings in Pretoria



Occupational Hygiene Division

Head: Mr Gopolang Sekobe





The Occupational Hygiene Division provides professional occupational hygiene services to national and provincial government departments, industry, private clients as well as support for occupational health and safety initiatives within the NIOH and the NHLS.

During the period under review, the Occupational Hygiene Division was involved in training, service and research projects. Teaching activities included academic support for undergraduate and postgraduate students at the University of Johannesburg and the University of the Witwatersrand. The division continues to put effort into the development of its staff and the expansion of its capabilities.



A hospital polyclinic. Air was sampled for TB during a combined project with the NIOH Immunology and Microbiology Section

The division has made a considerable investment in facilities, equipment and skills over the last few years, and is now in a strong position to provide valuable input into the occupational hygiene needs of the SADC region. Accreditation with SANAS, as required by the Department of Labour, is in progress. Four staff members passed the three-day SANAS technical assessors course. The division will continue its efforts to provide occupational hygiene support in the form of training, advice, risk assessments and exposure monitoring to national and provincial government departments, including the departments of Health, Labour, Mineral Resources, Defence, Correctional Services and Environmental Affairs.

This year, staff members had two papers published in journal publications and made one poster presentation. They gave five talks at the South African Institute for Occupational Hygiene (SAIOH) conference held at North-West University's Potchefstroom campus.

Occupational hygiene services

Occupational hygiene risk assessments, audits, surveys and advisory services were provided to a range of industries, including mining, woodworking and manufacturing, and laboratories and healthcare facilities. The services of the section aim to provide recommendations that will contribute to improved occupational health in all workplaces. Improved health at work leads to higher productivity and reduced national expenditure on 'ill health'.



Pouring of melted ore during lead-in-air sampling at a gold assay laboratory



Environmental lead and SO₂ sampling in Namibia

The section conducted 29 occupational hygiene surveys on conditions in a wide range of workplaces, including smelters, laboratories, offices and manufacturers. All its reports focus on practicable recommendations to reduce occupational health hazards in the workplace.

Analytical services

In addition to occupational hygiene services, the division also provides analytical services, which include asbestos counting using phase contrast microscopy (PCM) and quartz analysis with Fourier transform infrared spectroscopy (FTIR), X-ray fluorescence (XRF) and X-ray diffraction (XRD). The XRD, FTIR and XRF laboratories functions within the Occupational Hygiene Division and is headed by Ms T Madzivhandila, under the supervision of Mr G Sekobe (actively assisted by Dr B Kgarebe, Head of Analytical Services). Dust and solutions are analysed to help determine workplace risk.

A total of 168 bulk samples from abandoned mines and 32 filter samples from mines and factories were analysed for quartz using X-ray diffraction and FTIR. In addition, 150 geochemical analyses using XRF were performed – 96 from abandoned mines and 54 from Namibia.

The section's Asbestos Laboratory provides a comprehensive range of asbestos-related services throughout southern Africa, including occupational health risk assessments, workplace/building inspections, exposure measurements, advisory services, asbestos management plans and programmes, as well as training in asbestos safe-working practices and fibre counting. A total of 40 filter samples were analysed for asbestos fibres using the Phase Contrast Microscopy (PCM) method. The samples originated from surveys conducted at private clients' premises and at the NIOH.

Quality

The section participates in two international quality control schemes: 1) the respirable crystalline silica international quality assurance of the Health and Safety Laboratory (HSL) in the UK, in which XRD and FTIR are consistently rated as within range; and 2) the Asbestos Fibre Regular Informal Counting Arrangement (AFRICA) asbestos proficiency testing scheme with the Institute for Occupational Medicine (IOM) in Edinburgh, UK. Both have maintained a '1' grading ('good' performance).

The section is currently in the process of obtaining SANAS 17020 accreditation for Inspection Bodies as required of all DoL-approved Inspection Authorities (AIAs), as well as SANAS 17025 accreditation for the XRD Laboratory.

Research

Several research projects are in progress.

Hazardous chemical substances: Exposure of NHLS laboratory workers to hazardous chemical substances

– Led by Gabriel Mizan

This research project is ongoing, and field work is nearing completion. A total of 16 laboratories located in five provinces were visited during the year, including departments of histopathology, cytology, microbiology, haematology, chemistry and TB.

Particulate matter: Particulate exposure in waste reclaimers at a Gauteng landfill site

– Led by Tebogo Maeteletja

This is an ongoing project which aims to assess the association between PM₁₀, PM₄, soot and mineral composite exposure, and various respiratory symptoms in waste reclaimers at a Gauteng landfill site. The study emanated from the lack of knowledge of hazards caused by increasing waste generation, disposal, recycling rates and influx of waste reclaimers in landfill sites.

Dust control: Continuous dust monitoring and suppression

– Led by Kevin Renton

This Mine Health and Safety Council project is aimed at improving the control of workers' exposure to mine dust. This study is being planned as a collaborative research initiative with the CSIR.



Respirable crystalline silica: Characterisation of respirable crystalline silica in the dust obtained from abandoned mines around Roodepoort, West Rand, Johannesburg, South Africa

– Led by **Thingahangwi Madzivhandila**

Ms Madzivhandila is currently undertaking research on respirable crystalline silica dust exposures in abandoned mines around Roodepoort, West Rand, Johannesburg. The study aims to identify the mineral composition of the dust obtained from abandoned mines and to evaluate and characterise the seasonal exposure risks to the community living next to and around abandoned mines.

The significance of silica polymorphs in platinum mine dust

– Led by **Thingahangwi Madzivhandila**

Mr Gopolang Sekobe and Ms Thingahangwi Madzivhandila are studying polymorphs in platinum mine dust to determine their possible relationship to silicates that can be linked to silica and consequently the potential to cause silicosis.

Nanomaterials: Occupational exposure assessment of metal oxide nanomaterials during their synthesis in a research laboratory

– Led by **Muriel Mogane**

This research project has been completed and is in the process of finalisation. The study aims to assess tasks that result in emission of particles into the working environment and possible exposure of staff to these particles.

Respirator protection: A study of respirator fit test and face sizes of NHLS respirator users during 2013–2014

– Led by **Jeanneth Manganyi**

The study was conducted over a one-year period during 2013–2014 and was submitted towards a completion of a third-year MPH research project. The study aimed at describing the proportion of NHLS respirator users who were adequately protected from exposure to tuberculosis (TB) while wearing N95 respirators, using quantitative respirator fit testing. The study also investigated the influence of face size and gender on respirator fit.

A survey of South African facial characteristics and respirator fit testing

– Led by **Jeanneth Manganyi**

The study is ongoing. More data from different industries are required to reach adequate sample size. This study aims to evaluate the applicability of the current respirator fit test panel, which is used for designing and testing respirators supplied to South Africa. This will be achieved by measuring the key facial characteristics of a representative South African working population.

Effectiveness of Respiratory Protective Equipment (RPE) for nanoparticle exposure prevention: systematic review and meta-analysis

– Led by **Lebogang Ntlailane**

Contribution to public health: This review will fill the knowledge gaps of the issue and formulate more focused research on the subject that will feed into policy making for nanoparticle exposure prevention.

Completed research project

Noise: Noise exposure in laboratories

– Led by **Gopolang Sekobe**

Gopolang Sekobe, assisted by Tebogo Nthoke, undertook a study of noise generated by analytical equipment (AmpliPreps) in selected NHLS virology laboratories. This study arose owing to a complaint by analysts at the NHLS laboratory at Mankweng Hospital. A publication of the study is being prepared.

Teaching and training

Undergraduate

About 80 Diploma in Environmental Health and BTech students from the University of Johannesburg visited the NIOH for two short practical training courses on the physical and chemical aspects of occupational hygiene.

Postgraduate

Teaching and training activities included course management, student supervision and teaching, and practical support for the Masters in Public Health Degree (Occupational Hygiene) of the University of the Witwatersrand. Support is also given to the University of Pretoria's School of Public Health, where staff members act as external examiners of the mini-dissertations submitted by the MPH students.

Four risk assessment training sessions were held for government departments, including the provincial Department of Health, occupational hygiene personnel and NHLS SHE representatives. Approximately 45 delegates attended. The division also participated in workshops in support of the Department of Labour in occupational health and hygiene training and to raise awareness.

Honours

Jeanneth Manganyi was awarded the Occupational Hygienist of the Year award at the annual SAIOH Conference held at Potchefstroom. The prestigious award was handed to her at a dinner ceremony on 30 October 2014 held at Crista Galli in Potchefstroom.

Professional development

Three staff members passed the South African Institute for Occupational Hygienists (SAIOH) board exams and qualified to be registered as occupational hygiene technologists. Four staff members attended and passed the three-day SANAS technical assessors course, and one staff member qualified as a technical assessor.

Postgraduates enrolled: five (two MSc students in Community Health at the University of Pretoria, two MPH students in Occupational Hygiene – one at the University of the Witwatersrand and one at the University of Pretoria, and one student in MHealth in Physics at the University of the Witwatersrand).

Undergraduates enrolled: one (Certificate in Project Management at the University of the Witwatersrand).

Undergraduates completed: one (BTech at the University of the Free State).



Manager: Mr David Jones

Occupational Health, Safety and Environment Services (SHE)



Staffing

The year under review is the first year in which all of the occupational health nurse managers were in place. It also saw the resignation of one safety, health and environment (SHE) officer. The post has been designated as a critical post and will be filled early in the new financial year.

The occupational medicine practitioner position was not filled during the period under review. An agreement was reached that the post will transfer the funding to the Occupational Medicine Section and then, in return, an occupational medicine practitioner who is employed in the NIOH Occupational Medicine Section will be allocated to care for the NHLS employees. Dr O Abrahams was allocated to assist the NHLS as of 1 February 2015. In the few short months before going off on maternity leave, Dr Abrahams began reviewing the medical surveillance policies and providing medical guidance on many issues.

The advantage of the above arrangement is that while Dr Abrahams is on maternity leave, the NIOH, through its various occupational medicine practitioners, is continuing to provide services to the NHLS.

Clinical services

The Occupational Medicine Section of the NIOH continued to provide guidance and expert medical support to specific cases and incidents. Of particular note were:

- Possible exposure to Brucella
- Employees with TB
- Exposure to chemicals.

With the appointment of all of the occupational health nurses, a project is under way under the guidance of Dr Abrahams to check the levels of compliance with regard to hepatitis B immunisation and surveillance for TB. The information collected is being captured into the Occupational Health and Safety Information System (OHASIS) Workforce Health module.

Waste generators

The process of registering facilities that are deemed to be major generators of healthcare risk waste has continued during the past year and 65 sites have now been identified and have registered to ensure compliance with the National Waste Information Regulations, 2012, promulgated under the National Environmental Management: Waste Act, No. 59 of 2008.

The year under review also saw the appointment of 60 waste officers.

In line with the intention not to take employees out of the laboratory unless absolutely necessary, an online training course on healthcare risk waste has been developed internally and loaded onto the NHLS intranet. The aim is to empower employees in the segregation and legal handling of healthcare risk waste from 'cradle to grave'.

A new module in OHASIS was rolled out during the year under review. In order to gain access to the module, an employee must be trained in waste management and must also know to access and use OHASIS. This module is used to record and track hazardous waste generated.

Special investigations and NIOH support

The various divisions in the NIOH continued to provide expert support, including Occupational Hygiene, Occupational Medicine and Immunology. Examples of expert opinion and guidance related to:

- The fit testing of N95 respirators for staff
- Compliance with legal requirements regarding medical surveillance
- Noise surveillance
- Chemical exposure
- Indoor air quality monitoring
- Ergonomics assessments
- Immunology advice.



Conferences and training

Health and safety representative training

Online training of health and safety representatives, co-ordinated by the SHE officers, continued during the year under review. A concerted effort was made to ensure that all new health and safety representatives did the course. It was further requested that the training, which consists of six online modules, be made available to managers and other employees. This has been done and there is a growing number of people who are doing some of the modules.

Other training and presentations

Staff continued their involvement in training presentations within their respective areas. These range from safety orientation/induction, healthcare risk waste (HCRW), OHASIS, presentations at business manager meetings, management review meetings to evacuation drills, etc.

Various topics have been identified, and the SHE Division intends to develop training that will be made available to all employees online to ensure that the NHLS is legally compliant regarding training on identified hazards.

Grant funding is in the final stages of negotiating the production of professional induction videos. The aim is to disseminate the videos to all facilities. The videos will provide basic biosafety and biosecurity induction for all new employees, newly appointed managers, any visitors and also appointed security guards.

The WHO invited Mr D Jones to participate in an Expert Review Meeting looking at the Feasibility of the Minimal Information Model for Safety Information Reporting in Healthcare.

Four NHLS staff members received funding to attend the 56th American Biological Safety Association (ABSA) Conference in San Diego, California, US, from 2–8 October 2014. The conference included state-of-the-art keynote addresses, papers and panels highlighting best practices and hands-on skills crucial to today's biosafety and biosecurity professionals. All four members of the group had the opportunity to attend the pre-conference courses and seminars.

The SHE Division and the NIOH facilitated training conducted by Prof. A Duse of identified employees at all NHLS facilities who were providing services to the 11 hospitals designated by the Minister of Health as facilities for Ebola admission and treatment.

