NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service

NIOH

Annual Review **2016/17**

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CONTENTS

List of Abbreviations 3
Executive Director's Overview 6
Pathology Division 9
Occupational Medicine and Epidemiology Division 14
Occupational Medicine Section 16
Ergonomics Unit 19
Immunology and Microbiology Section 21
Epidemiology and Surveillance Section 25
Occupational Hygiene Section 29
Quality Assurance Department 33
HIV TB in the Workplace Unit 36
Analytical Services Section 40
Toxicology Section 43
Safety, Health and Environment (SHE) Department 47
NHLS Biobank 52
Information Services Section 56
Graphics, Marketing and Communication Section 59
International Liaison 65
Publications 2016/17 69

List of Abbreviations

16S rRNA	16S Ribosomal Ribonucleic Acid
AOP	Adverse Outcomes Pathway
AFRICA	Asbestos Fibre Regular Informal Counting Arrangement
AIA	Approved Inspection Authority
AIMS	Asbestos in Materials International Quality Assurance Scheme
ALK	Anaplastic Lymphoma Kinase
AMRC	Asia Monitor Resource Centre
APHL	Association of Public Health Laboratories
ARAOH	African Regional Association for Occupational Health
ART	Asbestos Relief Trust
CC	Collaborating Centre
CDC	Centers for Disease Control and Prevention, US
CKDu	Chronic Kidney Disease of Unknown Origin
CLTD	Centre for Learning and Teaching Development
COPD	Chronic Obstructive Pulmonary Disease
COPSOQ	Copenhagen Psychosocial Questionnaire
CPD	Continuing Professional Development
CSIR	Council for Scientific and Industrial Research
DCS	Department of Correctional Services
DIY	Do-it-yourself
DNA	Deoxyribonucleic Acid
DoH	Department of Health
DOH	Diploma in Occupational Health
DOMH	Diploma in Occupational Health and Medicine
dsDNA	Double-stranded Deoxyribonucleic Acid
DST	Department of Science and 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
EU	European Union
FIOH	Finnish Institute for Occupational Health
FTIR	Fourier Transmission Infrared Spectroscopy
G-EQUAS	German External Quality Assessment Scheme
GLP	Good Laboratory Practice
HBA	Hazardous Biological Agent
HCT	HIV Counselling and Testing
HCW	Healthcare Worker
HPCSA	Health Professionals Council of South Africa
HRA	Health Risk Assessment
HSL	Health and Safety Laboratory, UK
IAEA	International Atomic Energy Agency
IARC	International Agency for Research on Cancer
ICOH	International Commission on Occupational Health
ICPMS	Inductively-coupled Plasma Mass Spectrometry
IgG	Immunoglobulin G

ILO	International Labour Organization
IOM	Institute for Occupational Medicine, UK
ISBER	International Society of Biobanking and Biorepositories
ISO	International Organization for Standardization
IT	Information Technology
IUTOX	International Union of Toxicology
KRT	Kgalagadi Relief Trust
LAMP	Lead and Multi-element Proficiency program, US
LIMS	Laboratory Information Management System
MBOD	Medical Bureau for Occupational Diseases
MDL	Method Detection Limit
MHSC	Mine Health and Safety Council
MMed	Masters in Medicine degree
MMPA	Mine Medical Professionals Association
MN	Manufactured Nanomaterials
MPH	Master's in Public Health degree
NAPHISA	National Public Health Institute of South Africa
NBAC	NHLS Biobanking Advisory Committee
NCR	National Cancer Registry
NHI	National Health Insurance
NHL	Non-Hodgkin's Lymphoma
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)
NSCOB	National Steering Committee on Biobanking
OECD	Organisation for Economic Co-operation and Development
OEHS	Occupational and Environmental Health and Safety
OHASIS	Occupational Health and Safety Information System
OHS	Occupational Health and Safety
OHSS	Occupational Health and Safety Systems
OHASIS	Occupational Health and Safety Information System
OHN	Occupational Health Nurse
OHS	Occupational Health and Safety
OMP	Occupational Medicine Practitioner
PT	Patch Testing
PATHAUT	Pathology Disease Surveillance Database
PCM	Phase Contrast Microscopy
PCR	Polymerase Chain Reaction
PPE	Personal Protective Equipment
PDC	Professional Development Course
QA	Quality Assurance
QMS	Quality Management System
qPCR	Quantitative PCR
RSR	Railway Safety Regulator
SABS	South African Bureau of Standards
SACNASP	SA Council for Natural Scientific Professions
SADC	Southern African Development Community
SAIMR	South African Institute for Medical Research

SAIOH	Southern African Institute for Occupational Hygiene
SANRC	South African Medical Research Council
SAMHS	South African Military Health Services
SANAS	South African National Accreditation System
SANDF	South African National Defence Force
SASOHN	South African Society of Occupational Health Nursing Practitioners
SASOM	South African Society of Occupational Medicine
SDGs	Sustainable Development Goals
SEWA	Self-employed Women's Association
SHE	Safety, Health and Environment
SMME	Small, Medium and Micro-enterprise
SOT	Society of Toxicology
SPT	Skin Prick Testing
STI	Sexually Transmitted Infection
TUT	Tshwane University of Technology
TNO	Organisation for Applied Scientific Research, the Netherlands
UBC	University of British Columbia
UCT	University of Cape Town
UK	United Kingdom
UP	University of Pretoria
UVC	Ultraviolet C
UVGI	Ultraviolet Germicidal Irradiation
Wits	University of the Witwatersrand
WHO	World Health Organization
WIEGO	Women in Informal Employment: Globalizing and Organizing
XRF	X-ray Fluorescence
XRD	X-ray Diffraction

Dr Sophia Kisting

Executive Director's Overview

The National Institute for Occupational Health (NIOH) celebrated its 60th anniversary during the reporting period. We had the opportunity to reflect on the history of the NIOH, but more importantly, we can look confidently ahead to a future of decent work, reduced absenteeism and more sustainable, more equal and more productive workplaces. In the current challenging global economic and financial climate the world of work faces major challenges and the NIOH itself is not spared these challenges. This changing world of work with more technological innovations provides golden opportunities for sustainable preventive practices in occupational and environmental health and safety (OEHS) as well as the greater preservation of workers' health. The Institute has profiled ways in which the heavy burden of OEHS diseases presenting to health services, including those of the national and provincial Departments of Health, can be reduced effectively through better compliance and a mind-set change towards prevention.

As a follow-up to the inclusive occupational health and safety (OHS) concept paper of 2015, the NIOH and the broader OEHS community contributed to the all-important business case discussions for the establishment of the National Public Health Institute of South Africa (NAPHISA). The concept paper reviewed international best practice about the nature of occupational health and safety systems (OHSS). Due consideration was given to the role of the NIOH, since, in the poorly resourced area of OEHS, the multi-disciplinary Institute constitutes a core component. An important role is the support for government departments for the development of effective OEHS systems.

The NIOH continued to facilitate contributions from the broader OEHS fraternity for the inclusion of OEHS in the ongoing National Health Insurance (NHI) consultative process, which is expected to last for several financial years to come. In our review of OEHS systems, we identified an important gap specifically regarding gender concerns in the world of work. To find appropriate solutions, the NIOH continued to work on the findings of the participatory gender audit supported by national and international gender experts and the very active NIOH Gender Committee. With support from government departments, trade unions, employer organisations and international agencies, we celebrated the first anniversary of the launch of the NIOH's Gender@Work Programme on 8 March 2017. Achievements towards greater gender equity during the past year were celebrated with the National Health Laboratory Services (NHLS) and the broader world of work and we are deeply appreciative of their support and encouragement. The observed progress on gender concerns and the collaborative interventions undertaken auger well for greater unity of purpose to help overcome gender inequalities at work.

Components of OEHS services to prevent occupational diseases and injuries are often underdeveloped or at times totally lacking in South African workplaces. Consequently, the need for OEHS services, especially the specialised services of the NIOH, is considerable in most industrial sectors, as well as in the informal economy. The NIOH and its partners in government and in the private sector undertook a very wide range of activities to address OEHS needs in different sectors of our economy. These activities covered OEHS policy advice, teaching and training, technical support to at least 16 government departments, trade unions and employers; research and different aspects of OEHS surveillance; teaching and training; information services as well as the provision of specialised laboratory services. The NIOH further strengthened the understanding of workplace ethics for OEHS professionals and is in the process of developing an application that will facilitate access to information on ethics and work.

We have significantly increased our engagement with informal economy workers and as a World Health Organization (WHO) Collaborating Centre (CC), the NIOH currently leads the WHO initiative on better OHS for vulnerable workers. The engagement with governments, trade unions, employer organisations and the informal economy was strengthened mainly through collective teaching and training programmes and targeted service delivery. A significant development in the reporting period was the initiative by the Department of Health in collaboration with the WHO to develop an HIV and TB policy for health workers. This is a most significant undertaking by the National Department of Health (NDoH) and we will continue to support this process to finalisation and implementation.

The NIOH supports the Sustainable Development Goals (SDGs) adopted by the United Nations in September 2015. The SDGs include decent work, health, gender equity, youth employment, sustainable economies and sustainable environments. All of these are of great importance for healthier, productive, sustainable workplaces and the protection of the health of workers. The SDGs are intended to promote human rights, engender greater equity and peaceful and inclusive societies, create decent and sustainable jobs, and address the enormous environmental challenges of our time, including climate change. According to the WHO, environmental pollution (secondary to industrial and other workplace activities) contributes enormously to the burden of non-communicable diseases in many countries, including our own. This should further encourage all workplace stakeholders to greater compliance with OEHS legislation through effective and efficient preventive interventions at workplaces.

RESEARCH

The NIOH aims to continue to generate new knowledge through the rigour of good scientific research on key OEHS issues, especially those facing South Africa and the rest of the African continent. Collectively, the research projects of each division described in this Annual Report are testimony to the many OEHS issues requiring new knowledge, but also to the growing scope of the institute's research efforts and the strategic and greater engagement of younger researchers. It is notable that the research focus of the NIOH has broadened to include aspects of environmental health, gender concerns and reproductive health, problems related to climate change, as well as important policy concerns. The scientific publications listed in the NIOH Annual Report demonstrate a focus on many of the priority OEHS issues facing our country. Among the topics covered were asbestos in brake dust, in schools and in homes; preventing tuberculosis in individuals with silicosis; tuberculosis prevention in healthcare workers; noise-induced hearing loss and hearing conservation; occupations and lung cancer; water quality in hospitals; health effects in populations living around gold mine tailings; pesticides; and nanoparticles and health.

SPECIALISED AND OTHER SERVICES

The NIOH continues to provide discipline-specific information services to many industrial sectors and government departments. Its 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. Discipline-specific services include 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, due partly to 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 with limited availability elsewhere in the country, are obvious from this report. The unique national occupational health library continues to provide support and information well beyond the borders of South Africa.

The Biobank housed within the NIOH has grown significantly in the year under review, and is successfully housing thousands of specimens from different government departments. The HIV and TB Programme of the NIOH continue to make important contributions to both scientific research and service delivery, especially in the mining and health sectors, in close collaboration with the WHO and the International Labour Organization (ILO). The support for health workers has been most welcome as is the roll-out of training in different countries in Southern Africa on the WHO/ILO Health WISE Programme. The Marketing and Communications Section has done particularly well in profiling the history of the Institute and in strengthening engagement with OEHS programmes nationally and internationally. The Finance and General Services Section has made us all proud by maintaining the historical nature of the old building and making it a special home to the NIOH. The strategic and careful upgrading of the building has continued, and it has become a pleasure to work in this nearly hundred-year-old building.