Occupational Health Information System

The OHASIS health information system, which is being used in the NHLS, has progressed from being a paper-based system to being an online system and has now been upgraded to version 3, which was developed to this point in-house, together with the original developers, the University of British Columbia, Canada. Training of identified people in various facilities through online training via the NHLS intranet, is continuing. To date, 312 employees (up from 103 last year) have been trained and loaded as users of OHASIS. This means that they can input data into the Incident Reporting and Investigations and/or Waste Tracking Modules and are able to access reports. The intention is to continue with this process.

The NHLS intends to increase the modules within OHASIS to include a module that will assist health and safety committees to meet their legal requirements. It is envisaged that this module will assist with the setting up of agendas, the dissemination of minutes and records of the various checklists that are completed by safety appointees, such as health and safety representatives, first aiders and fire wardens.

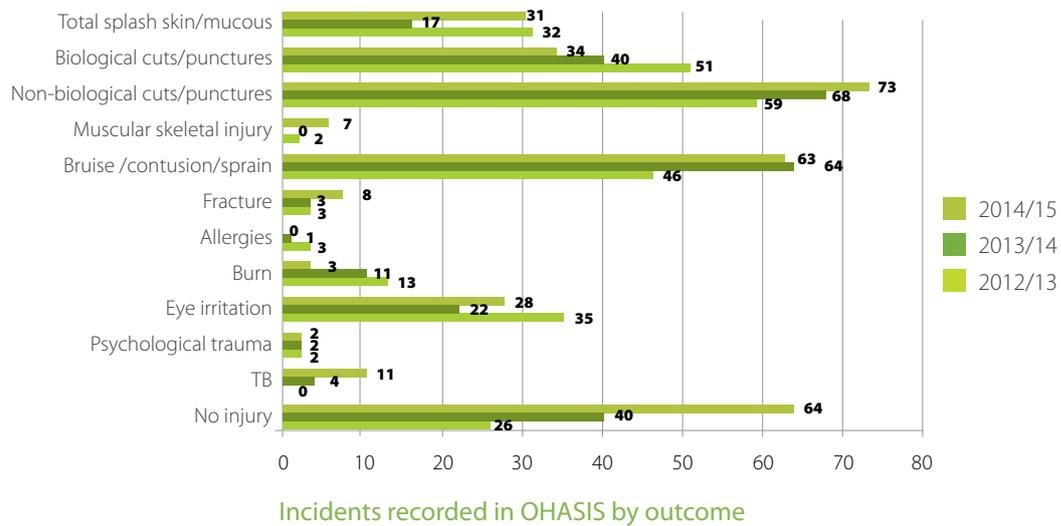


The Safety, Health and Environment (SHE) team

Back row (L–R): Ms Tendayi Chikoko, Sr Noluthando Masiza, Sr M Magasa, Mr Mackson Mulugisi, Sr Marlinee Naidoo
Front row (L–R): Ms A Potgieter, Ms M Morgan (Deputy Manager), Mr D Jones (Manager), Ms Ncebakazi Mvakade and Ms Nontutuzelo Mabuya

The value of OHASIS is becoming more recognised in South Africa, and an agreement is currently being negotiated with a provincial Department of Health to implement the system within the department. The NHLS continues to support the roll-out of OHASIS in the Free State, in partnership with the University of British Columbia.

A breakdown of some of the types and numbers of outcomes for incidents recorded in OHASIS during the year is shown in the graph below. The number of incidents increased from the 272 in the previous financial year, to 374.



During the period under review, the SHE officers, under the guidance of Ms M Morgan, continued with the process of auditing facilities. The audits were based on the type of information that would be looked at by the Department of Labour and the requirements of the Occupational Health and Safety (OHS) Act, No. 85 of 1993.

During the review period, 347 safety audits were conducted and the number of facilities that achieved a 100% score increased from one last year to nine this year. These facilities included Tygerberg Microbiology, Tygerberg Immunology, Groote Schuur Laboratory Support Services, Western Cape District Laboratory, Vredendal, Humansdorp, Port Elizabeth Cytology, Port Elizabeth Laboratory Support Services and NICD CVI Polio Isolation.

In order to assess the level of risk assessments in place in the various facilities, 321 different risk assessments were evaluated. To assist facilities where risk assessments were found to be wanting, SHE officers facilitated improvements to 136 of the 321 risk assessments to ensure compliance.

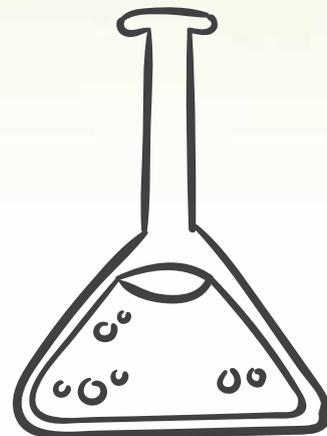
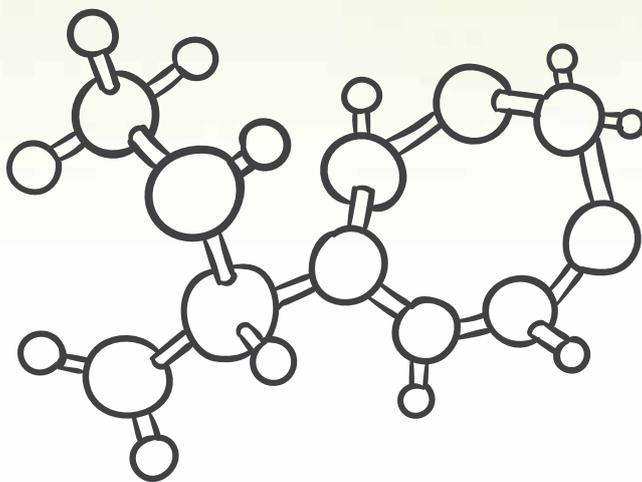


SHE Officers attending the 56th American Biological Safety Association Conference at the Manchester Grand Hyatt, San Diego, California, US, from 2–8 October 2014. (L–R) Nontutuzelo Fatyela, Marlinee Naidoo, Maleshwane Magasa and Tendayi Chikoko with a colleague they met in California.

HIV/TB in the Workplace Unit



Head: Dr Muzimkhulu Zungu



In line with the goal of achieving a 'long and healthy life for all South Africans', the Negotiated Service Delivery Agreement (NSDA) of the Ministry of Health has to reduce the burden of disease caused by the human immunodeficiency virus (HIV), acquired immunodeficiency syndrome (AIDS) and tuberculosis (TB), among others. HIV, AIDS and TB infect and affect workers who are the backbone of the economy. Over the last three years, therefore, the NIOH has strategically established the HIV/TB in the Workplace Unit.

In 2014/15, over and above the provision of HIV and TB services, teaching and training, and research, the Head of the HIV/TB Unit functioned as the Director of the Medical Bureau for Occupational Diseases (MBOD) and the Assistant Commissioner to the Compensation Commissioner for Occupational Diseases (CCOD). Both the MBOD and CCOD provide statutory services as per the Occupational Diseases in Mines and Works (ODMWA) Act, No. 78 of 1973.

Services

NHLS HIV/TB Workplace Programme

The unit provides technical support to the NHLS Safety, Health and Environment (SHE) Programme on queries from employees regarding HIV and TB in the workplace.

ODMWA Act

One-stop services

The HIV/TB Unit was among the key participants in the strengthening of occupational health services, in particular for TB and HIV in the mining sector. In an effort to improve access to occupational health services by ex-miners in South Africa, the unit participated in the inception and launch of one-stop services for current and ex-miners in Mthatha and Carletonville. Activities included the raising of funds and planning of services for both sites. The launch of the one-stop services was attended by the Deputy President of South Africa, the Honourable Mr Kgalema Motlanthe, in Mthatha in the Eastern Cape, and the Minister of Health, the onourable Dr Aaron Motsoaledi, in Carletonville, Gauteng. Work on occupational health services for mine workers is not only focusing on South Africa, but also extends to other parts of southern Africa. As a result, the unit participated in meetings with ex-miners from Swaziland to discuss the roll-out of services.

Director of the Medical Bureau for Occupational Diseases

The HIV/TB Unit managed, provided and co-ordinated the technical services of the MBOD for at least three-quarters of the reporting period. This included reconstituting the Risk Committee, chaired by the Chief Inspector of Mines of the Department of Mineral Resources; chairing the Certification Committee, which certifies miners for compensation under the ODMWA; participating in the Review Authority and the Joint Committee; and managing all other technical committees of the MBOD.

Assistant Commissioner for the Compensation Commissioner for Occupational Diseases

The HIV/TB Unit supported and participated in the Audit and Risk Committee and the Advisory Committee of the CCOD in executing their mandates. The unit also supported the office of the Compensation Commissioner with technical support on an *ad hoc* basis.

Occupational Health Services in the Public Service

The HIV/TB Unit, in collaboration with the National Department of Health (NDoH) and the World Health Organization (WHO), organised and hosted the National Occupational Health Workshop. The main purpose of the workshop was to deliberate on a Occupational Health System for South Africa, in line with the National Health Insurance (NHI) policy framework, to be delivered through the district health system, based on the re-engineered primary healthcare (RPHC) initiative. The meeting was attended by representatives from all nine provincial Departments of Health, occupational health experts, trade unions and business.

The HIV/TB Unit is also providing a number of support services to the public sector. It acted as the secretariat to the NDoH for the HIV/TB Workplace Programme for healthcare workers, provided occupational health and safety services to a Gauteng Provincial Hospital and supported TB infection prevention and control among healthcare workers in particular. The unit provided technical support to the national Ebola Response Unit. It also held several discussions in preparation for the provision of services in small, medium and micro enterprises and the informal economy, including with the Asiyeni teams from eThekweni.



Collaboration and partnerships

The HIV/TB Unit continues to strengthen its relationships with several key stakeholders, including:

1. The WHO on the Occupational Health System within the RPHC and the NHI
2. The World Bank on the control of TB in mines, both in South Africa and the SADC region
3. The International Labour Organization (ILO) in the development of HIV/TB prevention and control in the workplace
4. The University of British Columbia, Canada, in strengthening occupational health services for healthcare workers.

Teaching and training

During the period under review, the unit successfully hosted registrars in public health medicine (PHM) from the University of Pretoria. It also hosted a South African Field Epidemiology and Laboratory Training Programme (SAFELTP) resident who is registered as a PMH student at the University of Pretoria. The unit continues to collaborate with the University of Pretoria in co-ordinating the Diploma in Occupational Medicine and Health (DOMH) on behalf of the university's School of Health Systems and Public Health. Staff members also teach undergraduate and postgraduate students at the universities of Pretoria and the Witwatersrand, as well as at several public and private institutions. In addition, the unit collaborated with other institutions in discussing the training programme for a Diploma in Occupational Health at universities.

Research

The unit continues to be involved in the following research projects:

An evaluation of tuberculosis infection control practices in a regional hospital setting, South Africa, 2012–2017

The study aims to evaluate TB infection control interventions, including compensation for occupational TB, with a focus on the following:

- (a) Baseline assessment of administrative, engineering and environmental infection control measures in place
- (b) Implementing the intervention(s), including a TB surveillance system, based on the findings from (a)
- (c) Repeating the baseline assessments in (a) to evaluate the effectiveness of the interventions implemented in (b).

Incidence of TB (disease) among healthcare workers in two provinces in South Africa: A historical prospective cohort study

This study will determine the incidence rate of TB (disease) among healthcare workers (HCWs) in the Free State and Gauteng provinces from 2009–2012. Current estimates of the disease burden among HCWs in high-incidence regions are based on the results of occupational health record reviews (therefore excluding all HCWs who are diagnosed/treated elsewhere) or have relied on self-reporting by the HCW of their TB status.

To our knowledge, this will be the first study in South Africa to link confirmed TB disease to healthcare human resource records. Methodologies similar to those proposed here have been used extensively around the world to determine the rate of health outcomes among a wide variety of occupational cohorts.

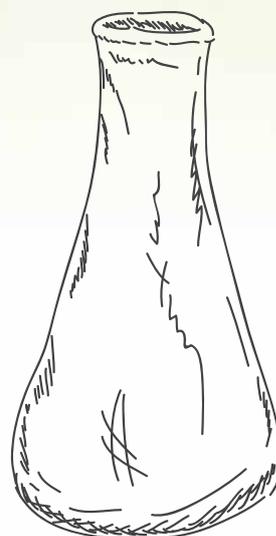
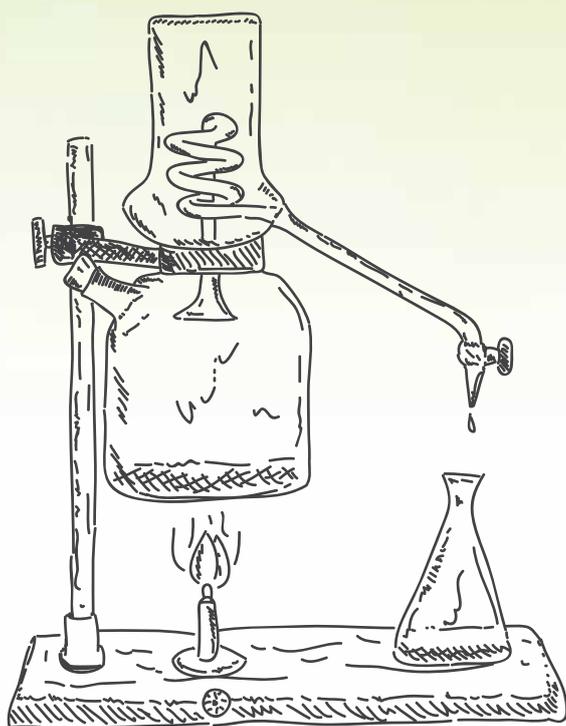


Participants at the National Occupational Health Workshop, Garden Court, Johannesburg



Analytical Services Section

Head: Dr Boitumelo Kgarebe





The Analytical Services Section provides specialised laboratory tests, advisory services and training to support private industries, government departments and academic institutions in occupational and environmental health. It also supports research. The section focused mainly on the analysis of hazardous substances in environmental and biological media as a way of strengthening the assessment of workplace exposures in compliance with the Regulations for Hazardous Chemical Substances.