The Safety Health and Environment (SHE) and Information Technology (IT) Programmes made significant strides on the pioneering Occupational Health and Safety Information System (OHASIS). This user-friendly information system supports compliance with OEHS legislation, enables online training and provides information for research analysis. The OHASIS has gone from strength to strength and is increasingly being rolled out to centres beyond the NHLS and NIOH as well as in neighbouring countries. This bodes extremely well for the much needed strengthening of OEHS information systems for research and evidence-informed workplace interventions. We are inspired by the roll-out in Namibia, the Gauteng Health Department and the current initiatives in Mpumalanga and the Western Cape Departments of Health.

Looking to 2017 and beyond, the NIOH will continue to help reduce the decent work deficit in our country, support ongoing efforts to reduce workplace inequality and strengthen the protection of human rights. Given our heavy burden of disease, it is incumbent upon the Institute to help nurture a culture of greater prevention of OEHS diseases and injuries. Health challenges, such as hypertension, diabetes, TB and stress, which are very often exacerbated by poor conditions of work, will also be addressed. Important areas that will require more attention relate to OEHS gender concerns, and OEHS for migrant workers, subcontracted workers, young workers and workers with disabilities. We have constituted a Green Committee and look to greater emphasis on greener workplaces and green jobs. NIOH staff members and the City of Johannesburg made concerted efforts on a voluntary basis throughout the year to provide subcontracted workers in the fields of security, cleaning and gardening services with training in skills ranging from fire fighting and first aid competency, to basic computer training. However, more strategic efforts are needed to reach more workers in precarious work.

The greatly talented NIOH Choir has gone from strength to strength over the last year and has provided the most beautiful renditions of national, regional and international songs at our major public events. We are proud of the contribution of each and every member of the choir and trust that they will continue to grow and include more and more OEHS songs from across the globe in their repertoire.

RETIREMENTS

Mr Kevin Renton (Occupational Hygiene Section)

Mr Kevin Renton retired in September 2016. Kevin began his career at the CSIR in 1977 after completing a BSc Honours in Biochemistry at Natal University (now the University of KwaZulu-Natal) and later a part-time Master's degree at the University of the Witwatersrand (Wits). He moved to the South African Institute for Medical Research (SAIMR) in 1980 working as a medical technician doing fertility research in the endocrine laboratory. In 1986, he joined the NIOH (then known as the NCOH) in the Analytical Section. He moved to the Occupational Hygiene Section in 1992 and won a scholarship in 1998 to study occupational hygiene at the University of Michigan. In 2000, he returned with new skills to contribute to the protection of workers' health. Kevin was selected to be the Southern African Institute of Occupational Hygiene's Hygienist of the Year in 2015. He presented at 19 health-related conferences, and was first author of seven and a co-author of 12 publications in peer-reviewed national and international journals. Kevin continues to assist the NIOH Occupational Hygiene Section, especially in its work for the Department of Correctional Services (DCS), and he teaches in the Wits School of Public Health in an honorary position.

Mrs Rosina Soko (Pathology Department)

Mrs Rosina Soko joined the NIOH in 1980 and was a conscientious, diligent and hard-working employee in the Pathology Department. Despite having no formal qualification, Rosina performed all the functions of a laboratory technician, delivering more than what was required of her at a high standard and with an admirable work ethic.

Obituary: Dr Danuta Kielkowski

Dr Danuta Kielkowski (PhD), who retired in December 2014 after 30 years of dedicated service at the NIOH, died on 3 July 2016. Danuta provided invaluable expertise, first to the Epidemiology Section at the NIOH and thereafter as Deputy Director of the National Cancer Registry. 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 published widely on occupational health in peer-reviewed journals and her scientific rigour contributed immensely to new knowledge in public health in South Africa and beyond. She also wrote technical reports which had a direct impact on public health policy. She supervised, nurtured and enthused numerous young epidemiologists, and was widely respected for the collegial and inclusive manner in which she shared her skills. Above all, Danuta exemplified the beautiful spirit of national and international collaboration to address major health concerns through collective research. Rest in peace, Danuta: you will always be fondly remembered and you are dearly missed.

ACKNOWLEDGEMENTS AND APPRECIATION

We wish to acknowledge the significant contribution of so many to the ongoing success of the OEHS interventions of the NIOH. We wish to acknowledge the significant and strategic support from the NHLS and from our government departments, in particular the departments of Health, Labour, Mineral Resources, Science and Technology, Environmental Affairs, Defence, Agriculture and Correctional Services. Special appreciation goes to the National Institute for Communicable Diseases (NICD) for the strategic leadership role in the NAPHISA process. We wish to acknowledge all the employer organisations and the growing number of trade unions, which continue to challenge us for an on-going positive impact on workplaces and better worker health.

Our appreciation goes to the many professional OEHS organisations including the South African Society of Occupational Medicine (SASOM), South African Society of Occupational Health Nursing Practitioners (SASOHN) and Southern African Institute for Occupational Hygiene (SAIOH), as well as international organisations, including the WHO, ILO, UN Women and UNAIDS, for their collegial support and great collaboration. We are particularly appreciative of the collaborative support from our sister OEHS institutes in Africa and across the globe.

We owe a particular gratitude to current and former staff of the NIOH, both academic and non-academic, for making and maintaining the Institute as an internationally recognised, accessible centre of excellence in OEHS research, teaching and training, and service delivery.

CONCLUSION

We invite the actors of the world of work and the broader South African public to join us on our journey of building on our collective strength to utilise the potential of all workplaces for better OEHS, for decent jobs and happier workplaces, and for the protection of human rights, greater productivity, and ultimately for sustainable economies.

Pathology Division

Head
Dr Naseema Vorajee

The origins of the Pathology Division lie in the Pneumoconiosis Research Unit founded in 1956 to conduct research into dust-induced lung diseases – the pneumoconioses – in mine workers. Today, the focus of the Pathology Division remains on occupational lung disease. The service work includes an autopsy service and a referral centre for lung biopsies obtained at surgery and analytical electron microscopy services. This service work provides material for teaching, research and surveillance. In 2016, all the laboratories within the Pathology Division maintained their accreditation status with the South African National Accreditation System (SANAS) in accordance with the recognised international standard ISO 15189:2007.

DIAGNOSTIC SERVICES

Autopsies

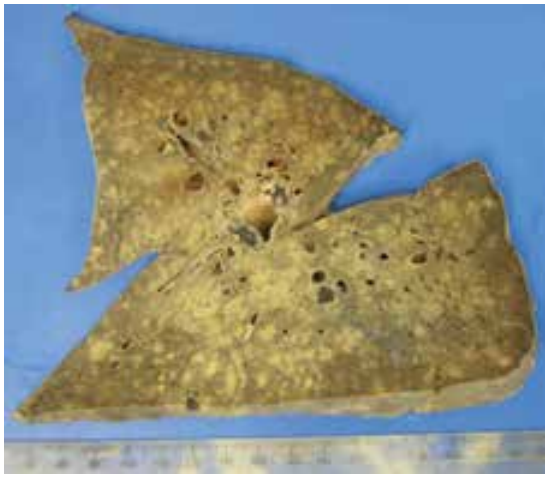
In terms of the Occupational Diseases in Mines and Works Act: Act 78 of 1973, the Pathology Division carries out the statutory requirement of examining the cardio-respiratory organs of deceased miners. A pathology report of this examination is sent to the Medical Bureau for Occupational Diseases to assist with the compensation process for families of deceased mine workers.

In 2016, 835 autopsies were carried out in terms of the Act. This is a decrease on 906 autopsies performed in 2015. To promote the use of the autopsy service, presentations and workshops were held to inform stakeholders. A team from the Pathology Division went to various sites in the North West to give training and present workshops on the removal of lungs from deceased mine workers to facilitate the compensation process. Dr Vorajee met with representatives from the Compensation Commissioner for Occupational Diseases, the Medical Bureau for Occupational Diseases, Taulekoa Mine management and labour, Occupational Medicine Practitioners, as well as Trade Unions representatives. The purpose was to raise awareness and educate our clients about the services provided by the NIOH.

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. This information is entered into the Pathology Division Autopsy database (PATHAUT). The PATHAUT database 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 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 has been 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 giving demographic data and disease rates, are produced annually. These have been made available in the public domain through the NIOH website. The URL for the reports is: http://www.nioh.ac.za/?page=pathology_disease_surveillance_reportsandid=162

Surgical Pathology

The Division has a vast experience of 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. In 2016, 803 diagnostic requests and consultations were received from clinicians at academic hospitals served by the NHLS and from the private sector.



(a) Tuberculous bronchopneumonia

(b) Mesothelioma

(c) Silicosis

(d) Bullous emphysema

Figure 1: Lung sections illustrating severe (a) tuberculous bronchopneumonia, (b) malignant mesothelioma, (c) silicosis with massive fibrosis and (d) bullous emphysema

Electron Microscopy

The Electron Microscopy Section functions within the Division and is headed by Prof. J. I. Phillips, a National Research Foundation-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 on 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 international quality assurance scheme coordinated by the Health and Safety Laboratory (HSL), United Kingdom (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. To date, the database contains 2,615 entries with information regarding the type of sample, where it comes from, and the type of industrial sector, along with the activity being performed, such as the renovation of an asbestos-containing structure.

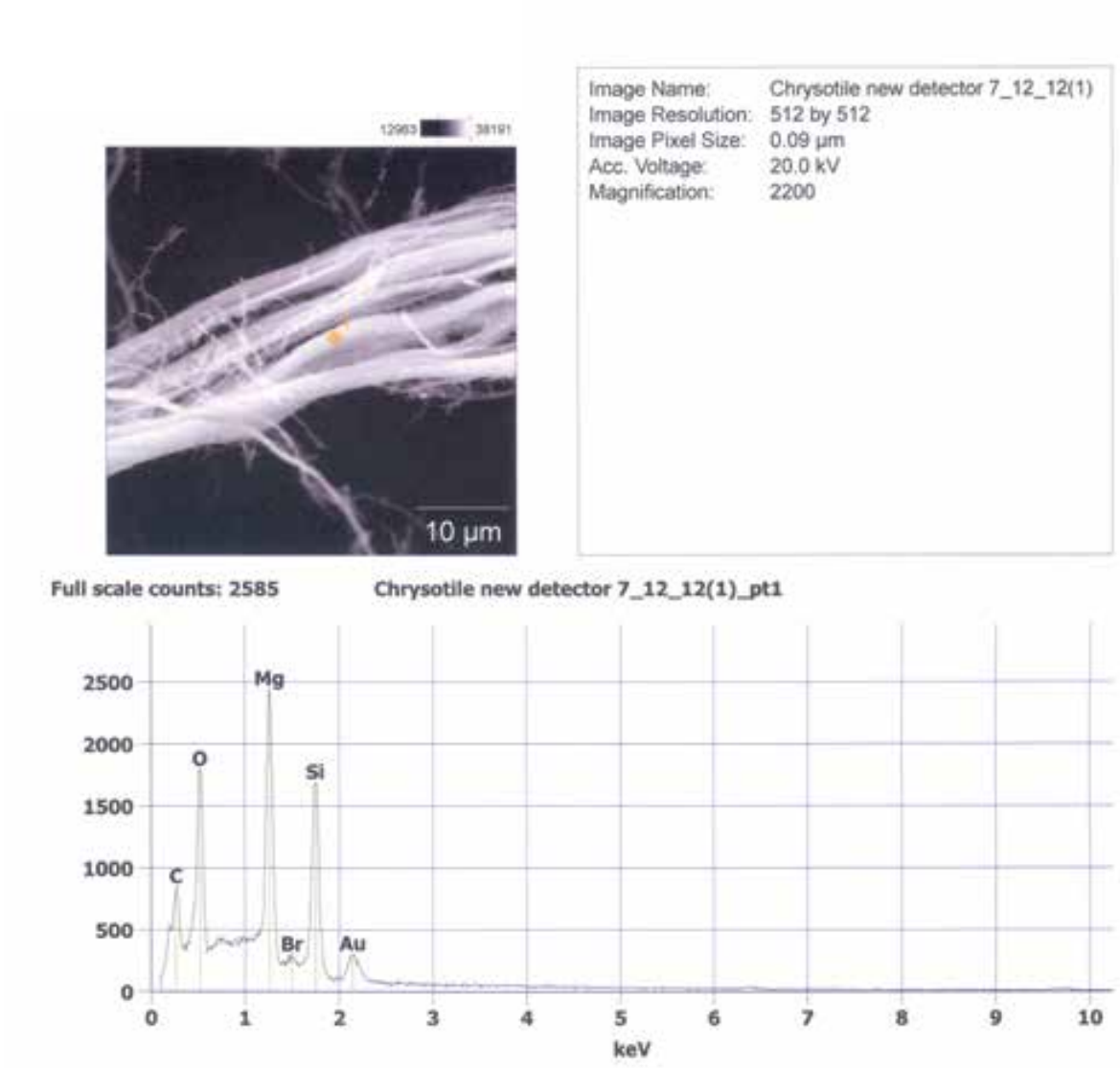


Figure 2: Scanning electron micrograph of chrysotile asbestos found in a floor tile from a school that is being renovated.