In addition, the section provided support for various research projects of national importance, advised the private and public sectors and trained postgraduate students in biological monitoring techniques for chemical contaminants in the workplace. By attending and presenting seminars, workshops and lectures, the section increased its own capacity to respond to occupational health concerns. Furthermore, by admitting research students for in-service training, and hosting postgraduate students to expose them to various practical aspects of an accredited laboratory, the section continued to assist national institutions in preparing students for laboratory-focused careers.

Diagnostic services

Over 11 000 tests for diagnostic and research purposes were completed during the reporting period. The tests included assays of toxic metals, mainly for aluminium, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, uranium, vanadium and zinc in blood, serum, urine, water and environmental samples. Organic assays of biological samples requested were mainly for o-cresol, dichloromethane, hexanedione, hydroxypyrene, mandelic acid, methanol, methylene diphenyl diisocyanate, methyl hippuric acid, methyl ethyl ketone, phenol, toluene diamine isocyanates, organophosphate metabolites, toluene, benzene, trichloroacetic acid and *t,t*-muconic acid.

Research and testing clients included UP, the MRC, South African National Defence Force, Sefako Makgatho Health Sciences University (formerly MEDUNSA), the Department of Correctional Services, DoH, Lancet Laboratories, National Bioproducts Institute, Western Province Blood Transfusion Service, NHLS, Metallica Chemicals, Global Clinical, Ethekeini Laboratory Services and Viral Laboratory.

New developments

In line with increasing its scope of activities and analyses, the section developed and put forward new methods for SANAS accreditation in 2015. These were the multi-element analyses of arsenic, cadmium, chromium, cobalt and manganese in blood and arsenic, cadmium, chromium, cobalt, manganese and nickel in urine. Both methods are done by Inductively-Coupled Plasma Mass Spectrometry (ICPMS). In addition, the measurement of lead in blood by Atomic Absorption Spectrometry (AAS) was also put forward for accreditation.

Accreditation

The Metals and Organic laboratories maintained their ISO 15189 accreditation status. A total of 11 tests are currently accredited in the Metals Laboratory and six tests in the Organic Laboratory. The Metals Laboratory's tests include aluminium in serum; cadmium, lead, mercury, chromium, creatinine and arsenic in urine; and cadmium, lead, manganese and mercury in whole blood. The Organic Laboratory's accredited tests include mandelic acid, phenol, o-cresol, hexanedione, 1-hydroxypyrene and methyl hippuric acid in urine.

Regular internal audits were conducted throughout the year to maintain the quality and competence of the laboratories.

In terms of benchmarking the quality and competence of the results and the personnel, the section continued its participation in the following External Quality Assurance (EQA) programmes:

- NY State Department of Health Programme for arsenic, cadmium, chromium, lead, manganese and mercury in blood and urine
- The German EQA Programme for mandelic acid, nickel, phenol, o-cresol, hexanedione, 1-hydroxypyrene and methyl hippuric acid in urine and aluminium in serum
- The Thistle EQA Programme for creatinine in urine
- CDCs (USA) Lead and Multi-element Proficiency (LAMP) Programme for cadmium, lead and mercury in blood
- The SABS Water-Check Proficiency Testing Scheme.

Research projects

Ms Bianca Southon registered for an MSc (Med) in Forensic Medicine and Pathology by dissertation at the University of the Witwatersrand under the co-supervision of Dr B Kgarebe. The title of her dissertation is *The effect of temperature and headspace on the determination of ethanol in post-mortem blood specimens: A South African perspective*. This study aims to assess the stability of alcohol (ethanol) concentrations in post-mortem blood specimens under temperature and headspace variables with respect to time, and under environmental conditions specific to South Africa.

In collaboration with the Occupational Hygiene Division, the Analytical Services Division undertook a study on the analysis of heavy metals contamination on behalf of the Namibian Ports Authority. This study aimed to assess contamination of bulk salt stockpiles at the Port of Walvis Bay.

Teaching and training

The section continues to host groups of postgraduate students to provide them with insight into the operations of an accredited laboratory.

Dr B Kgarebe conducted a laboratory workshop for the Middle East region on the sampling, analysis and detection of chemicals related to the Chemical Weapons Convention on behalf of the Organisation for the Prohibition of Chemical Weapons (OPCW), at the Ben Hayyan International Laboratories, in Aqaba, Jordan, from 19–30 October 2014.

Dr Kgarebe was appointed as Mr MP White's co-supervisor for his MSc (Med) in Forensic Medicine and Pathology by dissertation at the University of the Witwatersrand.

Honours

The Analytical Services Section continues to serve as a reference laboratory for the German External Quality Assessment Scheme (G-EQUAS) due to its continued good performance in the determination of 2,5-hexanedione in urine. G-EQUAS is a statistical quality control programme and certification scheme for occupational and environmental medical toxicological analyses in biological materials that has been running since 1982. Proven comparability of the section's measurements through its continued successful performance in inter-laboratory exercises, demonstrates its capability to perform specific analyses or to apply a specific measurement method.

Professional development

Ms Deborah Kanni and Mr Poobalan Poongavavum attended the annual Analytical Chemistry Course sponsored by the OPCW held at the Protechnik Laboratories in Pretoria. Ms Boitumelo Dabula attended the Analytical Skills Development Course, also sponsored by the OPCW, held at the Finnish Institute for Verification of the Chemical Weapons Convention (VERIFIN) at the Department of Chemistry, University of Helsinki, Finland, from 30 May–13 June 2014.

Toxicology Division



Head: Prof. Mary Gulumian



In line with the NIOH's mission, the Toxicology Division is committed to promoting research in collaboration with national and international scientific institutions, providing specialised services, contributing to capacity development through training and teaching of occupational toxicology to undergraduate and postgraduate students and also providing consultation in occupational toxicology to government departments and industry. The delivery of these services by the division is achieved through four specialised units, namely the Genotoxicity Unit, the Health Risk Assessment (HRA) Unit, the Nano- and Microparticle Toxicity Unit and the Toxicogenomics Unit.

Service delivery

The division continued to conduct the risk assessment of a number of pesticides for registration purposes with the Department of Agriculture, Forestry and Fisheries (DAFF) as per the requirements of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No. 36 of 1947.

Research and special projects

The division continued to receive major funding from the Department of Science and Technology, European Commission's Framework Programme 7 (EU FP7), and the Mine Health and Safety Council (MHSC) to conduct a number of research projects, including projects pertaining to the toxicity and risk assessment of incidental and engineered nanoparticles and toxic metals and pesticides.

Incidental nanoparticles

Projects on incidental nanoparticles include *In vitro toxicity assessment of dust emissions from six South African gold mine tailings sites*, which investigates the hazardous nature of tailings particles collected as bulk, ambient PM₁₀ and respirable (personal) samples from six South African gold mine tailings storage facilities. The project is funded by the MHSC and is being conducted by Miss Charlene Andraos, who is completing the work for her PhD under the supervision of Prof. M Gulumian.

Engineered nanoparticles

Projects on engineered nanoparticles include *In vitro assessment of the toxicity of gold nanoparticles*, which investigates the suitability of OECD tests to assess the toxicity of citrate-stabilised and functionalised gold nanoparticles. Within this project, the inter-laboratory study on non-fluorescent Colony Forming Efficiency (CFE) was conducted with a number of OECD member countries to evaluate the intra- and inter-laboratory reproducibility of the CFE assay for identifying possible factors that could influence results, and to propose measures to increase harmonisation of the protocol for nanomaterial testing. The project is funded by the DST, and is being conducted by Miss Melissa Vetten under the supervision of Prof. M Gulumian.

The project, *An in vitro study investigating the effects of functional groups on the toxicity of gold nanoparticles*, investigates the effects of functional groups on the toxicity of gold nanoparticles using HEK 293 kidney cells and HEPG2 liver cells to ascertain the role of functional groups and surface moieties as key players in the different cytotoxic mechanisms. The project is funded by the DST and is being conducted by Miss Nonhlanhla Tlotleng under the supervision of Prof. M Gulumian.

The project, *The biodegradation/biodurability of gold nanoparticles and their surface ligands in biological and environmental fluids*, investigates the biodurability of gold nanoparticles and their ligands in a number of biological simulant fluids in vitro. The project is funded by the DST and is being conducted by Miss Kariska Potgieter for her PhD under the supervision of Prof. M Gulumian.

The project, *Interference of gold and silver nanoparticles in conventionally used toxicity and genotoxicity tests*, assesses the interference of nanoparticles tested in the assay systems conventionally used in the toxicity testing of chemicals.

The *Association between metallothionein single nucleotide polymorphism and gold nanoparticle toxicity* project investigates the role of metallothionein SNP on the toxicity of gold nanoparticles. The ability of different types of nanoparticles to generate free radicals in the absence and presence of cells assesses the ability of different nanoparticles to generate free radicals without using dyes or chemicals, which may interfere with nanoparticles with the aid of electron spin resonance.

Finally, the *Nanosolutions* project aims to provide a means to develop a safety classification of nanomaterials based on an understanding of their interactions with living organisms at the molecular, cellular and organism levels. To date, the particles tested have included TiO₂, CuO, Ag, MWCNT, CdTe, Au spherical, Au rod-shaped, and nanodiamonds. The project is funded by EU FP7 and is being conducted by Mr Kailen Boodhia under the supervision of Prof. Gulumian.



Risk assessment

Health risk assessment is an important activity of the division. Three projects are being carried out under this activity. The first is *Exposure assessment to nanoparticles in research laboratories*, where the levels of nanomaterials released in the work environment at different laboratories are assessed. The project is funded by the DST and is being conducted by Mr Joel Maseki for his PhD under the supervision of Prof. M Gulumian. The second project, *Risk assessment of nanoparticles*, addresses the necessity of predictive models to aid in the risk assessment of gold nanoparticles, which is being conducted in collaboration with Washington University, USA. Finally, *Health risk assessment of lead exposure to children in Blantyre, Malawi* aims to determine whether children in Blantyre are exposed to hazardous levels of lead using the Environmental Protection Agency's Integrated Exposure Uptake Biokinetic (IEUBK) model. The project is being conducted by Mr Wells Utembe for his PhD under the supervision of Prof. M Gulumian.

Completed research projects

Two projects were completed during the year, namely *Investigation into surface activity of airborne particles in the gold, platinum and coal mining environment phase 2*, funded by the MHSC, and *Effect of gold nanoparticles on reproductive function*, funded by the DST. The latter was a collaborative project with New York University's School of Medicine, which determined the toxicity of gold nanoparticles and their ability to affect the reproductive function.

Teaching and training

The division gave a two-day training workshop for toxicologists on *In vivo and in vitro methods to identify and evaluate chemical health hazards: establishment of laboratory facilities and provision of training in the risk assessment of chemicals in South Africa*. The workshop was held in Cape Town from 11–12 July 2014. The division continued to train and supervise postgraduate students for Masters and PhD degrees at the universities of Johannesburg, Pretoria and the Witwatersrand.

Honours

Prof. Mary Gulumian was elected Vice-President of the International Union of Toxicology (IUTOX). She was re-appointed by the Minister of Science and Technology to serve as a member of the SA Council for Natural Scientific Professions (SACNASP) for the next three years, and was appointed as Extraordinary Professor by the University of Pretoria for her involvement in the academic programme in the proposed MPhil (Risk Assessment and Toxicology) Degree and as a Fellow of the Mapungubwe Institute for Strategic Reflection (MISTRA) for the role she played in the research project *Beyond the imagination: genetics, nano- and biotechnologies and their applications*.

Ms Leigh-Anne Koekemoer was awarded a EUROSA scholarship to spend ten months at Utrecht University and the National Institute for Public Health and the Environment (RIVM) in the Netherlands. She will be performing inhalation studies using different types of gold nanoparticles, and these studies will be used for the completion of her PhD. This scholarship involves collaboration between Utrecht University, the NIOH and the University of Pretoria.