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 good deal 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. During the course of the year, Prof. J. Murray and Prof. Phillips were asked by editors of scientific journals to peer-review research articles. Staff in the Division co-authored four articles in peer-reviewed journals, one non-peer reviewed article and a book chapter. The Division also produced the PATHAUT annual report on autopsy examinations in 2015. This report is of great value for researchers in the mining industry. Prof. Phillips chairs the NIOH Research Forum; he is the Vice Chair of the NHLS Research Development Committee and a member of the NHLS Research and Innovation Committee.

Dr Naseema Vorajee completed her Master of Medicine (Anatomical Pathology) thesis at Wits. The study which involved 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, has been submitted for examination.

Ms T. Vorster is registered for a Master's degree in Technology (MTech) in biomedical technology at the University of Johannesburg and Ms N. Kgokong is registered for an MSc in health sciences at Wits.

The Division collaborates with other divisions within the NIOH and assists with projects that involve the enumeration and identification of asbestos. Links are fostered with local and international institutions and these currently include: The Council for Scientific and Industrial Research (CSIR); Wits: Schools of Pathology, Public Health, Clinical Medicine and Archaeology; University of Johannesburg: Faculty of Health

Sciences; HSL; Occupational and Environmental Lung Injury Centre, Sheffield University, UK; University of Wales, UK; Harlan Laboratories, Switzerland; Dokkyo University School of Medicine, Japan; London School of Hygiene and Tropical Medicine; University College, London, UK; Brooklyn College, City University of New York, USA; and Sciences Po University, Paris, France

The Division also receives visitors from these local and international institutions. In this reporting year, international visitors included Prof. K. Honma (Dokkyo University, Japan) and Ms Odile Macchi (Sciences Po University, Paris, France).

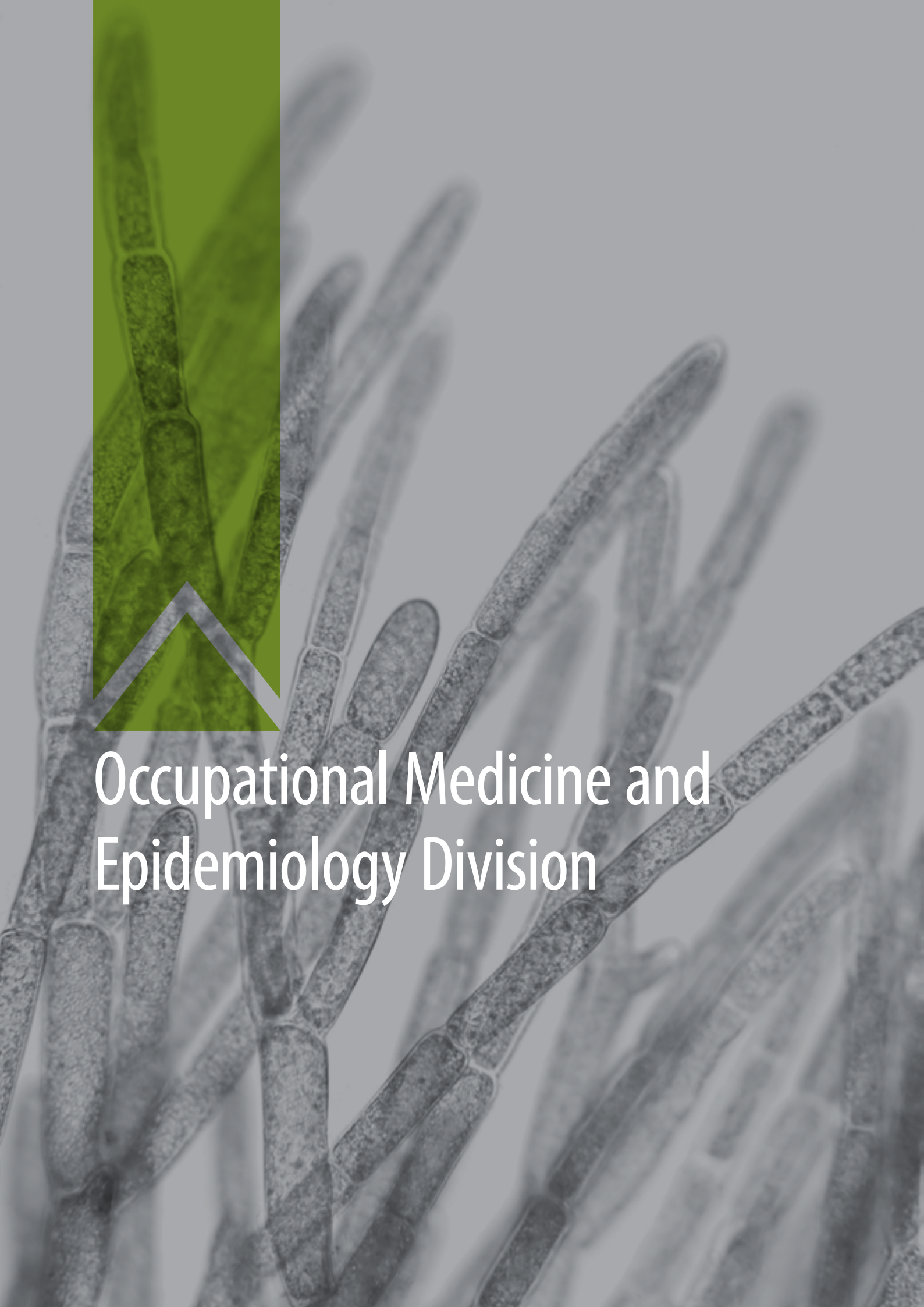
TEACHING AND TRAINING

The Division plays a role in teaching and training through training, workshops, presentations and formal lecturing to professional bodies, universities and teaching hospitals. Mr D. Africa gave a presentation in Klerksdorp to mine ventilation engineers about mine-dust related diseases and tuberculosis. He also assisted with presentations about safety and awareness for waste pickers at their waste sites. Mr Africa assists laboratory aids, medical technicians and technologists to prepare for their board examinations by giving tuition once a week.

Staff members participate in the mentoring, teaching and supervision of Master's students at Wits and the University of Johannesburg. Teaching is also given to Diploma in Occupational Health (DOH) students, medical students and allied healthcare students from Wits. 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 rotated through the Division as part of their specialist training. Specialised small group training is given to healthcare professionals, mine workers, organised labour, and mortuary and funeral parlour staff. In collaboration with trades unions, members of the Pathology Division have conducted workshops focusing on lung disease. Prof. Murray is an Associate Professor in the Wits School of Public Health and Prof. Phillips is a Visiting Professor in the Faculty of Health Sciences at the University of Johannesburg.

In October 2016, the Mauritian Government banned the use of asbestos; in December, Prof. Phillips and Mr Gabriel Mizan from Occupational Hygiene, NIOH, were invited by the Government of Mauritius to give training on the identification and handling of asbestos to Mauritian delegates. This training was conducted with the ILO to assist in the removal of asbestos from the environment.

Figure 3: Prof. Jim Phillips and Mr Gabriel Mizan participating in the International Training Course.



Occupational Medicine and Epidemiology Division

The Division comprises three sections, namely Occupational Medicine, Immunology and Microbiology, and Epidemiology and Surveillance. The sections' reports follow this brief introduction which focuses on the research, an area of work that is growing in the division. Taken together, the sections' research covers many priority areas.

Dr Spo Kgalamono's report on the Occupational Medicine Section includes a description of the section's substantial research projects. Besides supporting research principally led elsewhere in the NIOH, three big projects are located in the Section, albeit with collaborators in and out of the NIOH. One project is environmental and will examine the respiratory effects of gold mine waste dust on residents living in close proximity to these dumps. The likelihood of radiological silicosis arising from this exposure is one aspect of the study; lung function loss and diseases such as chronic obstructive pulmonary disease (COPD) and chronic bronchitis are also of interest. Another project is both environmental and occupational. Glyphosate, a widely used domestic and industrial herbicide, has been linked to non-Hodgkin's lymphoma (NHL). The project aims to describe the historical and current use of the pesticide in the country, to examine the extent, locality and sub-types of the lymphoma diagnosed in South Africa, and to do a pilot study in one hospital to determine whether a national multi-centre study is feasible. The third project is in response to an epidemic of chronic kidney disease of unknown origin (CKDu) occurring in agricultural workers, mainly sugarcane farm workers, in Mesoamerica and other hot regions. The condition has not been investigated in South African sugarcane farm workers, so it is unknown whether or not it occurs here. All these projects should provide information necessary to prevent environmental and occupational diseases.

Dr Tanusha Singh, Head of Immunology and Microbiology, reports on research that focused on infectious agent transmission – especially airborne transmission, prevention and control. This focus is appropriate because infections contribute substantially to worker ill-health and have historically been under-researched in South Africa.

The projects on ultraviolet germicidal irradiation (UVGI) in controlling transmission of Mycobacterium tuberculosis in healthcare settings; method detection limits (MDLs) of Mycobacteria tuberculosis from environmental samples; autofluorescence as a tool for rapid screening of Mycobacteria; and the effect of hand washing and scrubbing on bacterial flora and skin irritation in health care workers all have the potential to contribute to reducing work-acquired infections. Another research area was occupational allergy in poultry workers. The work with informal waste pickers, although not at research stage, has the potential to identify research topics, and is important, given the Institute's recognition of the needs of vulnerable workers and its support of WHO programmes for these groups.

The Head of Epidemiology and Surveillance, Dr Ruxana Jina, describes the diverse research programme in the section. Waste reclaimers were and will be the topical project in the section. This study focuses on the hazardous exposures facing waste reclaimers in conducting their work, their health status, and their access and utilisation of health care services. Asbestos exposure in mesothelioma patients has not been investigated for decades in South Africa and the role of the 'third wave of disease' – from exposure arising from asbestos (used in domestic contexts, and in offices and workplaces) – is one particular interest. The project on mental health is welcomed as little research has been done here, despite world-wide concern about the issue. The OHASIS, the electronic information and surveillance tool, is a rich source of data for monitoring and prevention. A systematic review on occupational tuberculosis in South Africa aims to rectify a gap in the current global burden of disease work which includes the contribution of infectious diseases, particularly tuberculosis, to the total burden of occupational disease globally. The section is contributing to many other projects, including cancer mortality and the environmental mine waste dump study.

Head
Prof. David Rees

Head
Dr Spo Kgalamono

Occupational Medicine Section

The Occupational Medicine Section, through its two sub-units, namely the Referral Clinic and the Ergonomics Unit, provides support to governmental departments, academic institutions and private entities in any matters pertaining to occupational health and safety.

SERVICES

The Referral Clinic continues to engage in activities for prevention of occupational diseases by comprehensive patient management and advice on workplace hazard control measures. Due to lack of occupational health capacity at provincial level, the Clinic provides a much needed clinical service for South Africa and the South African Development Community (SADC) region. The service includes response to complaints by employees on control of unsafe working conditions, clinical assessment of cases, and assistance with compensation submission. For this, the Clinic works very closely with the departments of Health and Labour.