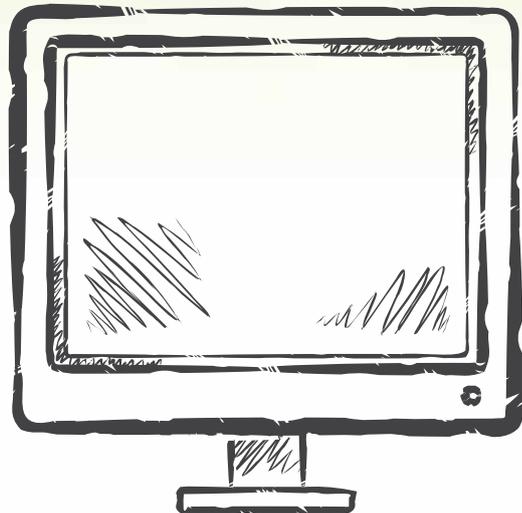
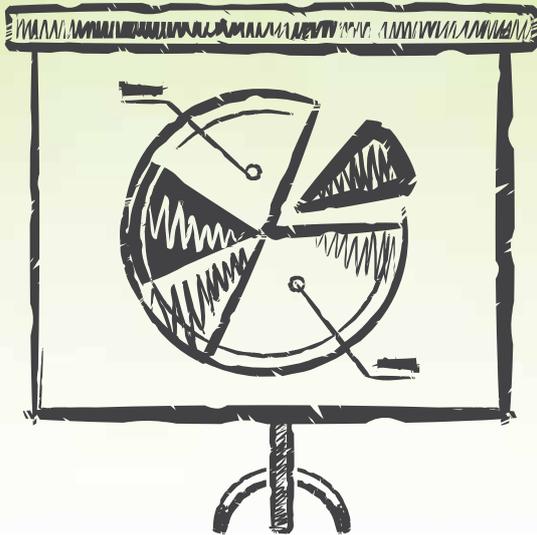
Dr Natasha Sanabria was awarded the NHLS Development Grant for 2014 to perform gene expression studies related to self- and non-self-recognition associated with innate immunity due to nanomaterials exposure. The research involves co-supervision of an MSc student and mentorship of three interns funded by the NRF-DST.

Postgraduates enrolled: seven (one MSc at the University of the Witwatersrand; six PhDs – four at the University of the Witwatersrand, one at the University of Pretoria and one at the University of Johannesburg; and one BTech at the Tshwane University of Technology).

Information Services



Head: Ms Angel Mzoneli





Information Services serves as a support function for the NIOH, the National Cancer Registry (NCR) and the NHLS, and acts as a gateway to occupational health information not only for the organisation, but also for external patrons. Information Services encompasses South Africa's national reference library for occupational health (AJ Orenstein Memorial Library); a query-handling service providing technical and scientific information on occupational health to practitioners throughout South Africa, southern Africa and internationally; an archive, which is aimed at fully documenting and preserving the character and identity of the organisation and providing evidence of the historical development and changes of the organisation over time; and the institutional repository, which is a digital collection of the organisation's intellectual output. Moreover, in providing seamless and consistent access to information resources (electronic and print) throughout the NHLS to support and enable researchers to conduct world-class and innovative research, Information Services expanded its offerings to include the libraries of the NICD and NHLS (formally known as the SAIMR library) located in Braamfontein and serving the needs of all NHLS staff, including those located in laboratories, and the eight medical schools throughout South Africa.

Services

Information Services supports the promotion of good occupational health practice by offering its knowledge and information to all stakeholders, both internal and external. Its mission is to ensure the provision of comprehensive resources and services in support of the research, teaching and training activities of the organisation, and to be a national resource and service dedicated to the collection, access to and dissemination of information on the prevention of occupational diseases and accidents in workplaces. The services' primary objective is therefore to collect, access and disseminate information in support of occupational health services and activities throughout South Africa and the SADC region.

To achieve this, Information Services supplies a wide variety of information resources. These include electronic databases and scientific periodicals and monographs – both in print and electronic formats. The NIOH Library, which deals exclusively with occupational health topics and is the only specialist OH reference library in South Africa, continued its principal function of searching, retrieving and disseminating information in support of occupational health services throughout South Africa and the SADC region. Through various library interventions, the skills needed to source information in occupational health were shared with occupational health professionals, university students, workers, management, health and safety representatives and labour union officials.

Information Services consistently received and responded to requests for technical and scientific information on occupational health issues through its query-handling service. These queries came through the 'info mailbox', which is linked to the organisation's website, and were captured on the query ticket system, ensuring a 24-hour turnaround time. Among others, the queries concerned:

- Requests for information, training and guidance on occupational health topics, such as asbestos (e.g. regulations governing the removal of asbestos and how to register as an asbestos contractor, etc.)
- Information on training interventions offered by the Institute
- Information on autopsy services offered by the NIOH to ex-miners
- Information held by the Medical Bureau for Occupational Diseases and outcomes on applications for compensation of second-degree benefit
- Information on occupational health studies offered by the NIOH
- Requests for risk assessments or occupational hygiene surveys
- Assistance requested by university students for research guidelines.

Queries received and responded to came from a wide range of people and organisations, such as university students, government departments, private industry, construction and mining companies, occupational health practitioners, doctors, academic institutions, etc. To reiterate the national and international role played by Information Services, it is important to note that queries came from all nine provinces, as well as other countries such as Zimbabwe, Mozambique, Botswana, India, the USA, China, Democratic Republic of Congo, Australia and many more that were not indicated by the requestors. The NIOH Library and the Query Handling Service combined received 930 queries and successfully answered 902 during the year.

In expanding the library collections, 25 journal titles were subscribed to, of which ten dealt with occupational health topics. In support of research activities and ease of access to full-text scientific journal articles, the libraries obtained a free trial to access the Medline complete database (EBSCO Health), which provides full-text access to over 2 400 medical journal titles. Open-access electronic resources/databases were also added to the library collection, which researchers can access through

the library page on the intranet. Information Services continued to provide researchers with the necessary literature to carry out their research projects. A total of 25 scientific papers published by NIOH researchers were uploaded onto the website. Information Services also disseminated 33 publication summaries from the research output to regional occupational health co-ordinators and other occupational health practitioners in South Africa.

To commemorate world health events, the libraries put on displays/exhibitions to create awareness of various themes, e.g. World TB Month, World Aids Day, National Science Week, Cancer Awareness Week, and various library resources available in support of those themes. The libraries also organised events in celebration of Open Access Week and Human Rights Day with the emphasis on the Promotion of Access to Information Act (PAIA), No. 2 of 2000.

Teaching and training

In fulfilling the teaching and training function, Information Services delivered a lecture on sourcing occupational health information to Masters in Public Health students from the University of the Witwatersrand. They also hosted three students from the Durban University of Technology (DUT) and four students from the University of Fort Hare in an experiential learning programme. The programme offers practical training to final-year Information Science students in their quest to balance their theoretical knowledge with hands-on experience in the field of information science. The libraries provided training to new employees and interns on information search tools, such as the use of TDNet, a portal for electronic journals. Staff from various sections were trained on the query ticket system. The training covered topics relating to capturing and responding to queries. Information Services also held library orientation sessions for occupational health nurses, registrars, officials from provincial government departments, health practitioners, university students and international visitors.

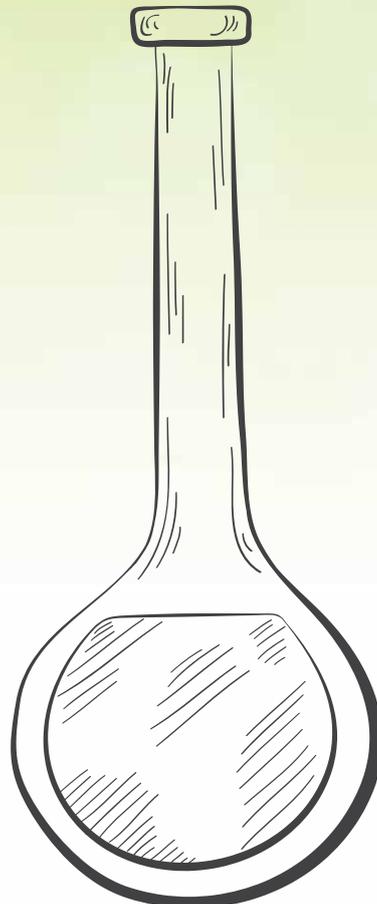
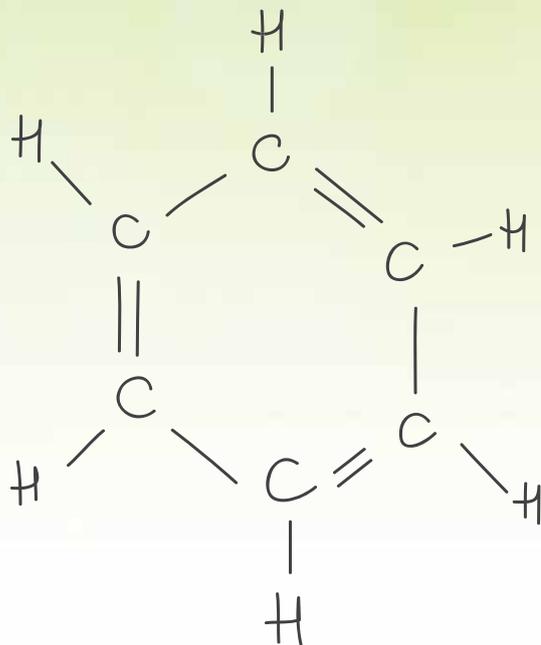
Professional development

One staff member from Information Services completed a Programme in Archival Studies at the University of South Africa (UNISA), while others attended various training interventions/workshops to enhance their skills in sourcing information and carrying out their work, e.g. InMagic, Open Access (OA) Statement Workshop and the Resource Descriptive Access (RDA) Workshop.

Graphics, Marketing and Communications



Manager: Ms Shanaz Hampson



The Graphics, Marketing and Communications Section is a support function to the NIOH, the NCR and the NHLS. It also contributes marketing and graphic design assistance to the Medical Bureau for Occupational Diseases (MBOD). Its primary objectives are the promotion of good occupational health and safety, together with the development of human resources and networks in the SADC region through international training and outreach programmes. The section co-ordinates the NIOH's training programmes, organises programmes for visitors and provides an event management, marketing, communications, public relations and graphic design service internally and externally, locally and internationally. Additionally, the section manages and co-ordinates the NIOH Programme for Continuing Professional Development (CPD) through the Health Professions Council of South Africa (HPCSA), and provides support to the NIOH's OHS Training Unit.

Services

During the reporting period, section staff contributed to the management, content and design of the websites of the NIOH, the NCR, the Biobank and the NHLS, as well as the NHLS intranet. The Biobank website, which is embedded within the NHLS website, has its own independent URL, and during the third quarter an attempt was made to raise its Google rankings for search engine optimisation (SEO) and improvement in terms of visibility and authority on the web. The website platforms serve as robust information dissemination portals, and the section continued to ensure consistency of content, layout and design, both in alignment with the Corporate Identity of the NHLS as well through the activation of topical content for all stakeholders.

The section staff are members of the NHLS Communications Forum and attended meetings, which brought together communications representatives from the NHLS, NIOH and NICD to develop and implement an integrated communications and marketing strategy across the NHLS. The aim of these meetings is to share experience and knowledge, and to ensure that the communications and marketing methodologies employed are aligned to the corporate strategies and meet the organisational strategic and operational goals of the NHLS. In addition, section staff are members of the Public Relations Institute for South Africa (PRISA).

Assistance was offered to the MBOD and CCOD for the launch of the one-stop service centre in Carltonville during the first quarter. The inauguration of this centre will improve access to occupational health services by ex-miners in South Africa by strengthening these services. Activities of the section included press coverage of the event and logistic support. The section also contributed to the NIOH Pathology Division's outreach and marketing activities at the National Union of Mineworkers (NUM) Central Committee meeting held during the second quarter at the Birchwood Conferencing Hotel in Boksburg. This campaign was aimed at sharing knowledge and exchanging information on occupational health and safety issues, as well as compensation information for those working specifically in the mining sector. The section, in collaboration with the Pathology Division, also exhibited at the annual South African Society for Occupational Medicine (SASOM) Congress, which was held in partnership with the African Regional Association for Occupational Health (ARAOH) at Emperors Palace. This provided an ideal platform for the NIOH to showcase its current research, teaching and training activities and strategies, and allowed further networking with occupational health colleagues from South Africa, the SADC region and the rest of the African continent.



Ms I N Ngcakaza (Pathology Division) and Ms S Hampson (Marketing and Communications) exhibiting at the SASOM Congress (1–4 August 2014), Emperors Palace, Johannesburg



During the period under review, the most widespread epidemic of Ebola virus disease (EVD) in history began. Since the first outbreak in 1976, this is the 26th outbreak to occur and the first to appear in West Africa. Although the outbreak started in December 2013, the first confirmed cases were reported in Guinea only on 21 March 2014 and the WHO announced an outbreak on 23 March 2014. In a 26 September 2014 statement, the WHO said “The Ebola epidemic ravaging parts of West Africa is the most severe acute public health emergency seen in modern times”, and the Director-General, Margaret Chan, called the outbreak “the largest, most complex and most severe we’ve ever seen”.⁴ As a result of this calamitous situation, the South African Government requested the NICD to provide support on a number of fronts – including diagnostic laboratory support in West Africa – in a multifaceted approach to ensure its citizens and visitors remain safe.⁵

The following actions were undertaken by the South African Government:

- The Multisectoral National Outbreak Response Team (MNORT), which co-ordinates South Africa’s response to outbreaks of diseases, met monthly, with Ebola virus disease as a standing item on the agenda
- Guidelines and alerts with case definitions were circulated to all public and private stakeholders, including provinces, port health officials, Civil Aviation Authority, and public and private laboratories
- Surveillance for viral haemorrhagic fevers (VHF), in particular EVD, was intensified at ports of entry
- Port health services and public and private healthcare practitioners were put on the alert for any ill persons who had travelled to VHF risk areas. Consultation with the NICD through their hotline was available 24 hours a day, seven days a week
- Medical transfers into the country were screened
- The NHLS and NICD intensified laboratory surveillance.

By 24 March 2014, EVD had spread to Liberia, on 12 May to Sierra Leone and on 30 July to Nigeria. The spread of the disease alarmed SADC health ministers, who held an extra-ordinary meeting on 6 August 2014 in Johannesburg to co-ordinate their response to the outbreak. The main outcomes of this meeting were:

- The announcement of joint strategic actions to prevent the introduction and spread of EVD in the region
- The formation of the Inter-ministerial Committee on EVD at SADC and country level to provide overall co-ordination of preparedness
- The designation of the NICD as a centre of excellence for laboratory testing of EVD samples, and training and expertise in the SADC region.

Regarding occupational health, the NIOH provided assistance to Dr Seymour CDC in emergency preparedness for Ebola frontline workers in South Africa, including workers at points of entry (sea, land and air travel). The NIOH assisted largely in an advisory capacity. Staff from the NIOH’s HIV/TB in the Workplace Unit, the Occupational Health and Safety Division’s Training Unit, the Immunology and Microbiology Section and Marketing and Communications formed part of the project task team whose primary aim was to ascertain how the NIOH could strengthen and support the existing efforts of Prof. A Duse and the NICD.⁶

In addition, the section contributed towards the filming and editing of an instructional video on personal protective equipment (PPE) for Ebola, which illustrated the correct donning and doffing procedures for healthcare workers and laboratory staff dealing with specimens/patients in suspected cases of EVD. During the third quarter, the section was invited to join the Emergency Operation Centre (EOC) Social Mobilisation Committee, headed by Dr N Mayet (NICD). The NICD was mandated by the National Department of Health (NDoH) to run an EOC aimed at responding to the Ebola outbreak as well as future high-risk disease outbreaks in South Africa. The committee brought together stakeholders from NIOSH-CDC, Soul City, the NHLS, the NICD and the NIOH in an effort to further explore opportunities for collaboration when designing and implementing a social mobilisation plan for Ebola. An action plan was devised and the necessary target groups and communication tools/models were identified. These tools and models can be used later for other

4 News release (3 September 2014). *UN senior leaders outline needs for global Ebola response*. WHO. [Retrieved 7 September 2014].

5 Brand South Africa information gateway. (26 November 2014). <http://www.southafrica.info/news/ebola-261114.htm#.VUdVA9Kqqko>

6 Press release. (10 October 2014). Department of Health. <http://www.gov.za/health-ebola-response-fund>.

infectious disease outbreaks. The primary role of the EOC Committee is to complement the existing Ebola Communication Strategy document, which was developed by the NDoH, and play a co-ordinating role in feeding into other structures, such as the Ebola Communications Committee.

During the period under review, section staff also assisted with poster design and preparation, as well as the design of marketing materials for NIOH staff attending local and international conferences and events. These included the SASOM/ ARAOH Congress in Johannesburg; the University of the Witwatersrand Faculty of Health Research Day in Johannesburg; the 10th Public Health Association of South Africa (PHASA) Conference in Polokwane the South African Institute for Occupational Hygiene (SAIOH) Conference in Potchefstroom; the World Congress of Epidemiology in Anchorage, Alaska; the Conference on the Science of Global Prostate Cancer Disparities in Black Men in Jamaica; the 2015 annual meeting of the Society for Occupational Toxicology (SOT) in San Diego, California; and the 7th International Nanotoxicology Congress (NanoTox) in Turkey.

Marketing and stakeholder relations

Stakeholder engagement provides opportunities to further align business practices with societal needs and expectations, helping to drive long-term sustainability and value. This engagement is intended to help public and occupational health practitioners and specialists to fully realise the benefits of stakeholder engagement in their organisations, to compete in an increasingly complex and ever-changing business environment, while at the same time bringing about systemic change towards sustainable development.

During the first quarter, the Chemical Industries Education and Training Authority (CHIETA) requested permission to film video clips at one of the NIOH toxicology laboratories, profiling the occupation and career pathways that relate to the toxicology and biochemistry profession. S Hampson, together with X Masoka and M Vetten, co-ordinated the logistics and management of the film crew on site during the film shoot on 8 April 2014. The filming was part of the national career development initiative between the Department of Higher Education and Training (DHET), the South African Qualifications Authority (SAQA) and CHIETA to develop material in the form of video clips for all occupations on the Organising Framework for Occupations (OFO).

Staff in the section, with support from the OHS Training Unit, were responsible for co-ordinating and arranging visits by key stakeholders, the aim of which was to re-establish links and initiate new collaborative endeavours. Meetings were held with representatives from the Medical Bureau for Occupational Diseases (MBOD), the Department of Labour and the Compensation Commissioner, provincial occupational health co-ordinators, the Chamber of Mines, the International Cooperation Branch of the Organisation for the Prohibition of Chemical Weapons (OPCW, The Hague, Netherlands), NIOSH-CDC (USA), the International Atomic Energy Agency (IAEA), WHO, ILO, the Mine Health and Safety Council (MHSC), the American Society for Tropical Medicine; the Organisation for Applied Scientific Research (TNO, Netherlands), the Self-employed Women's Association (SEWA), the Asia Monitor Resource Centre (AMRC) and senior officials from the Ethiopian Ministry of Health.

The section, in collaboration with the OHS Training Unit, also co-ordinated visitor programmes for occupational health nursing students from the University of the Witwatersrand; Diploma in Occupational Health students from the University of the Witwatersrand School of Public Health (SPH); a visiting academic from the University of Zimbabwe; four senior officials from the Ministry of Health in Ethiopia; and three occupational health specialists from international universities/industry. Senior colleagues from the Railway Safety Regulator (RSR) and Pikitup also visited the NIOH to discuss its involvement in OHS training facilitation and the provision of assistance for the identification of hazards and risks associated with each job category per industry. The NIOH will develop memorandums of understanding with each of the entities for this service provision.

Special presentation sessions were given to NIOH staff during the year by visiting academics on a variety of topics, including *NIOSH aerosol monitoring activities in mining* – Dr Emanuele Cauda (NIOSH-CDC, USA); *State-of-the art dermal and inhalation modeling, including current research efforts focusing on nanomaterials and exposure* – Mr Henk Goede and Mr Maikel van Niftrik (TNO, Netherlands); *National legal requirements for the sustainable management of hazardous chemical substances, with a specific focus on the Environmental Management Waste Amendment Act* – Dr Claudine Roos (North-West University); and *Toxic plants and their related health hazards* – Prof. Ameenah Gurib-Fakim, Managing Director of the Centre for Phytotherapy Research (CEPHYR), University of Mauritius.



Information dissemination

The section also dealt with a number of queries from the media and occupational health professionals from various industries, both public and private, for printed and audio-visual marketing materials and technical and scientific information on a variety of occupational health-related issues. These queries are taken from the website or are sent directly to the section.

The staff also continued to foster online links with the web platforms of many occupational health-related organisations and societies – the links allowed the NHLS and NIOH to act as a single entry point for these information resources.

Local and international collaboration in occupational health

The section contributed to collaborating, networking, fostering and maintaining links with international organisations, such as the WHO, ILO, the International Commission on Occupational Health (ICOH); NIOSH-CDC, USA; the Finnish Institute for Occupational Health (FIOH), the Health and Safety Laboratory (HSL) of the UK, the International Association of Cancer Registries (IACR), as well as local societies and stakeholders, namely the national and provincial Departments of Health, the departments of Labour and Mineral Resources, the South African Society of Occupational Medicine (SASOM), the African Regional Association for Occupational Health (ARAOH), the South African Society of Occupational Health Nurses (SASOHN), the Mine Medical Professionals Association (MMPA), academia, union representatives, employers, employees, and public and private sector groups.

The NIOH's commitment to workers' health continued with a visit from Ethiopian Ministry of Health representatives during the first quarter of the reporting period. The delegates of this high-level visit were Mr Awel Ababulgu (Ministry of Health), Dr Tekleab Zaid (USAID – Private Health Sector Program), Dr Hassen Mohammed (USAID – Private Health Sector Program/Ministry of Health) and Dr Berhanu Tekle (ICAP, Columbia University). The highlight of the visit was an experience-sharing tour, specifically aimed at understating public-private partnerships (PPPs) in health. The delegation is the lead group in Ethiopia that is considering areas of public-private interactions (PPIs) in health as the Ministry of Health reforms and expands its health sector to provide quality and broader access to healthcare. The private health sector in Ethiopia consists of for-profit (formal and informal) and not-for-profit entities ranging from individual practitioners to large institutions. At present, 25% of general practitioners and 23% of specialists work in the private sector. The private sector serves 45% of the rural population and 42% of the urban population. The Ministry of Health in Ethiopia is engaging with the private sector for clinical support services (radiology, diagnostic laboratories and pharmacies), non-clinical support services ('hotel' services – catering, maintenance, cleaning services, etc.) and infrastructure (buildings and equipment). Ethiopia is the second most populous country in Africa and is enjoying substantial economic growth.

The section, with assistance of the OHS Training Unit, oriented the delegation on occupational health initiatives and current projects under way at the NIOH and arranged specialised visits to key role players and stakeholders dealing with PPIs and PPPs in health.

During the second quarter, the NIOH Immunology and Microbiology Section, in partnership with Buckman Laboratories, hosted a workshop on Legionella standards. The first South African National Standard for Legionella (SANS 893) was published in 2013. Shortly after its publication, several concerns were raised by industry with regard to: adherence to the Legionella levels recommended in the standard; standardisation of laboratory methods to test for Legionella in environmental samples; and risk assessments for Legionella in water distribution systems. These concerns were discussed and summarised during the meeting in preparation for the formation of a technical committee, which will work towards amending the standard. Ms S Hampson and Ms I Naik managed the logistics and pre-workshop preparation for this meeting, which took place on 5 June 2014.



International Women's Day event at the School of Public Health (L–R): Dr Sophia Kisting (NIOH Executive Director), Prof. Ameenah Gurib-Fakim (University of Mauritius) and Prof. Laetitia Rispel (Head of the School of Public Health, University of the Witwatersrand)

In an effort to improve the safety of prosecutors and mortuary workers and raise awareness of possible exposure to certain diseases, a training course outlining the legislation, health hazards and effects of working in a mortuary as well as the removal of cardio-respiratory organs was devised by the Pathology Division. The training was held during September 2014 and was titled *Safety, procedure and policies related to cardio-respiratory organ removal in the mortuary*. The primary objectives of the course were to inform prosecutors and mortuary workers on the procedures, policies and preservation of tissues or organs with reference to the Retention of Human Tissue Act, No. 65 of 1983, to facilitate discussions on the removal of cardio-respiratory organs in terms of the Occupational Diseases in Mines and Works Act (ODMWA), No. 78 of 1973; and to provide information on good practice mortuary technique.

During the second quarter of the reporting period the HIV/TB in the Workplace Unit, in collaboration with the NDoH and the WHO, held a high-level national occupational health meeting. The main purpose of the meeting was to deliberate on the Occupational Health System for South Africa, in line with the National Health Insurance (NHI) policy framework, to be delivered through the district health system and based on re-engineered primary healthcare (RPHC). Discussions were held on the Occupational Health System and services for South Africa, a one-stop service for workers and HIV/TB workplace interventions for healthcare workers. The meeting was attended by human resources, occupational health and primary healthcare representatives from all nine provinces, as well as academics and other interested groups.