Occupational lung diseases still form the bulk of cases referred to the Clinic. During the period under review, respiratory disorders accounted for over 70% of cases (Figure 4).

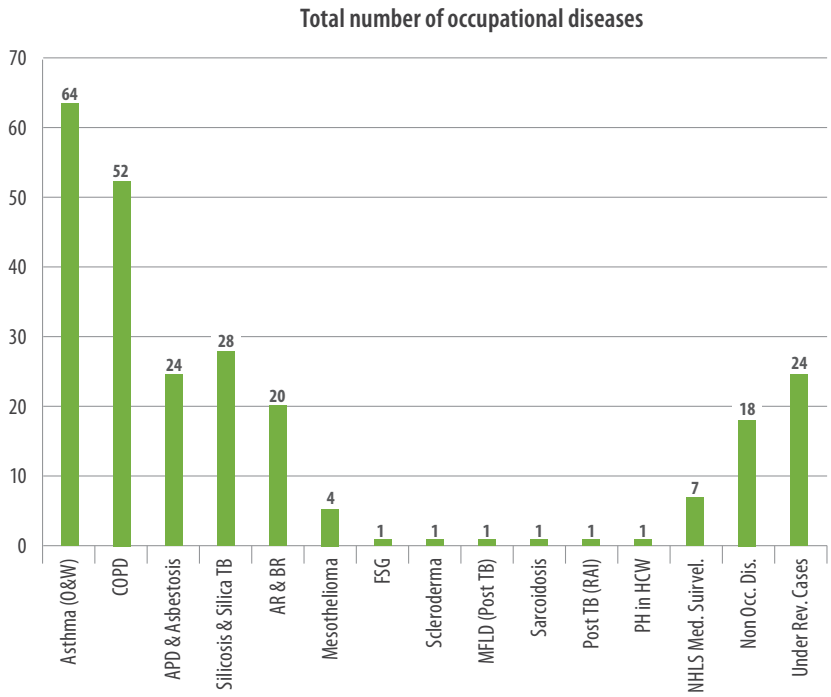


Figure 4: Number of cases by disease categories

In collaboration with other NIOH sections, the Clinic staff contributes to technical reports for governmental departments, provides an occupational health service for the NHLS and supports provincial occupational health structures. The need for assistance to trade unions regarding members who require a second medical opinion, or for assistance with disputes between employers and employees regarding exposures and ill health, continues to grow.

Additional support was offered to the Medical Bureau for Occupational Diseases (MBOD) through participation in the Medical Review Authority and the Joint Committee for the certification of cases of occupational diseases for the mining sector. Some staff members played a part in current legislative reforms on integration of the two South African workers' compensation systems. Training and technical support was also provided free of charge for the clinical team at MBOD. More training for services providers (nurses and doctors) has been developed for piloting later in the year.

Contribution was also made to health and safety initiatives in various departments. One such example was the assistance given to the City of Joburg on the Health and Safety day. Staff members presented on various topics and witnessed the signing of the pledge for provision of occupational health services for employees of the City of Joburg.

RESEARCH

Besides supervising post-graduate students at Master's and PhD levels at various universities, the section collaborated with other sections within the NIOH in various projects and embarked in self-initiated research projects. Below is a summary of key current projects.

An assessment of the NHLS Safety, Health and Environment (SHE) programme

Study Team: *Ncha R[1], Kgalamono S[2], Volmink O[2], Jones D[2], Naidoo S[1]*

[1]University of the Witwatersrand, [2]NIOH

The study's main objective is to assess the effectiveness of the programme in meeting the objectives of the SHE policy. This was done by assessing perceptions of the top and middle management using the ILO Voluntary Standards (guidelines) on Occupational Safety and Health Management System to collect baseline information on the status of the programme. The guidelines focused on the following domains: policy, organising, planning and implementation, measuring performance (evaluation), and auditing and reviewing performance (action and improvement) domains.

The results show that both top and middle management agree on the adequacy of the SHE policy in meeting SHE objectives; the availability of a sound and effective management system and structure to allow for proper delivery of the services within the programme; and top management support for SHE programme. The one area that needs improvement is the regular auditing of the programme to streamline improvement processes.

Environmental silica dust exposure from mine dumps as a risk factor for chronic respiratory disease in a Gauteng township

Study team: *South African Medical Research Council (SAMRC), NIOH*

This study aims to assess the respiratory effects of chronic inhalable and respirable dust exposure based on the proximity to the mine dump in the Gauteng township of Riverlea. The residents of Riverlea have laid numerous complaints regarding the dust pollution emanating from the mine dump. The objectives of this research are to describe the prevalence of respiratory symptoms and respiratory conditions in the Riverlea community in relation to the level of exposure; to describe associations between the level of inhalable and respirable crystalline silica dust exposure and respiratory disease and symptoms; and the factors which may modify the association while controlling for potential confounders.

Glyphosate and other Pesticide Exposure as Risk Factors for Non-Hodgkin's Lymphoma (NHL)

Study team: *Ndaba M, Iyaloo S, Rees D, Kgalamono S*

This study plans to establish whether pesticide exposure (specifically glyphosate exposure) is a risk factor for NHL in South Africa. This was in response to reclassification of the pesticide, glyphosate, as a category II carcinogen by the International Agency for Research on Cancer (IARC); glyphosate is a commonly used herbicide. One of the key IARC findings was the relationship between glyphosate exposure and NHL.

A three-part project to explore the relationship between glyphosates and NHL will be done. The first part of the study is collating all previous and current literature on the extent of the use of glyphosates in South Africa. The second part aims to collect information on the prevalence, and referral pathways of NHL. This includes an in-depth analysis of NHL, its subtypes and risk factors (mainly HIV). Thirdly, a pilot case-control study will be conducted at a single tertiary hospital, to understand exposure patterns and distribution of glyphosate pesticide use in South Africa.

Funding: *Cancer Association of South Africa*

Kidney function changes in sugarcane workers in South Africa

Study Team: *Assounga A[1], Barregard L[2], Dorkin E[3], George J[4] , Jina R[5], Kgalamono S[5], Manganyi J[5], Naicker S[4], Naidoo R[1], Nyantumbu B[5], Rees D[5], Snyman T[4] , Vorajee N[5], Wesseling C[2]*

[1]University of Kwazulu-Natal; [2]Gothenborg University, Sweden; [3]Private OMP; [4]University of Witwatersrand; [5]NIOH

CKDu has been discovered in some parts of the world amongst agricultural workers, particularly sugarcane cutters. Studies done in different parts of the world suggest that repetitive dehydration as a result of strenuous work in a hot environment is the cause of this kidney disease. There is consensus that sugar cane workers are the most affected population. No research has been done on CKDu in sugar cane workers in South Africa. We need to identify whether work in similar conditions to those studied in other countries results in similar changes in kidney function in South African workers. If CKDu does exist in South Africa, it can be prevented using simple and affordable measures.

TEACHING AND TRAINING

Capacity building in occupational health continues to be a strong focus of the section. Besides the four resident NIOH Occupational Medicine registrars, public health medicine and occupational medicine registrars from the universities of Pretoria, Limpopo and the Witwatersrand rotate annually through the section for experiential learning. The section also collaborates with Wits in offering the post-grad DOH course for doctors. For occupational medicine specialist examinations in 2017, two staff members are examiners, with one elected by the College of Medicine of South Africa as the convener for these national examinations.

For the period under review, the section successfully organised an international training in collaboration with the ILO. Experts from Germany, USA and Switzerland provided this train-the-trainer four-day workshop on interpretation of chest X-ray for classification of radiographs of pneumoconiosis. Participants came from both public and private sectors in South Africa, Namibia and Zimbabwe. The use of this classification has become mandatory in many countries around the world and has been used in South Africa to establish requirements for assessment of compensation claims. The classification is also used extensively by occupational medicine practitioners in workers' health surveillance on a daily basis at various enterprises. An additional specific training on chest x-ray and lung function interpretation was offered to doctors and nurses of Rand Mutual Assurance as per their request.

Another milestone was reached with the Railway Safety Regulator (RSR). A memorandum of agreement was signed between NIOH and the RSR to develop a health and safety course jointly for occupational health professionals in this sector. This sector-specific training has been developed and piloted. Actual training will commence in the latter half of 2017.

Informal training to empower employees through their labour movements, employers and other occupational health professionals takes the form of workshops and seminars on topics of national interest or as requested by these stakeholders. Several staff members presented specific topics at workshops organised by NIOH, the SASOM, the SASOHN, and the departments of Mineral Resources and Labour, to mention a few.

PROFESSIONAL DEVELOPMENT

One registrar completed training; this adds an occupational medicine specialist to the pool of around 50 specialists in the country. There are four other registrars currently undergoing training through the NIOH.

Two administrators enrolled for a business management course and the occupational health nurse enrolled for a BTech in occupational health nursing.

Several members attended research courses to build capacity in conducting quality research.

Ergonomics Unit

The Ergonomics Unit has been operating in an environment devoid of a regulatory framework. This is about to change: the Unit assisted with the development of ergonomics regulations in South Africa, which are currently being revised after public comments. The demand for ergonomic services from workplaces is expected to increase with the promulgation of these regulations. Teaching and training of occupational health professionals on ergonomics will need to be expedited so that ergonomic risk factors are effectively managed in the workplace. The performance and support of research related to ergonomics is important in the Unit to generate new knowledge which will be translated to improve the health and productivity of workers in the workplace.

ERGONOMIC SERVICES

The main ergonomic services offered by the Unit are ergonomic risk assessments. This includes the identification of ergonomic hazards, the assessment of the risk they pose to workers, and the formulation of preventive and control strategies. All of these are compiled in a comprehensive report of findings and recommendations.

In the year under review, 10 ergonomic risk assessments were conducted in the public healthcare sector. Nine assessments were done at the NHLS. It is noteworthy that the intervention applied by the Ergonomics Unit alleviated the pain suffered by staff members who were experiencing musculoskeletal disorders from using new computers which were deficient in design. The intervention was applied concurrently with the assessment.

RESEARCH

In the year 2016/17, the Unit was involved in various research activities. It contributed to research conducted by the Occupational Medicine Section, reviewed students' research protocols and a research article, and co-authored two articles.

The Unit contributed to the production of the information sheet and video for the study on 'Kidney function changes in sugarcane workers in the south coast of KwaZulu-Natal in South Africa', which is conducted by the Occupational Medicine Section. Three Master's in public health (industrial hygiene) students' research protocols from the Wits School of Public Health were reviewed, as well as a research article for possible publication in the *Occupational Health Southern Africa Journal*. A PhD thesis was produced and two research articles were published in PLOS One and PAIN Journal.

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TEACHING AND TRAINING

Teaching and training of occupational health professionals including workers occurred at different levels. These include university courses, in-service training and continuing education.

During the 2016/2017 year cycle, teaching and training on ergonomics was offered to the Diploma in Occupational Health (DOH) students at the universities of Pretoria and the Witwatersrand.

Rhodes University approached the NIOH for collaboration in offering a post-graduate certificate course in ergonomics. The first module of this course was co-ordinated and run at NIOH premises in March 2017. Three registrars on rotation at the Occupational Medicine Section received training on ergonomics. A new staff member in the Ergonomics Unit has been receiving on-going ergonomics training. Occupational health professionals received training on ergonomics at Mpumalanga Health Department and NHLS Health and Safety Department workshops. Training was performed at the Mine Health and Safety Council (MHSC) Dialogue on Occupational Health Safety. Lastly, workers at NHLS were trained on ergonomic risks after ergonomic risk assessments were performed.

PERFORMANCE TARGETS

The performance of the Ergonomics Unit in the year under review is showed in Figure 5. The targets were met in all the different functions of the Unit. The targets were exceeded by four ergonomic risk assessments, six teaching and training activities and three publications. This is attributed to the addition of one staff member to the Unit.