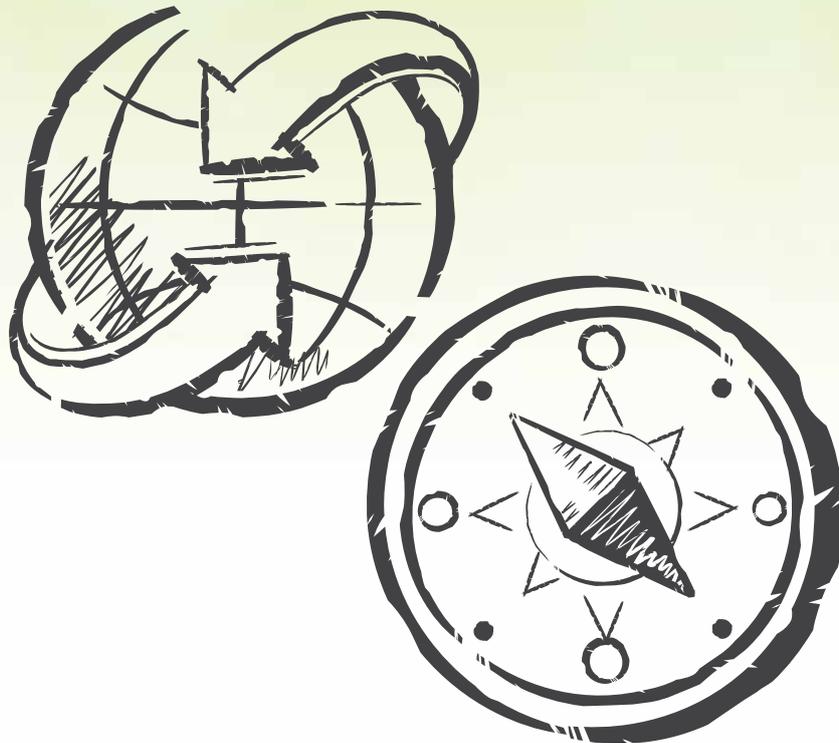


Ethiopian delegation. Back row (L–R): Mrs Ina Naik and Dr Barry Kistnasamy. Front row (L–R): Dr Tekleab Zaid, Mr Awel Ababulgu, Dr Hassen Mohammed and Dr Berhanu Tekle

International Liaison



Manager: Dr Tanusha Singh



Outreach to the SADC region

The NIOH continued to provide technical support for occupational health to the SADC region. Laboratory and clinical support was provided, as was training on occupational health matters such as exposure sampling and medical surveillance. Activities included assessing lead exposure in children in Malawi and a sampling exercise in Namibia. The NIOH co-hosted an event themed *Women, science and the world of work* with the University of the Witwatersrand School of Public Health. The keynote address was given by internationally acclaimed scientist, Prof. Ameenah Gurib-Fakim from the University of Mauritius. The address outlined the role of women in development and science, especially in Africa. This was followed by a panel discussion on women, work and work and family-life balance. The panellists were Dr Boitumelo Kgarebe (Analytical Services Division), Dr Odette Abrahams (Occupational Medicine Division) and Mr Gaby Mizan (Occupational Hygiene Division).

Dr Dingani Moyo from the University of Zimbabwe visited the NIOH for a tour of the facility, specifically the Pathology and Occupational Hygiene Divisions, to understand the functioning of the institute.

International collaboration in occupational health

The NIOH hosted a delegation from the Ethiopian Ministry of Health aimed at understating PPPs in health to provide quality healthcare and to expand access thereto. Experts from the Organisation for Applied Scientific Research, Netherlands (Mr Maikel van Niftrik and Mr Henk Goede), visited the NIOH and delivered a presentation titled *State-of-the-art in dermal and inhalation exposure modelling, including current research efforts focusing on nanomaterials and exposure*. The institute also hosted other international visitors, including Prof. Sameeh Munsour from Egypt, Mr Peter Stacey from the HSL, UK, and Dr Emanuele Cauda, Senior Service Fellow at the Office of Mine Safety and Health Research of the CDC. These visitors gained a sense of the research and activities conducted within the NIOH.

Dr Cauda gave a presentation on aerosol-monitoring activities in mining, which was beneficial to all researchers currently working with silica with regard to mining operations. Several collaborative meetings were held with the research group from Canada to discuss ongoing research on the use of the Occupational Health and Safety Information System (OHASIS) in the NHL. Focus groups were planned and the follow-up phase of the baseline investigation was confirmed for February 2015.

The institute also welcomed Phillen Maqhuzu, a Masters Epidemiology student from Ludwig Maximilian University of Munich, Germany, who completed an 18-week internship at the CERG. Dr Naseema Vorajee and Prof. Jill Murray contributed to an international workshop on the role of inorganic particles in pulmonary, systematic and autoimmune diseases hosted by the European Research Council, Paris, France.

Dr B Kistnasamy, in his capacity as the Facility Director, and Prof. M Gulumian, in her capacity as the Study Director, signed the study plans following OECD GLP guidelines for OECD certification. The plans were distributed to relevant stakeholders. Prof. Gulumian, in her capacity as the South African representative, attended the 13th OECD Working Party for Manufactured Nanomaterials (WPMN) meeting from 2–6 June in Paris, France. Prof. Gulumian participated in the WPMN project on the testing and assessment of manufactured nanomaterials; a risk assessment seminar; and the WPMN Steering Group 8: *Co-operation on exposure measurement and exposure mitigation*. The following emanated from the meetings: Inter-laboratory comparison of the colony-forming efficiency assay for assessing cytotoxicity of nanomaterials by 12 participants from Europe, Japan, South Korea and South Africa, and two documents were developed and submitted, namely *Assessment and biodurability of nanomaterials and their surface ligands* and *Dossier on gold nanoparticles*.

Prof. Gulumian also participated in a discussion with the United States Government Accountability Office (US GAO) on how to select international organisations to conduct and develop toxicity assessments, including obtaining data. The discussion included what processes and practices select international organisations may offer, and opportunities for improvements to the Integrated Risk Information System (IRIS). Prof. Gulumian, who is the Vice-President of International Union of Toxicology (IUTOX), also contributed to the review of the proposal for an FDA-IUTOX partnership in the area of regulatory science and research and training, which will aid capacity building in at-risk regions around the world on the common ground of 'promoting an understanding and acceptance of science-based safety assessments.' Member societies lacking a registration or certification programme called upon IUTOX to design a recognition scheme that can be adopted in their own countries to clarify the role, qualifications and importance of toxicologists working in industry, academia and government. The proposed designation of IUTOX-Recognised Toxicologist (IRT) is also being addressed by the IUTOX Executive Committee.



World Health Organization

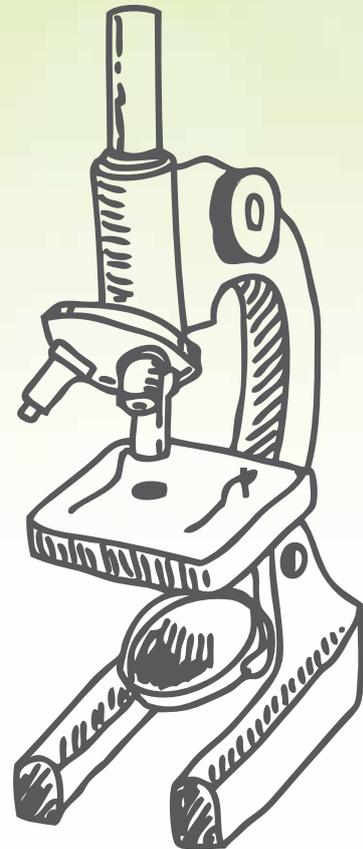
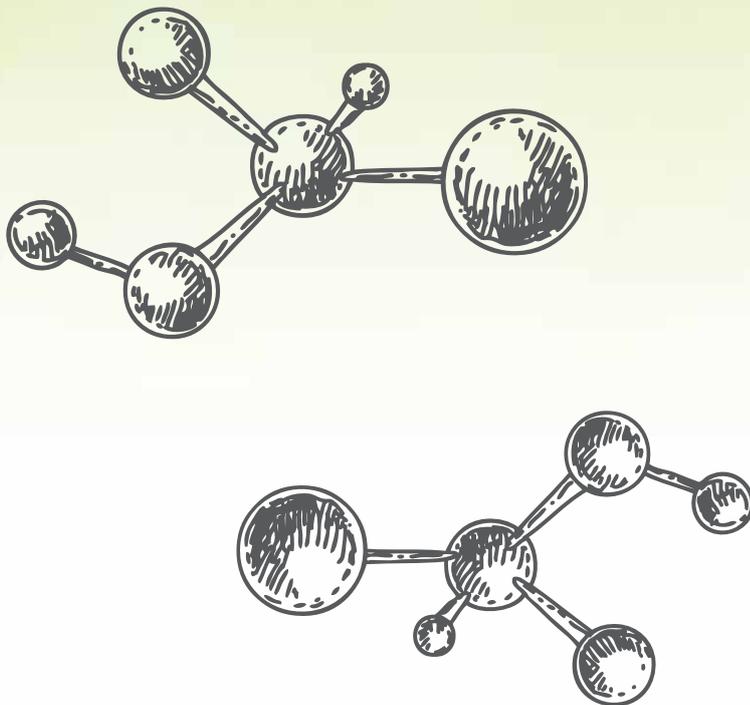
NIOH once again continued to be an integral part of the WHO Collaborating Centres (CC) in the Occupational Health Global Network Plan (2012–2017). During the period under review, the NIOH began the process of applying for its re-designation as a WHO CC in occupational health. Several meetings were held with Drs Ivan Ivanov and Evelyn Kortum from the WHO headquarters, Geneva, to discuss NIOH activities. This was co-ordinated by Dr T Singh. The NIOH, in collaboration with the NDoH and the WHO, hosted the National Occupational Health Workshop, which was attended by all nine provincial DoH (occupational health, human resources and primary healthcare) and occupational health experts, unions and business from 1–4 July 2014 at the Garden Court Hotel in Kempton Park.

Dr M Zungu presented a paper on occupational health services within primary healthcare at a WHO conference on workers' health in Semnan, Iran. The NIOH, represented by Prof. Gulumian, was invited to become a participant of the WHO Chemical Risk Assessment Network, the activities of which include capacity building and training; chemical risk assessments/knowledge sharing; risk assessment methodology; and the identification and communication of research priorities. Prof. Gulumian was also invited to join the organising committee of the meeting held in Geneva from 8–10 October 2014 to propose a range of new collaborative activities for the network to achieve its objectives, share experience from recent activities, provide a forum for network participants to meet, exchange information and enable bilateral collaboration on topics of mutual interest and advise on network arrangements, such as the collaborative web workspace and communications plans. Prof. Gulumian, Dr Sanabria, Dr De Jager and Ms Andraos worked on the PICO question for the health surveillance of nano-workers to generate a report for the WHO.



OHS Training Unit

Head: Mrs Inakshi Naik





The Occupational Health and Safety (OHS) Training Unit was established in January 2012 and has since been managed by Mrs Inakshi Naik. The unit provides specialised training services to support the practice of occupational and environmental health within the private and public sectors. As its core function, it is responsible for building capacity in the country through a variety of training programmes in occupational health. The training done by the unit primarily targets occupational health professionals through seminars, workshops and lectures. Also included in the training are continuing education and supplementary courses aimed at maintaining and developing professional skills. Many of the training events are Continuing Professional Development (CPD) accredited through the Health Professionals Council of South Africa (HPCSA). Ms S Hampson, Graphics, Marketing and Communications, provides logistic support and manages the CPD accreditation for the training as well as the generation of certificates.

The unit also provides support to Graphics, Marketing and Communications in managing events and the hosting of visitors.

Capacity building initiatives in occupational health

The following training courses were conducted during the period under review:

South African National Standard for Legionella (SANS 893) workshop

The OHS Training Unit, together with Ms S Hampson, co-ordinated the Workshop on Legionella Standards, which was hosted by Dr D Bartie from the Immunology and Microbiology Section, in partnership with Buckman Laboratories. The workshop was held at the Sunnyside Park Hotel in Parktown, Johannesburg. The objective of the workshop was to address concerns raised after the first South African National Standard for Legionella (SANS 893) was published in 2013. The workshop was attended by 29 delegates and their feedback was positive.

Management of chemical exposures, simple and cost-effective solutions using Stoffenmanager as a risk assessment tool for training

A one-day training course was conducted at the NIOH for a group of delegates who were invited from various SADC countries by the Chemical and Allied Industries Association (CAIA) on 6 June 2014. The title of the training course was *Stoffenmanager: management of chemical exposures, simple and cost-effective solutions*. Twelve delegates from various chemical industries attended the training. Stoffenmanager is a web-based IT tool (open source and freely available) to help small and medium-sized enterprises (SMEs). It allows non-expert users in companies to manage their chemical substances more efficiently. The innovative method of risk assessment empowers owners/operators to evaluate their workplace for hazards and risks. The training was very well received by all SADC delegates.

PHC nurses in the fundamentals of occupational health

Mrs Naik conducted a training course entitled *Training of PHC nurses in the Fundamentals of Occupational Health*. The course was conducted at the Raheema Moosa Nursing College from 18–20 June 2014. In total, 25 PHC nurses studying towards a Diploma in Clinical Nursing Science, Health Assessment Treatment and Care, attended the training. Mrs Naik gave all the lectures, except for the lectures, on occupational asthma and allergies and an introduction to ergonomics. These lectures were given by Ms Anna Fourie (Immunology and Microbiology Section) and Ms Busi Nyantumbu-Mkhize (Occupational Medicine Division) respectively.

The need for such training was identified as part of the restructuring of PHC in South Africa due to the current shortage of occupational health nursing practitioners in the county. In addition, not all employers have on-site occupational health services. When an employee develops occupational ill health, the client may consult a healthcare worker at a PHC clinic. PHC nurses are not taught the basics of occupational health in their training and are thus not skilled in the identification of an occupational disease. PHC nurses who complete this course will be better equipped to identify and manage occupational ill health. The financial burden of this ill health will then be referred back to the employer and not fall on the State, as is often the case. Through the early detection of disease, the morbidity associated with occupational diseases can also be reduced, thereby decreasing the disease burden in the country.