Figure 5: Performance of Ergonomics Unit in 2016/2017

PLANS FOR THE FUTURE

As most of the ergonomic risk assessments performed by the Unit in the year under review emanated from the NHLS, the Unit will identify equipment that is poorly designed and formulate recommendations for better designed equipment. Features and specifications of better designed equipment will be compiled and submitted to the Buying Department.

PROFESSIONAL DEVELOPMENT

In the year under review, one PhD was obtained from Wits.

One staff member enrolled for the postgraduate certificate in ergonomics at Rhodes University.

Immunology and Microbiology Section

Head
Dr Tanusha Singh

Workers in many jobs may be exposed to various hazardous biological agents (HBAs), either due to the nature of the job or incidentally, contributing to the burden of occupational disease in the country. Therefore, adequate control measures for eliminating or containment of the source of exposure, coupled with best practices and appropriate training, are fundamental to managing hazardous biological exposure in the workplace. The Section's primary focus in the reporting year was airborne infection prevention and control as poor indoor air quality is a challenge in many workplaces, particularly health facilities. Despite efforts to improve airborne infection control, its implementation and sustainability remains a key determinant in the transmission of infectious agents such as tuberculosis. The Section also focuses on allergies by continued provision of tailored diagnostics to manage the worker clinically as although allergies may not be debilitating, they do affect the quality of life of workers by impacting on their productivity. The Section continued to promote awareness of HBAs through the services rendered, teaching and training programme and research activities to inform decisions on resource allocations. Several multi-stakeholder forums (departments of Labour and Health; MHSC; the CSIR; the University of Pretoria [UP]) were attended by staff on various occupational health-related matters that will culminate in programmatic approaches to address the disparity of decent work across various sectors. The Section contributed to strengthening the occupational health system for NHLS by hosting an Allergy Awareness Day for the NIOH staff on International Allergy Day; presenting a talk on latex allergy to the TB laboratory at NHLS central; and conducted a Handwashing Awareness Day at the NICD to coincide with Global Handwash Day.

DIAGNOSTIC SERVICES

Specialised testing for occupationally-related respiratory and skin disease investigations continued to be provided and the service represents the sole capacity locally for specific workplace allergens. There has been an increase in the number of immunoglobulin G (IgG) tests performed from workers with probable hypersensitivity pneumonitis. The panel of allergens for skin prick testing (SPT) for mining companies expanded to include chromium, nickel and platinum. Through its routine diagnostic service, the Section contributes to valuable information on occupational allergies across industrial sectors. Indoor air quality simulation experiments for airborne TB were performed to assess efficacy of disinfection devices and is poised to assist in airborne detection and prevention control interventions, aligned to government initiatives for reducing airborne infections in health care facilities. The laboratory also provide sterility testing of nanoparticle samples and conducted HBAs risk assessments after worker complaints were reported in different settings, as well as for compliance with HBA regulation. The Section provides an identification service of medically important airborne fungi in response to the increasing number of queries related to mould or fungal exposure in the workplace as a result of failing infrastructure of many buildings and water damage. Industry awareness and confidence have been growing, which is demonstrated by the increasing number of queries related to workplace exposure and appropriate testing.

The Section was accredited by SANAS under ISO15189:2007 for the 10th consecutive years. The Section met 95% of its turn-around-times and achieved a 98.7% positive customer satisfaction rating, which reinforces the quality of the testing service to clients. In addition, the Section also obtained a 97.7% compliance rating from the health and safety audit.

RESEARCH

The section conducted wide-ranging research that focused on airborne infectious agent transmission, prevention and control as well as occupational allergies. Research conducted involved section supported and collaborative projects with stakeholders across various disciplines, including, occupational medicine, infection control, engineering and architecture which aimed to enhance intelligence on determinants of TB transmission. A summary of the key projects are presented below.

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

Collaborative study team: *Singh T[1,2], Matuka O[1,2], Duba T[1], Ngcobo Z[1], Muleba L[1], Nthoke T[1], de Jager P[3], van Reenen T[3], Leuschner W[4], Stolper R[3]*

[1]National Institute for Occupational Health, [2]University of the Witwatersrand, [3]CSIR, [4]University of Pretoria

Airborne transmission of Mycobacterium tuberculosis (TB) and other infectious agents within indoor environments has been a recognised hazard for decades. The increasing incidence of drug-resistant TB has renewed interest in UVGI to reduce transmission. This study aimed to determine the efficacy of UVGI devices on the South African market for inactivating airborne TB bacteria. The effectiveness of UVGI fixtures supplied in South Africa is highly variable with minimum output ultraviolet C (UVC). The reduced level of effectiveness of some devices may be influenced by the fixture design and needs to be reassessed by manufacturers. The current phase of the study is to assess the effectiveness of airborne infection controls in health facilities in the nine provinces. Several health facilities participated in the mapping study to obtain information on the number of UVGI devices installed, the type of device and model, the date installed and status of functioning. The information is being used to develop a sampling strategy to assess the efficacy of devices on site to determine the effectiveness of interventions in place. Field sampling in healthcare facilities has started and reporting of results should be ready for the next reporting cycle.

Method detection limits of Mycobacteria tuberculosis from environmental samples

Collaborative study team: *Ngcobo Z[1], Matuka O[1,2], Singh T[1,2]*

[1]National Institute for Occupational Health, [2]University of the Witwatersrand

Detection and quantitation of Mycobacterium tuberculosis (TB) using polymerase chain reaction (PCR) by targeting the 16S rRNA offers a more rapid alternative method independent of culturing, thereby circumventing the concerns regarding non-unculturability of environmental microorganisms and loss of culturability due to aerosol sampling.

The logarithmic amplification, which is the basis of quantitative PCR (qPCR), results in significant standard deviations among repeated qPCR runs, particularly for air samples, due to aerosol infiltration, resuspension and deposition. It is therefore necessary to determine the analytical variability and MDLs to determine whether the method is suitable for estimating exposure and delineating the experimental differences observed in aerosol processes. The aim of this study was to validate the deoxyribonucleic acid (DNA) extraction efficiency from suspension and spiked filters using the Quant-iT PicoGreen Assay Kit for double-stranded deoxyribonucleic acid (dsDNA).

The DNA extraction efficiency was calculated from a known concentration of 1x108 (TB) cells. The recovery rate from the samples was calculated using the theoretical mass of TB DNA. The minimum of DNA extraction efficiency for the extracted TB DNA suspension ranged from 88.8 to 145.9 % while for the spiked filters was 80.2 to 115.6% for the five repeat experiments. The method used has proven to be effective for recovering TB cells from spiked filters.

Autofluorescence as a tool for rapid screening of Mycobacteria

Collaborative study team: *Duba T[1], Singh T[1,2], Matuka O[1,2], Stolper R[3], Govender U[3], Vilakazi B[3]*

[1]National Institute for Occupational Health, [2]University of the Witwatersrand, [3]CSIR

Intrinsic autofluorescence in Mycobacterium species, particularly in the cyan range, is a characteristic that has been found previously in several microorganisms. It allows bacterial cell detection at a specific wavelength (emission and excitation) without the need for fluorescence staining. In comparison to fluorescence microscopy with fluorochrome dyes such as auramine O or auramine-rhodamine reputed to have higher degrees of sensitivity and specificity, autofluorescence can be an inexpensive way for screening TB using mobile phones with specific camera detectors. This study aims to detect airborne Mycobacterium tuberculosis through its intrinsic autofluorescence.

To date, autofluorescence has been detected in spiked suspensions and heat treated samples. This shows promise that autofluorescence detection is achievable for M.tuberculosis. The next phase of the study will be to detect autofluorescence in air samples and determine the sensitivity and specificity of the method for contaminated air with mixed exposures.

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

Study team: *Ngajilo D[3], Singh T[1,2], Matuka DO[1,2], Ratshikhopha E[1,2], Dayal P[1], Baatjies R[3], Jeebhay M[3]*

[1]NIOH, [2]University of the Witwatersrand, [3]University of Cape Town

Poultry production is associated with a spectrum of different occupational diseases and a greater prevalence of respiratory symptoms than other farm workers. This is due to exposure to diverse hazardous airborne agents, including dust particulate, allergens, endotoxins,

micro-organisms and chemical pollutants. While an association between poultry production and work-related respiratory diseases has been reported, few studies have focused on occupational sensitisation to specific allergens on poultry farms. This study investigated the prevalence and risk factors associated with occupational allergic sensitisation and various asthma phenotypes in poultry workers. The findings showed that non-allergic asthma is the most common asthma phenotype among poultry workers with work in the rearing-department demonstrating an increased risk. The study is complete and the postgraduate student obtained an MMed degree from the University of Cape Town (UCT) in 2016.

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

Study team: *Fourie A[1,2], Matuka O[1,2], Binta B[1], Kirsten Z[1], Carman H[3], Girdler-Brown B[4], Singh T[1,2]*

[1]National Institute for Occupational Health, [2]University of the Witwatersrand, [3]Private dermatology consultant, [4]University of Pretoria

Numerous reports reflect the necessity for hand washing using various techniques to prevent the spread of pathogenic organisms to patients. However, excessive washing using detergents and especially scrubbing may damage the stratum corneum and hence alter the barrier function of the skin, leading to irritant dermatitis and increased levels of bacteria. Of 75 workers, 11 were sampled on two occasions and the rest only once. S.aureus was isolated in the prewash samples of 33 (45%) workers and in the postwash samples of 25 (33%) of workers. Of the 33 with positive cultures of S.aureus at prewash, 22 (67%) showed a decrease in the postwash count while 11 (33%) showed an increase or no change in the postwash count. There were no statistical differences found in terms of the method of handwashing used or the cleansing formula (soap) used. Thus it seems that S.aureus is commonly found on the hands of theatre workers, that hand washing is effective in a proportion of these workers only, and that consideration should be given to closer monitoring of the hand washing protocols used.

TEACHING AND TRAINING

The section strengthened capacity development through its training initiatives, targeting various professionals such as occupational and public health registrars, occupational health practitioners, occupational health nurses, occupational hygienists, scientists and workers. Teaching contributions were made to the DOH for the universities of Pretoria and the Witwatersrand, Master's in Public Health (MPH), and undergraduate teaching at the universities of Johannesburg and the Witwatersrand. The section also presented the professional development course (PDC) on Biorisk Management at the SAIOH conference in 2016 in Mpumalanga. The PDC was a combination of lectures, practical demonstrations and problem solving and open discussions through interactive group activities. The PDC was attended by 70 delegates and included a keynote address on HBAs at the conference. Support of the HPCSA medical intern scientist microbiology training continued through the reporting year with an additional intern scientist in the programme. The NIOH Immunology and Microbiology Section hosted a Pre-Congress Workshop on Occupational Allergies: Clinical Value of Testing, for doctors and nurses attending the SASOM annual congress at the Kopanong Hotel and Conferencing Facility in Benoni, 10-11 June 2016. The aim of the workshop was to provide an overview of the value of respiratory and skin allergy testing (SPT and patch testing (PT), respectively) in industries where workers are exposed to sensitisers, for examples (platinum, bakery allergens, latex allergen, epoxy, metal working oils, and moulds). Presentations and discussions also focused on the complexities of both SPT and PT. The programme included topics such as the clinical value of SPT; tests of sensitisation; and the practicalities of occupational contact dermatitis.

Occupational health and safety awareness among informal waste pickers

Collaborative study team: *Kirsten Z[1], Duba T[1], Nthuka A[1], Africa D[1], Singh T[1,2]*

[1]National Institute for Occupational Health, [2]University of the Witwatersrand

Vulnerable workers account for approximately half of the total global workforce ranging between 1.48 and 1.59 billion workers. However, the occupational burden of ill-health in this sector is mostly unmeasured. Vulnerable workers lack decent working conditions, adequate social security and 'voice' through effective representation by trade unions and similar organisations. They also have greater exposure than most to illnesses caused by HBAs due to their lack of awareness, reluctance to ask questions, communication barriers and fear of loss of income. They continue to work in precarious conditions daily, to support their families. To protect the health and promote wellness among this group of workers the NIOH team embarked on an occupational health and safety awareness initiative. Through this process, key research priorities will be identified which will improve access to occupational health services and implementation of appropriate interventions to reduce exposures. Greater collaboration for joint research and adherence to global best practice in occupational health and safety is envisaged. A health and safety roadshow was held at two informal camps in Johannesburg (Pageview and Bigizela camps) to date. A brochure which visually illustrates the dos and don'ts of exposure to various hazardous scenarios was compiled in the most common vernacular languages and was handed out to the informal waste pickers.

PROFESSIONAL DEVELOPMENT

Postgraduates enrolled: Three (one MSc at UP; two MPH at Wits).

Figure 6: NIOH staff demonstrating safe working procedures and providing occupational health and safety information to the group of informal workers

Epidemiology and Surveillance Section

The Epidemiology and Surveillance Section provides support to NIOH research projects in terms of data management, analysis and interpretation. The Section also conducts primary research on the effects of occupational exposures on health, occupational health among workers, and is working on the development of an occupational health surveillance system and indicators for South Africa.

SERVICES

Staff from the Epidemiology Section provided technical support in epidemiology and public health to various government entities and parastatals. At national level, staff gave input on the integration of compensation systems, on TB and HIV workplace programmes for health workers, on the inclusion of occupational and environmental health and safety in the development of the national health insurance, and analysed data from the Electronic TB Register, and on volatile organic compounds personal exposure data. Some work was also done to formalise relationships between government entities and the Epidemiology Section, and in some instances, with the NIOH as a whole. Initial meetings were held with the Department of Labour, Gauteng Department of Health, and the City of Joburg to draft Memorandums of Agreement to strengthen ongoing and future collaborative work.

The Epidemiology Section continues to support the MHSC. Staff worked with the HIV and TB Unit on a project that investigated the capacity of mining houses to extend healthcare services to neighbouring communities. Ruxana Jina and Kerry Wilson were responsible for analysing the data and drafted the report with recommendations on enhancing the data collection process to improve confidence in the findings. In addition, staff attended consultative meetings with the MHSC on the calculation of levies for mines, and the unemployment of mining engineering graduates.

The Epidemiology Section considered previous challenges faced in establishing occupational health surveillance systems in the country. A decision was thus made to host a consultative workshop with national and international experts and government representatives to develop a feasible and sustainable system for the country. Staff in the Section has begun background literature reviews and administrative planning to host such a workshop. Applications for grants were also submitted. In the interim, staff engaged with owners of relevant longitudinal studies or datasets to include occupational health components to these.

Half of the staff in the Epidemiology Section serves on the Gender Committee at the NIOH. The committee successfully completed a participatory gender audit at the NIOH facilitated by the Gender Research Alliance, and are now working on the recommendations from the audit and extending their work to other institutions and bodies. Members of the committee underwent training in gender mainstreaming conducted by a gender specialist from the ILO. This training served to build capacity within the Gender@Work Programme by allowing staff to understand the process and concepts involved in gender mainstreaming and how to approach research through a gender lens. The Committee has also committed to increasing research in the field, and is working on a review paper to describe the current state of knowledge on the effect of sex and or gender on nine common occupational exposures in healthcare workers. A study on hazardous exposures in domestic workers has also been conceptualised for future roll-out. Furthermore, the committee successfully hosted two events to commemorate the National and International Women's Days, with a specific focus on gender mainstreaming awareness in occupational safety and health.

Head
Dr Ruxana Jina

RESEARCH

Informal workers

A Memorandum of Agreement was signed with an interested external collaborator to undertake a study with waste reclaimers. This study will focus on the hazardous exposures facing waste reclaimers in conducting their work, health status, and access and utilisation of health care services. It is envisioned that this work will result in solutions using local municipality and provincial resources, which could possibly be extrapolated to other cities. This project forms part of a body of work that fulfils the Institute's aim to engage more actively on issues related to vulnerable workers.

Asbestos exposures in patients with mesothelioma

Ethics approval was obtained for a study involving patients diagnosed with mesothelioma in public health facilities over a two-year period. This project which includes investigators from Australia and three sections of the NIOH, seeks to describe the sources of asbestos exposure in currently diagnosed patients, as international research has shown a changing picture in terms of asbestos exposure, resulting in a 'third wave' of cases, and it is not known if South Africa is facing a similar scenario. The study also wishes to investigate some specific questions related to the asbestos exposure due to do-it-yourself (DIY) activities, whether chrysotile exposure alone can result in the development of mesothelioma, and whether any patients have exclusive exposure from asbestos cement roofs alone. The collaborative study protocol was reviewed extensively by local and international collaborators, and consultative meetings were held with key stakeholders. The investigators are currently approaching Clinical Heads of Oncology Departments and Chief Executive Officers of hospitals, seeking permissions to conduct the study.

Respiratory health effects in communities living near mine dumps

Health concerns have always been raised regarding communities living in close proximity to mine dumps in South Africa, yet only a few recent studies have attempted to describe this problem. Background work began for a research study that will commence in mid-2017 on the respiratory health effects due to inhalable and respirable dust and silica in members of one community surrounded by various mine dumps. The study will include environmental sampling testing for levels of respirable and inhalable dust and silica, questionnaires with members of the community to assess self-reported symptoms and history of physician-diagnosed respiratory disease, and chest x-rays and spirometry to objectively diagnose disease. This will be compared to a control community, with a similar socio-demographic background. Preparation for the project included engagements with community forums, external partners, and potential funders of the research.

Mental health of workers

Initial plans to conduct a review on burnout were incorporated into larger study on mental health in the financial sector of South Africa. This study will describe the prevalence of mental ill-health of employees in the banking industry in South Africa, and identify factors associated with mental ill-health. The study has commenced with the first phase of the project, where secondary data analysis was performed on employee sick leave records, wellness reports and medical aid data. The second phase of the project will test for institution-specific factors associated with mental ill-health by administering an online psychological assessment tool and Copenhagen Psychosocial Questionnaire (COPSOQ). This project will serve as groundwork for future occupational mental health risk assessments in workplaces.

Ongoing analysis of OHASIS data

Kerry Wilson continued to analyse data from the OHASIS of the NIOH, and presented a talk on the impact of an occupational health information system in a medical laboratory service at the NIOH Research Forum and at an international conference. She produced a report on the comparative analysis of incidents reported over four years (2012–2015), which was circulated to the relevant managers to consider. This report covers the uptake of the OHASIS as an incident reporting system, the description of the incidents reported and factors associated with the incidents. Kerry also drafted a protocol for a future study on the use of the OHASIS to improve needle stick and splash outcomes in the NHLS.

Systematic review on occupational tuberculosis in South Africa

Researchers in the section identified a gap in the current global burden of disease work as it does include the contribution of infectious diseases, particularly tuberculosis, to the total burden of occupational disease globally. Engagements with the members of the Institute for Health Metrics and Evaluation indicated that the NIOH could assist by providing pooled estimates for incidence, prevalence and risk, which they could impute into their current calculations. The section is, therefore, commencing with a systematic review on occupational tuberculosis in three South African industries namely: mining, construction and healthcare, to calculate pooled estimates where feasible, or to provide a qualitative report on incidence, prevalence and risk where there are insufficient data for pooled estimates.

Other projects

Work on two papers related to cancer mortality is underway, using age-adjusted rates to compare cancer mortality by province and by the top five cancers in the country. Staff in the section has also been assessing the availability and quality of smoking data from various data sources for miners who have died. This work will assist with a feasibility study to test the combined effects of infections, occupational exposures and genetic/epigenetic factors on the risk of lung cancer among miners in South Africa. Almost all of the staff in the section worked on a review report of key exposures and resultant diseases in foundries in South Africa, which was commissioned by an external supplier.

Staff in the section is also encouraged to work in areas of interest, to be able to publish and present results. Kerry Wilson is working on a paper looking at outcomes after parathyroid surgery from one large surgical unit in South Africa, while Ruxana Jina is a co-investigator on a national study on rape adjudication and prosecution in South Africa.

Research outputs

Staff in the section published nine articles in peer-reviewed journals during the period under review, in addition to other scientific reports. Some staff in the section was invited to review articles for journals. Kerry Wilson and Ruxana Jina attended the Epidemiology in Occupational Health 2016 conference in Barcelona, Spain. During the conference, they attended three collaborative meetings for upcoming NIOH projects, and Kerry Wilson presented on the impact of the OHASIS in the NHLS. Felix Made presented on validation of self-reported measures of adherence to antiretroviral therapy in Uganda at an academic meeting of the School of Public Health, Wits.

TEACHING AND TRAINING

The Section taught on a few undergraduate and postgraduate academic programmes. Ruxana Jina provided lectures, facilitated tutorials and participated in teleconferences for the Bachelor of Health Sciences and Graduate Entry Medical Programme at Wits. All staff contributed to a one-week module on occupational epidemiology for the DOH at Wits, and Ruxana Jina acted as a facilitator for the research protocol development module for MSc (Epidemiology) students. Vusi Ntlebi provided epidemiology support to the Ear, Nose and Throat Department at UP. He conducted analysis for research studies, reviewed protocols for MMed students and provided training on Epi-Info. Kerry Wilson and Ruxana Jina acted as assessors and chairs for the postgraduate assessor committees, and Ruxana Jina was an assessor for a PhD student's interim seminar at the Wits School of Public Health. Ruxana Jina was an external examiner for a Master's dissertation for an MPH student of the University of KwaZulu-Natal.

Staff in the Epidemiology division is supervising one Honours, three Master's and one PhD student. Kerry Wilson has supported her PhD student, Jeanneth Manganyi, from the Occupational Hygiene Section with regression analysis on respirator fit testing and facial characteristics to identify significant predictors of respirator fit in male and female staff. In addition to the formal supervision, staff offers technical guidance and support in a number of ways. Ruxana Jina assisted an occupational health and safety officer from the transport sector with analysis for an MBA thesis; she provided advice to a PhD student on his data analysis, and attended a meeting to provide external review and comments to a PhD student using the PATHAUT database. Extensive reviews, comments and support have been provided on the MMed projects of two occupational medicine registrars based at the NIOH, and input was provided on short reports for public health medicine registrars from Wits. Kerry Wilson provides epidemiological and statistical support to many physiology and physiotherapy students completing Master's degrees. Felix Made assisted NIOH staff (a PhD student and three Master's students) with statistical analysis, including sample size calculation, data integrity, data analysis, and addressing examiners' comments.

The Section also ran courses in Stata, Google Drive and the Google Suite for staff at the NIOH.

PERFORMANCE TARGETS

The Section produced a report on the OHASIS, a surveillance system within the NHLS, and has begun work on a consultative workshop to develop a national surveillance system. The Section also exceeded expectations in terms of research publications, and has progressed fairly well with the postgraduate students who are being supervised, with one MMed student graduating during the year. Engagements have continued with external partners, with a new partnership developing with Women in Informal Employment: Globalizing and Organizing (WIEGO) during the year.

PROFESSIONAL DEVELOPMENT

A few staff from the section continued with advanced degrees. Pieter de Jager completed his required modules and dissertation titled *Cost-effectiveness of safety engineered devices and training in reducing needlestick injuries among healthcare workers in South Africa* for his MSc degree in health economics, policy and management from the London School of Economics. Nonhlanhla Tloteng submitted her PhD thesis for examination. Felix Made and Tahira Kootbodien attended courses to support their PhD studies; Felix attended a course on statistical theory in health research at the Wits, and Tahira attended the genetics course for the BSc (Med) Honours at UCT.