The purpose of the training is to equip PHC nurses with the knowledge and skills necessary to take an appropriate occupational history and refer suspected occupational disease cases to the next level of referral, i.e. the district hospital. Their task is to have a high index of suspicion of work-related problems and knowledge of referral systems within the district.

The training materials for this course were developed by Mrs Naik.

National legal requirements for the sustainable management of hazardous chemical substances, with a special focus on the National Environmental Management Waste Amendment Act – training

On 23 July 2014, Dr Claudine Roos from North-West University presented a one-day training workshop to NHLS staff on sustainable hazardous chemical substances/waste management. This workshop aimed to equip delegates with the necessary knowledge and understanding required to appropriately manage significant environmental matters related to the management of hazardous chemical substances, specifically related to the laboratory environment. The workshop aimed at providing practical guidance on the implementation of current legal requirements in the workplace to ensure that hazardous substances and dangerous goods are handled, stored, transported and disposed of responsibly. The main focus of the workshop was to introduce delegates to the latest legal requirements applicable to hazardous substance management, with the focus on the new National Environmental Management Waste Amendment Act, No. 26 of 2014.

This was the first course that NIOH piloted through Oracle OLM as the Training Unit wanted to extend the invitation to all NHLS staff members who deal with hazardous chemical substances and/or waste. The workshop was attended by over 32 staff members from NHLS central region and the NIOH.

A practical approach to managing occupational health for nursing professionals – training

On 24 and 25 September, Mrs Naik presented a training programme on the fundamentals in occupational health to a group of nurses from across India entitled *A Practical Approach to Managing Occupational Health for Nursing Professionals*. The aim of the training was to equip nurses with the knowledge and skill necessary to take an appropriate occupational history and refer suspected occupational disease cases to the next level of referral. Their task is to have a high index of suspicion of work-related problems and knowledge of referral systems within the district.

This programme formed part of the second International Conference on Occupational and Environmental Health (ICOEH) in New Delhi, India. Mrs Naik was invited to attend the conference and provide the much-needed training programme that formed part of pre-conference activities. Ms S Hampson provided the necessary logistic and design support for certificates and CD covers.

Mortuary techniques training

On 30 September 2014 training was given by the Pathology Division entitled *Safety, procedure and policies related to cardio-respiratory organ removal in the mortuary*. In total 14 mortuary professionals and prosecutors attended the training course. Ms Hampson and Mrs Naik provided events management support and advice to the division.

Occupational and environmental medicine skill share training (for medical practitioners)

A five-day training course was organised by the Asia Monitor Resource Centre (AMRC) at the Universiti Sains in Penang, Malaysia, from 11–16 October 2014. The title of the training was *Occupational and environmental medicine skill share (for medical practitioners)*. The training was provided to a group of 25 medical doctors from different parts of Asia. As a large part of the workforce is falling victim to occupational disease such as silicosis, asbestosis, noise-induced hearing loss and byssinosis, etc. in almost all Asian countries, there is a severe shortage of physicians with knowledge of occupational health, and therefore a need has arisen to train doctors in diagnosing occupational diseases. A team of trainers from India, Malaysia, South Korea, the USA and South Africa (NIOH) were invited to conduct the course. Mrs Naik contributed towards teaching, facilitating, compiling pre- and post-evaluation of knowledge questionnaires, analysing the evaluation reports and certifying the training with the School of Public Health, University of Illinois, Chicago, USA.

Health and safety representative (HSR) training for forensic pathology laboratories and the Department of Health, Pretoria

Mrs Naik conducted a two-day training course entitled *Health and safety representative (HSR) training* for HSRs employed at the Department of Health in Pretoria, on 20–21 May 2015, and also to HSRs from the forensic pathology laboratories in Cape Town on 12–13 November 2015. The training was attended by 25 HSRs in Pretoria and 15 HSRs in Cape Town. A certificate of attendance was issued to the HSRs who completed the training.

Health and safety representative (HSR) training online for NHLS HSRs

The training material developed by the OHS Training Department for the online health and safety representative (HSR) training course was rolled out on the NHLS intranet for the third year during the period under review. A number of NHLS staff registered for the course and completed assessments for the modules they had registered for.



ILO/CXR: International Labour Organization Classification of radiographs of pneumoconioses

ILO-CXR training took place at the NIOH on 27 March 2015. Eight doctors from Harmony Gold Mining Company, Life Health Care Group and DPSA attended the training. The participants found the training to be of great value and positive feedback was given on the course evaluation forms.

This training was intended to assist occupational medicine practitioners to recognise radiological changes due to mineral dusts and to understand the ILO classification of radiographs of pneumoconioses. It included both theoretical and practical aspects of recognising pneumoconioses and the use of the ILO classification system. The training dealt mainly with parenchymal abnormalities (small and large opacities), pleural changes, and other features associated, or sometimes confused with occupational lung disease. The training was conducted by Prof. D Rees and Dr S Kgalamono from the Occupational Medicine Division, with logistic support from Mrs I Naik and Ms S Hampson.

The training course was submitted by Ms Hampson to the HPCSA and is approved for four CPD points.

Stakeholder presentations in occupational health

- On 22 May 2015 Mrs Naik delivered two lectures at the OCSA Training Centre in Alrodeto 30 Nurses in training for the Diploma in Occupational Health. The titles of the presentations were *Introduction to Toxicology and Hazardous Chemical Substances (OEL, STEL, TLV)*.
- Mrs Naik delivered a lecture to public health professionals at the University of Pretoria on 20 May 2015 on the Compensation for Occupational Injuries and Diseases Act (COIDA), No. 130 of 1993 as amended and the Occupational Health and Safety Act.
- Mrs Naik presented a paper titled *Training of Occupational Health Professionals for Delivery of Occupational Health Services in South Africa* at the second International Conference on Occupational and Environmental Health, 26–29 September 2014 in Delhi, India. The conference was attended by approximately 500 delegates in India. They were professionals from academia and the private and public sectors mainly engaged in occupational and environmental health.
- Mrs Naik presented a paper titled *Training for the delivery of occupational health services* on 4 July 2015 at the National Occupational Health meeting held at the Garden Court Hotel at OR Tambo International Airport from 1–4 July 2014. The presentation contributed towards the theme of the conference, *Capacity building in occupational health*.
- Mrs Naik gave a talk titled *Stoffenmanager – a web-based control banding tool using an exposure process model* at the Responsible Care Product Stewardship and GHS Workshop hosted by the Chemical and Allied Industries Association (CAIA) on 5 June 2014 at the Johannesburg Country Club. The event was attended by over 300 delegates from chemical industries around South Africa.
- Mrs Naik was invited to co-train students registered for the Advanced Biorisk Management Trainer workshop using the Global Biorisk Management Curriculum developed by Sandia National Laboratories, USA. The course was offered by the African Centre for Integrated Laboratory Training (ACILT) at the NHLS.

Strategic Initiatives In Occupational Health

- Mrs Naik and Ms Hampson co-ordinated flights, hotel accommodation, catering and meetings in Pretoria with the NDoH and National Treasury for a group of delegates from Ethiopia for the PPP Programme for Ethiopia. Mr Awel Ababulgu, Dr Tekleab Zaid, Dr Hassen Mohammed and Dr Berhanu Tekle were hosted from 18–25 May 2015 by the NIOH. They were from the Ministry of Health, Ethiopia, the private health sector programmes in Ethiopia and ICAP at Columbia University.
- Dr Ashish Mittal was invited by the NIOH to spend time with Mr David Jones and Mr Lincoln Darwin to develop and advise on OHASIS development at the beginning of July 2014 for a week. All the travel arrangements, accommodation and catering were co-ordinated by Mrs Naik. Dr Mittal is actively engaged in developing occupational health capacity in India through risk assessment, medical surveillance and implementation of OHS programmes in small and medium enterprises. He is also involved in organising OH conferences and training at national level in India.
- In December 2015 the Railway Safety Regulators (RSR) approached the Occupational Medicine section to develop and deliver a course for occupational health professionals (OHP) employed in railway operations. The RSR has identified gaps in training in railway operations and therefore a short course needs to be offered to OH practitioners on railway occupational health and safety. Mrs Naik gave a presentation to the RSR team on the NIOH, focusing on the structures, functions and expertise within the NIOH. Once it was agreed that the NIOH would meet the challenge, a number

of walk-through observation surveys were organised by the RSR at PRASA, TRANSNET, as well as railway operations in mines and chemical industries for the NIOH team to familiarise themselves with railway occupational health and safety issues. A number of meetings followed to discuss the framework of the training curriculum, a Memorandum of Agreement between the two organisations, costing, etc. Mrs Naik facilitated and co-ordinated all the activities, including the intellectual input required in the development of the training materials. The project is currently ongoing.

- On 17 December 2014 the OHS team from Pikitup visited the NIOH. Mrs Naik gave a presentation on the NIOH, its core functions and the services it has to offer. Dr Kisting presented an overview of the support that the NIOH can provide to Pikitup's OHS programmes. Interest was expressed by Pikitup in a follow-up meeting with the Occupational Medicine and Occupational Hygiene divisions, and the Immunology and Epidemiology sections. The meeting took place on 15 January 2015 and covered the structures and functions of the company as well as the exposures faced by its staff. Pikitup has a large staff complement, and they are concerned about their waste collectors and those working on waste sites exposed to all five groups of occupational hazards. Pikitup is liaising with Mrs Naik to discuss potential service level agreements with the NIOH. The project is currently ongoing.

Training support and capacity building within the NHLS

Training needs analysis

A training needs analysis (TNA) was sent out by Mrs Naik to all heads of sections in December 2014 so that NIOH staff's immediate training needs could be effectively accommodated in early January 2015 – this was for both core and non-core staff. Staff members from the Pathology and Analytical Services divisions were trained on the SAS package and ICP-MS respectively.

Workplace Skills Plan 2015/16

Each year, a TNA is conducted to identify the main skills gaps and training needs that must be addressed to improve the NHLS's performance and achieve its business strategy. A workplace Skills Plan/Annual Training Report will be compiled for 2015/16.

The Workplace Skills Plan for the NIOH, which was due for submission to the Health and Welfare Sector Education and Training Authority (HWSETA) by the end of April 2015, was required by the Learning Academy of the NHLS. The facilitation and co-ordination of information-gathering from all the NIOH departments was done by Mrs Naik. A final comprehensive spreadsheet was submitted to the Learning Academy at the end of March 2015.

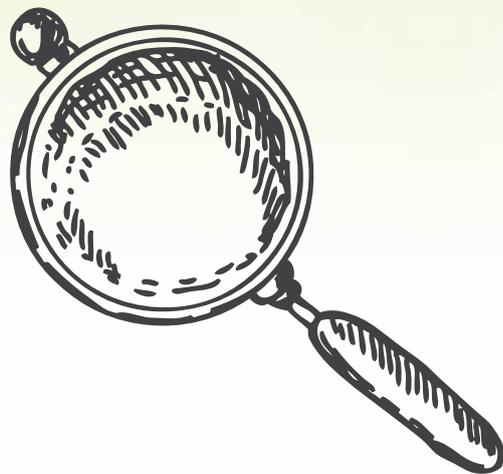
Professional development

Mrs Naik attended a Foundation of Laboratory Leadership and Management Course from 28 July – 1 August 2014. The training was provided by the Association of Public Health Laboratories (APHL) CDC-SA and the NHLS Learning Academy. Delegates were awarded 25 CEU points for completion of training. The aim was to develop leadership and management skills among laboratory managers at the NHLS.



National Cancer Registry

Deputy Director (Acting): Dr Elvira Singh



The National Cancer Registry (NCR) continued to grow from strength to strength in the 2014/15 financial year, with decisive strides taken to satisfy its legislated mandate to produce national cancer incidence rates and implement population-based cancer registration. It has also been a successful year for research with a number of peer-reviewed papers published and new research collaborations established.

Highlights

The NCR's ten-year Business Plan has proved to be a useful tool in its fundraising initiatives. Several private businesses have committed funding and technical assistance to help establish population-based cancer registration in South Africa. In addition, the Cancer Association of South Africa (CANSA) and the Movember Group have provided funding for the NCR to procure the additional expertise required to manage the backlog of its pathology-based Cancer Registry. By the end of the financial year, 2008 and 2009 cancer incidence estimates were produced, leaving the NCR with a six-year backlog, just outside the internationally accepted lag-time for cancer reporting of 3–5 years. To increase awareness of cancer legislation, the NCR participated in a road show on cancer reporting, supported by the Department of Health. Prof. Paul Ruff, Head of Oncology at Charlotte Maxeke Johannesburg Academic Hospital and the University of the Witwatersrand, visited provincial hospitals on behalf of the NCR to educate healthcare professionals about the registry and the importance of cancer reporting.

The NCR has maintained its links with the National Department of Health through support of activities conducted by the Non-Communicable Diseases Directorate. It also contributed to the planning and drafting of the National Integrated Plan for Cancer Prevention and Control in South Africa and participated in the evaluation of the very successful HPV vaccination.