Staff completed various courses during the year to strengthen knowledge and skills required for the research projects being undertaken. Samantha Jack completed a number of BA (Psychology) courses. She also attended systematic review training on quantitative and qualitative data hosted by Wits and the Joanna Briggs Institute. Ruxana Jina completed an online course on systematic reviews and meta-analysis provided by Johns Hopkins University, and an EdX course on pivot tables using new features in Excel 2016. Nonhlanhla Tlotleng completed an online course on occupational health in developing countries. All staff attended training at Wits on searching strategies and MESH terms, and an introductory training on REDCap, a database system that provides a Windows-based straightforward system for improving the capture of survey data. Nonhlanhla Tlotleng, Vusi Ntlebi and Samantha Jack attended the scientific writing and publishing course, and Asanda Jekwa attended business writing and minute taking courses, and a professional receptionist course.

HUMAN RESOURCES

Four new staff began working in the section, which has strengthened the capacity of the section, and allowed a number of new projects to commence. Unfortunately, the new Head of the Section had to leave at the end of the financial term, due to personal reasons.

The Epidemiology Section lost a dear ex-staff member, Danuta Kielkowski, during the year. Danuta was the previous Head of the Section for 25 years, and had worked at the NIOH for 31 years. Her role in building the Section and conducting novel research in the field will not be forgotten.

Occupational Hygiene Section

Head
Ms Jeanneth Manganyi

The Occupational Hygiene Section provides professional occupational hygiene services in the form of training, advice, risk assessments and exposure monitoring to the private sector and the national and provincial government departments, including Health, Labour, Correctional Services, and Environmental Affairs, as well as support for occupational and environmental health and safety initiatives within the NIOH and the NHLS.

OCCUPATIONAL HYGIENE SERVICES

The Occupational Hygiene Section has an on-going project with the DCS which involves conducting baseline health risk assessments and the measurement of occupational hygiene stressors for officials and offenders during work activities in their facilities. Such activities and related stressors may include, among others, exposure to excessive noise in workshops, hazardous chemicals and biological substances related to cleaning activities and agriculture work, ergonomic and thermal stress in boiler rooms, kitchens and outdoor work, as well as poor air quality and insufficient lighting when performing tasks indoors. Facilities located in four of the 48 DCS management areas in various parts of South Africa have been assessed so far.

Figure 7: Evaluating airflow direction using a smoke test

Figure 8: Testing respirator fit using a Portacount

In the 2016/17 year, a total of five health risk assessments and five exposure monitoring surveys were conducted and completed.

The Occupational Hygiene Section continues to give support to other NIOH sections. The Section worked with the HIV/TB Unit to assess the ventilation parameters for TB infection control in several hospitals and clinics. A respirator fit testing was carried out on 96 staff members from one TB hospital.

The Occupation Hygiene Section continued giving support through the provision of training and teaching. Gabriel Mizan and Prof. Jim Phillips assisted the Government of Mauritius with an awareness and training programme on asbestos. The training was given to a tripartite group of delegates in order to enhance capacity in the identification, safe handling and monitoring of work carried out in terms of new asbestos regulations that were promulgated in Mauritius.

Figure 9: Mauritius asbestos training participants and facilitators: Mr Franklin Muchiri (ILO), Prof. J Phillips (NIOH) and Mr. G Mizan (NIOH).

ANALYTICAL SERVICES

The Occupational Hygiene Section provides analytical services to both internal and external clients. The services include asbestos fibre counting using Phase Contrast Microscopy (PCM) and respirable crystalline silica analysis using Fourier Transmission Infrared Spectroscopy (FTIR), X-ray Fluorescence (XRF) and X-ray Diffraction (XRD) methods. The XRD laboratory (headed by Ms Madzivhandila) and the asbestos laboratory (headed by Mr Mizan) function within the Occupational Hygiene Section and under direct supervision of the Head of Section.

A total of 77 samples were analysed at the XRD laboratory originating from a research project investigating particulate exposure and respiratory symptoms in waste reclaimers at a landfill site near Johannesburg. In addition, 22 samples using XRD, XRF and FTIR and seven asbestos samples related to various other projects were analysed.

RESEARCH

Thingahangwi Madzivhandila has submitted an MSc thesis on *Characterisation of Respirable Crystalline Silica Dust in Abandoned Mines around Roodepoort*. The study aims to identify the dust composition at the selected abandoned mines and characterise the seasonal exposure risks to the communities surrounding these mines.

Lebogang Ntlailane is conducting a systematic review on gold nanoparticle exposure assessment. The study aims to determine whether the commonly used respirators are effective against nanoparticles. She is currently finalising the results to be included in a report for the Organisation for Economic Co-operation and Development (OECD).

Tebogo Maeteletja is at a conclusion stage of her MSc research project on *Particulate Exposure and Respiratory Symptoms in Waste Reclaimers* at the Onderstepoort Landfill Site, Gauteng.

Figure 10: Soil samples collected from selected locations at the mine dumps

COLLABORATIVE RESEARCH

There are currently a number of research projects in collaboration with other NIOH Sections.

Gabriel Mizan is collaborating with the Epidemiology and Surveillance Section, and Occupational Medicine Sections, on a project regarding exclusive asbestos cement roof exposure in patients with malignant mesothelioma in South Africa. The research protocol has been submitted and the team has recently received the ethics approval to go ahead with this important study.

Occupational Hygiene, together with the Occupational Medicine and Epidemiology and Surveillance Sections, has undertaken a research project investigating the association between dust exposure and respiratory health effects in communities situated in close proximity to mine dumps in the Johannesburg area. The project will also assist in the determination of respirable and inhalable quartz, and other minerals in the soil collected from mine dumps.

Occupational Hygiene is collaborating with the Epidemiology and Surveillance Section, and other NIOH Sections, in a study reviewing the current scientific literature on occupational health and safety research by sex in healthcare workers. This is part of the NIOH gender, health and work research initiative.

TEACHING AND TRAINING

Undergraduate

Thingahangwi Madzivhandila provided mentoring and training on the XRD laboratory functions to a student from the University of Venda, which formed part of his degree requirements.

Postgraduate

Jeanneth Manganyi provided occupational hygiene tutorials to four occupational medicine registrars as part of their academic deliverables.

Gabriel Mizan and Kevin Renton coordinated and lectured in the risk assessment and management module presented to the MPH (Occupational Hygiene) students at Wits.

Jeanneth Manganyi presented the developing of an effective respiratory protective programme to the UP DOH students.

PROFESSIONAL DEVELOPMENT

Postgraduates enrolled: One PhD in public health at Wits; two Master of Science (Community Health) at UP; two MPH (Occupational Hygiene), one at Wits and the other at UP.

Undergraduates enrolled: One BSc Honours (Occupational Hygiene) at UP.

One member obtained a certification as an Occupational Hygiene technologist from the SAIOH.

QUALITY

The XRD/FTIR laboratory continued participation in the respirable crystalline silica international quality assurance of the HSL in the UK. Ten samples were analysed for respirable crystalline silica as part of the proficiency testing scheme for the XRD/FTIR laboratory and satisfactory results were achieved.

The Asbestos Laboratory partakes in the Asbestos Fibre Regular Informal Counting Arrangement (AFRICA) asbestos proficiency testing scheme with the Institute for Occupational Medicine (IOM) in Edinburgh, UK. The laboratory has maintained a "1" grading.

The Occupational Hygiene Section has maintained the SANAS 17020 accreditation since October 2015.

Quality Assurance Department

Head
Mr Bonginkosi Duma

The field of quality assurance involves making certain that tasks, procedures and processes are executed accurately as intended. NIOH Quality Assurance (QA) is going from strength to strength every year. The Department is responsible for conducting internal audits and coordinating external audits from SANAS and different external clients for the NIOH. The Department handles customer complaints both internally (within NIOH) and externally. The complaints are analysed and the customer given feedback on the outcomes of the complaints. NIOH QA ensures that all NIOH laboratories and other non-technical areas receive necessary attention to ensure that quality management systems are implemented in NIOH. The section also provides support to NIOH laboratories in getting SANAS approval on the quality management system and technical competence.

SERVICES

NIOH has been accredited on three different standards, namely ISO15189, ISO17025 and ISO17020. It is currently the only institution within NHLS which has more than two accreditation standards.

SANAS continues to audit NIOH. In October 2016, the institution was audited for ISO 17020. In April 2016, the NIOH was audited for ISO 15189 and in February 2017 for ISO 17025. NIOH still maintained all accreditation despite challenges facing the departments. The challenges include old equipment and new staff requiring more time to understand the system and settle into new roles. There are currently five accredited technical signatories within NIOH: three from the Occupational Hygiene Section and two from the Analytical Services Section. The SANAS audit for ISO 17020 has shown good improvement with NIOH staff demonstrating a good understanding of the system. The number of non-conformances in the current audit has decreased, compared to the previous one. Next year we plan to increase the scope of ISO 17025 by including the XRD laboratory in the Occupational Health Section of the NIOH.

NIOH QA Department has employed a new staff member, Kebareileng Mogari, as QA Coordinator who also deputises for both QA and Biobank in the absence of the manager. Kebareileng is a highly experienced quality coordinator with experience of both private and public laboratories, and she is also a certified SANAS assessor under ISO 15189.

NIOH is planning to implement ISO 9001 to all non-laboratory areas. This will strengthen the quality systems within all departments of NIOH, namely Procurement, Finance, Information Services, Biobank, IT, Marketing and Communications, Occupational Medicine and General Services.

The decision to implement ISO 9001:2015 was introduced at the Annual Management Review meeting in May last year. The NIOH QA Department has so far held training with an external company and communicated with the heads of sections to buy into the quality management system (QMS) implementation. Two staff members from each department were selected to be part of the QA representatives working hand in hand with the NIOH QA Department. Drafting of the quality manual has begun and the gap analysis for Epidemiology and the Biobank has been identified.

TRAINING

The section conducts training internally to strengthen the quality management systems. Training conducted during the year under review includes:

• How to log client complaints	4 May 2016
• Non-conforming events	14 June 2016
• Non-conforming events	23 June 2016
• Root cause analysis	30 November 2016
• How to handle and use spill kits	18 January 2017
• How to handle and use spill kits	23 January 2017
• Use of personal protective equipment (PPE)	23 January 2017
• Risk assessment	31 March 2017
• Monitoring quality indicators	20 April 2017

PROFESSIONAL DEVELOPMENT

NIOH QA has been requested by the KwaZulu-Natal area manager to help in accreditation preparation of the Public Health laboratory for ISO 17025 accreditation. This started in October 2016 and is still underway. QA staff members will be presenting a paper on the implementation of ISO9001 in NIOH at the Laboratory Medicine Congress in Durban in May 2017.

ACHIEVEMENTS

The section received ASLM certificate of recognition for the role that NIOH QA plays in accrediting laboratories.


ASLM
AFRICAN SOCIETY FOR LABORATORY MEDICINE
2016

ASLM Certificate of Recognition for Accreditation of Government Laboratories

Awarded to

Bonginkosi Duma

South Africa

on the 8th day of December in the year 2016

Figure 11: ASLM certificate of recognition awarded to NIOH QA for the role it plays in accrediting laboratories

HIV TB in the Workplace Unit

People of the world have come together and rallied behind the United Nations' SDGs, a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. SDG 3, Good health and Well-being, seeks to ensure healthy lives and promote well-being for all and at all ages. Furthermore, SDG target 3.3 refers to "ending the epidemics of AIDS, tuberculosis…..". SDG 3 supports the ILO's recommendation concerning HIV and AIDS and the World of Work, 2010 (No.200), and the WHO End TB Strategy. These epidemics affecting South Africa and its workers negatively warrant specific focus within the NIOH.

South Africa is one of the countries with the highest burden of HIV and TB. UNAIDS 2016 reported in 2015 that 36.7 million people lived with HIV globally, of which about 7 million were in South Africa. WHO estimates that almost 1% (454,000 of South Africans had TB, and that the incidence rate for TB was 834 per 100,000 in South Africa, with a TB and HIV co-infection rate of about 57%.