The NCR is now a proud partner of the Medical Research Council (MRC) Wits Cancer Centre of Excellence, established in 2015. Wits, together with the NCR, were awarded MRC funding to establish the MRC/Wits Common Epithelial Cancer Research Centre in Johannesburg. Other partners included collaborators from the Chris Hani Baragwanath Hospital, Charlotte Maxeke Hospital and the Donald Gordon Medical Centre. Through this collaboration, cancer reporting from these establishments to the NCR will be facilitated and additional resources for a surveillance officer will be made available.

The NCR, together with its research arm, the Cancer Epidemiology Research Group, increased its publication rate in 2014. The unit produced nine publications in the financial year. Particular mention should be made of the *South African Medical Journal*, which describes the NCR methodology to South African stakeholders and demonstrates the minimal impact of decreased private sector reporting to the NCR between 2004–2006.

A previous publication involving the NCR/CERG⁷ was one of the *Journal of the National Cancer Institute*'s⁸ top 50 most-cited articles published in 2012. A publication in this journal is highly prestigious. Being among the top most-cited publications in this journal bears testimony to the popularity of this research study, and its important contribution to the body of knowledge on cancer internationally.

Research

The principle research study of the Cancer Epidemiology Research Group (CERG) is the Johannesburg Cancer Case Control Study. This study established robust case control infrastructure in order to investigate risk for cancer in the South African population. Established in 1994, the study has recruited over 20 000 participants and collected approximately 11 000 serum samples for analysis. In the last financial year, an additional 1 452 new cases were added to the database.

International collaboration

The NCR has ongoing collaboration with the International Agency for Research on Cancer, the University of Bern (Switzerland), the African Cancer Registry Network and the United States Centres for Disease Control and Prevention.

In addition, the CERG has been involved in a number of research collaborations including:

7 Sitas F *et al.* (including Urban MI). InterSCOPE Study: Associations between esophageal squamous cell carcinoma and human papillomavirus serological markers. *J Natl Cancer Inst.* 2012; 104 (2): 147–158.

8 The *Journal of the National Cancer Institute* is an internationally acclaimed peer-reviewed publication on cancer research and treatment with an impact factor of 15.



International collaborative study on risk factors for squamous cell carcinoma of the oesophagus (InterSCOPE)

In this study there were collaborators from six studies from nine countries. The key collaborators were Prof. F Sitas, Cancer Council of New South Wales, Sydney, Australia and Drs Tim Waterboer and Michael Pawlita, Virology Section, German Cancer Research Centre (DKFZ). Phase II of the project included Prof. Martin Hale from the Department of Anatomical Pathology, University of the Witwatersrand. Phase II provides strong biological and mechanistic evidence against an etiological role for mucosal HPV in the carcinogenesis of oesophageal squamous cell carcinoma (OSCC) in South Africa, China and Iran.

Oesophageal cancer

Oesophageal cancer is a high incidence cancer in South Africa, with the Eastern Cape having some of the highest oesophageal cancer incidence rates in the world. There are a number of projects at the CERG investigating oesophageal cancer, including from an epidemiological perspective (IARC – Dr V McCormack and the NCR) risk factor analysis looking at smoking and alcohol use in the Johannesburg Cancer Case Control data (with the Wits School of Public Health and Dr E Musenge), and the start of genetic research in collaboration with Prof. C Mathew at Wits and Kings College London.

Collaborative groups on hormonal factors in female cancers

The CERG is part of this large international collaboration which is being co-ordinated by the Cancer Epidemiology Unit at the University of Oxford in the UK.

Prostate cancer in black men

Dr C Babb has secured CANSA funding to research prostate cancer in black men using the Johannesburg Cancer Case Control Study. As information on prostate cancer in Africa is scarce, a manuscript using NCR data and Statistics SA mortality data on prostate cancer was written to provide data, which are lacking in the public domain. This manuscript was published in 2014.

Men of African Descent and Carcinoma of the Prostate (MADCaP) Consortium

This is a multi-institutional collaboration of epidemiologic studies to address the high incidence of prostate cancer among men of African descent. The principal investigator is Prof. TR Rebbeck, University of Pennsylvania, and the consortium includes participants from Cape Town, Johannesburg (CERG), Senegal, Nigeria, Bahamas, Uganda and the USA. National Institutes of Health (NIH) funding was awarded to the consortium in March 2015.

Liver cancer and hepatitis B and C

The CERG, with the Hepatitis Virus Diversity Research Programme at Wits (Prof. A Kramvis) and the School of Public Health (Associate Prof. C Chasela), are collaborating on this study. The study will evaluate the interactive or additive effect of co-infection with HBV/HCV/HIV in relation to hepatocellular carcinoma risk, taking into account potentially confounding and lifestyle factors including age, gender, alcohol consumption and smoking.

Professional development

DST-NRF interns (P Windvogel and L Joseph-Panday) worked at the NCR-CERG to gain work experience and provide valuable support to the research initiatives. During the year, Ms Phillen Maqhuzu, an MSc (Epidemiology) student from the Ludwig Maximilian University of Munich in Germany, completed a four-month (August–December 2014) workplace internship at the NCR. She analysed data from the NCR and produced a publication on Kaposi's sarcoma, which is being finalised. Mr T Maphanga attended the summer school of the International Agency for Research on Cancer (IARC) (16 June–4 July 2014). Mr Maphanga is the data manager for the Johannesburg Cancer Case Control Study, and the skills acquired in data management and analysis have proved to be useful for the NCR. Dr Babb was made a joint staff member of the Division of Human Genetics and the University of the Witwatersrand. Dr Singh continues as a joint staff member of the School of Public Health, University of the Witwatersrand. Mr T Maphanga gave lectures at postgraduate level at the University of Pretoria and the University of the Witwatersrand throughout the year.

The NCR currently supports one Honours student and four Masters students. Ms M Beery completed her Masters in Public Health (Field Epidemiology) with the NCR in December 2014. Dr O Abrahams received her MMed *cum laude* using data from the Johannesburg Cancer Case Control Study in 2014.

Postgraduates enrolled: four (three Masters at the University of the Witwatersrand and one Masters at the University of Pretoria).

Postgraduates completed: two (one Masters in Public Health in Field Epidemiology, University of the Witwatersrand and one Masters in Medicine, University of the Witwatersrand).

Publications 2014/15

Journal articles

Bernstein DM, Rogers R, Sepulveda R, Kunzendorf P, Bellmann B, Ernst H, Phillips JI. Evaluation of the deposition, translocation and pathological response of brake dust with and without added chrysotile in comparison to crocidolite asbestos following short-term inhalation: Interim results. *Toxicology and Applied Pharmacology*. 2014; 276: 28–46.

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Kistnasamy B, Zungu M, Babatunde, S. South Africa on pathway to universal health coverage of workers.

O'Hara L, Yassi, A Nophale L, Zungu M. Occupational health, infection control and TB control: Working together to prevent the transmission of TB in public hospitals in Free State, South Africa.

Reports

Barnard TG, Kruger CA, Hodgkinson N, Bartie C. *An independent investigation into the purification capacity of small-scale water purification units supplied in South Africa. Volume 1. Laboratory testing of home water treatment devices.* WRC Report number 1444/1/13.

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De Jager P, Masoka X, Sanabria N, Vetten M, Andraos C, Boodhia K, Koekemoer L-A, Matatiele P, Singh E, Gulumian M. *Nanotechnology in South Africa: A baseline study.* Submitted to the DST, April 2014.

Gulumian M, De Jager P, Andraos C, Sanabria N. *Health surveillance of nanoworkers review: Summary report of interim findings*. WHO, February 2015.

Conference presentations – Oral presentations

International

WHO Conference on Workers' Health Coverage, Semnan, Islamic Republic of Iran, 28–30 April 2014

Zungu LM. Capacity building for primary care providers in workers' health.

WHO TB Infection and Prevention Control Working Group, Geneva, Switzerland, 12–13 May 2014

Zungu LM. Occupational Health and Safety Information System.

OECD WPMN 13th Working Party on Manufactured Nanomaterials (WPMN) Meeting, Paris, France, 4–6 June 2014

Gulumian M. Exposure assessment case study on nanogold.

Gulumian M. Assessment of biodurability of nanomaterials and their surface ligands.

International WCP2014 Conference, Cape Town, South Africa, 13–18 July 2014

Gulumian M. Nanotoxicology and nanomedicine.

MAM-14, 7th International Symposium on Macro and Supramolecular Architectures and Materials, Johannesburg, South Africa, 23–27 November 2014

Gulumian M. Nanotechnology and occupational and environmental health.

All African Nanoscience and Nanotechnology Initiative for African Member States, Cape Town, South Africa, University of the Western Cape, 19–21 November 2014

Gulumian M. Nanotoxicology and nanocode.

National

SASOHN Annual Conference, Durban, South Africa, 13–15 November 2014

Zungu LM. Occupational health within primary healthcare.

TB conference, Durban, South Africa, 10 June 2014

Zungu LM. Compensation for tuberculosis in HCWs.

Occupational Health Workshop, Kempton Park, South Africa, 1 July 2014

Zungu LM. Strengthening occupational health within PHC.

Workshop organised by the DAFF, held at ARC (Vegetable and Ornamental Institute) Roodeplaat, Pretoria, 30 July 2014

Gulumian M. The process of risk assessment of pesticides.

All African Nanoscience and Nanotechnology Initiative for African Member States, Cape Town, South Africa, University of the Western Cape, 19–21 November 2014

Gulumian M. Nanotoxicology and nanocode.

1st Stakeholders Meeting for Advancing Close Co-operation on Research on Chemicals and Waste to Enhance the Science-Policy Interface in South Africa, Johannesburg, South Africa, Department of Environmental Affairs, 17 March 2015

Gulumian M. Nanotechnologies and manufactured nanomaterials in South Africa.

Annual SAIOH Conference, North-West University, Potchefstroom, 29–30 October 2014

Mogane NM, Masoka X, Vuyi K. Occupational exposure to iron oxide nanoparticles in a research laboratory.

Mizan GE. Noise-induced hearing loss and hearing conservation in the iron and steel industry in South Africa.

Renton K. Occupational hygiene measurements – Do we need them?

Madzivhandila T. Characterisation of respirable crystalline silica dust in the dust obtained from abandoned mines around Roodepoort.

Provincial

Gauteng Department of Finance Employee Wellness Conference, Johannesburg, South Africa, 27 October 2014

Zungu LM. Basic workplace health programme.

5th International Conference on Nanoscience and Nanotechnology, Vaal University of Technology, Vanderbijlpark, South Africa, 30 March–2 April 2014

George J, Gulumian M. Genotoxicity study on 14 nm citrate-stabilised gold nanoparticles using the Ames test.

Tlotleng N, Tshikhudu R, Gulumian M. Cytotoxicity induced by gold nanoparticles on cultured human cells.

Gulumian M. National and international efforts in the risk assessment of nanomaterials.

Masoka X, Mogane M, Ntlailane L, Sekobe G, Gulumian M. Occupational exposure to metal-based nanoparticles during synthesis by wet chemical methods.

Conference presentations – Poster presentations

International

53rd Annual SOT Meeting, Phoenix, Arizona, 23–27 March 2014

Andraos C, Gulumian M. In vitro toxicity assessment of dust emissions from South African gold mine dumps.

Koekemoer L, Gulumian M. Assessing toxicity of ferrous dust particles collected from a South African ferromanganese smelter works: In vitro studies on primary rat astrocytes and BEAS-2B cells.

Gulumian M, Sanabria N, Andraos C. Interference study of conventional assays, caused by gold nanoparticles (AuNPs) exhibiting surface plasmon resonance (SPR).

7th International Nanotoxicology Congress (NanoTox), Antalya, Turkey, 23–26 April 2014

Boodhia K, Gulumian M. Assessing the potential toxicity of gold nanoparticle carrier systems conjugated with therapeutic peptides.

Faustman EM, Vetten M, Gulumian M, Griffith WC. Benchmark dose approaches for evaluating gold nanoparticles response.

SOT 2015 Annual Meeting, San Diego, California, US, 22–26 March 2015

Vetten M, Gulumian M. Investigation of the endocytosis of gold nanoparticles into the human bronchial epithelial cell line BEAS-2B.

Gulumian M, Vetten M. Ligand-dependent uptake of 14 nm gold nanoparticles in BEAS-2B cells.

National

10th Public Health Association of South Africa (PHASA) Conference, Polokwane, South Africa, 2–6 September 2014

Utembe W, Alfazema L, Kamndaya M, Gulumian M. Prevalence and determinants of high blood lead levels among children in Blantyre, Malawi.

Utembe W, Gulumian M. A critical review of pesticide spray drift management strategies in South Africa.

Annual SAIOH Conference, North-West University, Potchefstroom, South Africa, 29–30 October 2014

Vuma CD, Manganyi J, Wilson K. The role of body mass index in respirator fit testing and selection.

Local

Wits Faculty of Health Sciences Research Day and Postgraduate Expo 2014, 16 September 2014

Vetten M, Gulumian M. Evaluation of uptake of citrate stabilised gold nanoparticles in vitro using the CytoViva Hyperspectral Imaging (HSI) System.

Andraos C, Gulumian M. Mechanisms of interference of engineered and incidental nanoparticles with conventional assay systems.



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