The NIOH's HIV TB in the Workplace Unit therefore plays a pivotal role, not only in contributing towards the well-being of workers through HIV and TB workplace interventions, but also by contributing towards the country's targets of reducing both HIV and TB in the formal and informal economies.

SERVICES

Occupational Health and Safety Assessments

In collaboration with the Mpumalanga Department of Health and NIOH's Occupational Hygiene Section, TB assessments were conducted in Shongwe and Impungwe hospitals in Mpumalanga, resulting in technical reports with recommendations in managing TB infection and prevention control in healthcare settings.

Occupational Medicine Clinic

The Unit provides OEHS services in collaboration with the Gauteng Department of Health at Kalafong Provincial Tertiary Hospital for health workers. These OEHS services include occupational health risk assessment, risk-based medical surveillance, OEHS teaching and training, and waste management.

HIV TB Awareness

The Unit organised two World AIDS Day commemoration events: one for NIOH employees and a second for the informal economy workers at the Johannesburg market. The events were conducted in collaboration with Right to Care; and services provided were access to HIV counselling and testing (HCT) and TB screening, referral services, condom distribution and information products on HIV, sexually transmitted infections (STIs) and TB.

Head
Dr Muzimkhulu Zungu

Figure 12: Johannesburg market awareness campaign

Projects Conducted with External Partners

The unit continues to collaborate with the University of British Columbia (UBC) and the ILO on the HealthWISE project in Mozambique, South Africa and Zimbabwe. HealthWISE is a quality improvement tool to guide the improvement of occupational health and safety in healthcare facilities/ workplaces. The Unit (in collaboration with the partners listed above) provided training of trainers on the HealthWISE tool for health workers in Mozambique, South Africa and Zimbabwe.

Figure 13: HealthWISE training of the trainer workshop participants in Zimbabwe

The Unit (together with the Epidemiology Section) has done work for the mining industry on analysing the Gauteng West Rand District ETR.Net TB Outcomes data for the period 1 January–31 December 2015. This work is done in an effort to control TB in the mining industry of South Africa, as part of the Masoyise iTB initiative led by the Government of South Africa, the Chamber of Mines and the trade unions in the mining sector.

Support Services

The unit provided support to several government departments and other institutions in line with the mandate of the NIOH, such as the National Department of Health (DoH) Steering Committee that is developing the HIV TB occupational health policy for health workers, ad hoc support to the Department of Labour on the management of hazardous biological agents in the health sector, as well as OEHS services in the informal economy.

TEACHING AND TRAINING

Academic Qualifications in Occupational Health

The Unit coordinates the Diploma in Occupational Health and Medicine (DOMH), and teaches occupational health to undergraduate and postgraduate students on behalf of the School of Health Systems and Public Health, UP. The Unit provides occupational health teaching and training to MPH students at the Walter Sisulu University in Umthatha. The Unit was a rotation site for practical training for three public health medicine registrars from the universities of Limpopo and Pretoria.

Training of Workers and Management in Occupational Health and Safety Short Courses

The unit (in collaboration with other NIOH Sections) organised and hosted the inaugural Occupational Health and Decent Work for the Construction Industry Tripartite Workshop. The purpose of the workshop was to provide a platform of knowledge sharing and outline a way forward to improving the OEHS for South African construction workers. The workshop was attended by government, trade union federations, employer organisations, academics and civil society. The workshop was a huge success, with effective deliberations to impact positively on occupational health practices in the construction industry.

The Unit also provided training on HIV TB and silicosis for more than 30 participants of the small, medium and micro-enterprises (SMMEs) in the construction industry, and on TB and HIV for health workers in the Northern Cape Provincial Department of Health.

RESEARCH

On-going research projects are currently at various stages. These research projects are in the formal and informal economy within health, mining and construction sectors.

Analytical Services Section

The Analytical Services Section has focused on the analysis of hazardous substances in biological and environmental media as a way of strengthening the assessment of workplace exposures in compliance with the regulations of hazardous chemical substances. The Section has provided specialised laboratory tests, advisory services and training in support of private industries, government departments, and academic institutions in occupational and environmental health.

The Section has rendered advice to the private and public sectors, and trained postgraduate students on good laboratory practice (GLP) and analytical techniques for chemical contaminants detection in the workplace and for biological monitoring. Through the attendance of seminars, workshops, conferences and lectures, the Section has increased its own capacity to address occupational health concerns. By admitting postgraduate students and hosting students for exposure to various practical aspects of an accredited laboratory, the Section assists national institutions to prepare students for laboratory–focused careers.

DIAGNOSTIC SERVICES

Some 2,253 tests (for diagnostic and research purposes) were completed during the reporting period. The tests included assays on 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, tissue, water and environmental samples. Organic assays requested on biological samples were mainly for toluene, dichloromethane, hexane, hydroxypyrene, mandelic acid, methanol, methylene diphenyl diisocyanate, methylhippuric acid, methyl ethyl ketone, phenol, toluene diamine isocynates, organophosphate metabolites, toluene, benzene, trichloroacetic acid, and t,t-muconic acid.

NEW DEVELOPMENTS

During the year under review, the focus has been on a number of key areas that address efficient and optimal operation within the Section. In line with the NIOH/NHLS strategic direction, the Section is actively testing new, cost-effective and time-saving analytical methods to maintain its niche in laboratory testing services. In the organics unit, migration to kit-based methods to halve current turnaround times is underway, whilst in the metals unit, single element analyses on atomic absorption spectrophotometry for the determination of aluminium in water and mercury in blood are being migrated to the more sensitive and much quicker inductively-coupled plasma mass spectrometry (ICPMS) technique. These methods will be put up for SANAS accreditation during 2018.

The procurement process for the purchase of an integrated chromatography system from seed funding provided by the MHSC is currently underway. The equipment purchase will provide multidisciplinary, science-based research-capability to inform policy coherence in the mining and allied sectors, with emphasis on prevention. The equipment will greatly enhance the scope of the work undertaken not only in the Analytical Section alone, but also at NIOH as a whole.

ACCREDITATION

The Metals and Organic Units maintained the annual ISO Code 15189 accreditation status. In November 2016, the Section was audited by SANAS and maintained its ISO 17025:2005 accreditation status for testing aluminium and mercury in water. The status was maintained after a follow-up audit in February 2017. SANAS was impressed with the improvement in the laboratory's quality management system (QMS). Analytical Services remains the only laboratory within the NHLS, which has obtained ISO 17025 accreditation.

Regular internal audits were conducted throughout the year to maintain safety, quality and competence in the laboratory.

In terms of benchmarking both quality and competence of the results and personnel, the Section participated in the following external quality assurance (EQA) programmes:

Head
Dr Boitumelo Kgarebe

i. New York State Department of Health for arsenic, cadmium, chromium, lead, manganese and mercury in blood and urine and aluminium in serum;

ii. German EQA programme for mandelic acid, nickel, phenol, o-cresol, hexanedione, 1-hydroxypyrene and methylhippuric acid in urine and aluminium in serum;

iii. Thistle EQA programme for creatinine in urine;

iv. Lead and Multi-element Proficiency (LAMP) Program of Centers for Disease Control and Prevention (CDC), US, for cadmium, lead and mercury in blood; and

v. The South African Bureau of Standards (SABS) water check scheme.

At the request of the WHO Country Office in Juba, South Sudan, and in collaboration with the Occupational Medicine Section, the Analytical Services Section undertook analyses of a cluster of cases that were presumed to be linked to human exposure to toxic hydrocarbons and/or heavy metals and possible environmental contamination at a petroleum drilling plant in Paloich, Upper Nile, South Sudan. A first report has been sent to the WHO, and the second phase of the investigations is on-going.

TEACHING AND TRAINING

The Section continues to host groups of postgraduate students providing insight into the operations of an accredited laboratory.

HONOURS/RECOGNITION

The Analytical Services Section continues to serve as a reference laboratory for the German external quality assessment scheme (G-EQUAS) due to sustained good performance in the determination of 2,5-hexandione in urine, which is a biomarker for exposure to hexane.

PROFESSIONAL DEVELOPMENT

Boitumelo Dabula and Frans Sethosa have obtained professional certificates in quality control under the South African Quality Institute.

Figure 14: Preparation of blood and urine samples for analysis by ICP-MS

Toxicology Section

Head
Prof. Mary Gulumian

The Toxicology Section has continued delivery in line with the NIOH's mission, including research, teaching and training, consultation to industry, and service delivery. In research, the section has collaborated, internationally and nationally, on different projects within which it opportunities for students as well as staff members for training in occupational toxicology and to register for their postgraduate work. The Section has also provided consultation in occupational toxicology to government departments and industry. The delivery of these services by the section 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.

RESEARCH

International Collaborations

European Union Projects

Research in the Section involved the study of the toxicity and the risk assessment of engineered nanoparticles through funding from the European Commission's Framework Programme 7 (EU FP7) as part of a project entitled Nanosolutions. In addition, the section was invited in 2016 to collaborate in another European Commission's Framework Programme Horizon 2020 (EU FP20) entitled caLIBRAte. The first project involved the hazard identification of different nanomaterials with different sizes and surface coatings and functional groups. The latter project involved risk assessment and suitability of the existing models in exposure assessment of nanomaterials in work environment.

WHO

The section made a substantial contribution to the development of guidelines by WHO on protecting workers from potential risks of manufactured nanomaterials.

OECD

The Toxicology Section has actively participated in the OECD's Working Party of Manufactured Nanomaterials activities by attending its meetings and also contributed to the finalisation of soon-to-be published documents entitled *Assessment of biodurability of nanomaterials and their surface ligands* and *Gold nanoparticles occupational exposure assessment in a pilot-scale facility*.

International Standards Organization (ISO)

Once again the Toxicology Section has contributed to the activities of this organisation through SABS by participating in the meetings and also finalising a document (a first for South Africa) entitled *"Nanotechnologies – use and application of Acellular in vitro tests and methodologies to assess nanomaterial biodurability"*. The section has now proposed a new project entitled *Label-free impedance technology to assess the toxicity of nanomaterials in vitro*, which has already been accepted by the member countries of the ISO Technical Committee on Nanotechnologies (ISO/TC 229).

National Collaborations

MHSC

The Section advised the MHSC regarding the project on adverse health impacts associated with dust emissions from gold mine tailings (SIM100801), and submitted the final report in December 2016.

Department of Science and Technology

The Section has received substantial support from the Department of Science and Technology (DST) to conduct research on two major projects: Risk assessment of gold nanomaterials: An OECD sponsorship programme; and Nanotechnology health, safety and environment (HSE) risk research platform. The first project is in collaboration with Mintek, North West University and NIOH/NHLS and the latter with the CSIR, North West University, UP and NIOH/NHLS. These projects concentrate mainly on the hazard identification and exposure assessment of different types of nanomaterials synthesised in South Africa for the purpose of their risk assessment and risk management.

South African Bureau of Standards

The Section is mandated by the South African Bureau of Standards (SABS) to head the delegation of the TC229-Nanotechnologies on the ISO/TC 229 Working Group 3: health, safety and environment.

SERVICE DELIVERY

The Section was instrumental in developing and performing specialised tests in urine and blood samples to assess the genotoxicity in populations residing near and around mine dump tailings in Johannesburg.

TEACHING AND TRAINING

Postgraduate Students

The Section provided postgraduate training to a number of students as well as staff members in the section.

The 4th South African Nanoscience and Nanotechnology Summer School

Toxicology staff members participated in and made major contributions to the 4th South African Nanoscience and Nanotechnology Summer School held from 4 to 9 December 2016 at North West University. The theme was 'Nanotechnology health, safety, and environmental risk research: A necessity and not an impediment in the advancement of nanotechnology benefits'. The School, held under the auspices of the DST, was opened by the Minister of Science and Technology, Ms Naledi Pandor, and was attended by 100 scientists from across the country.

Lectures presented:

Gulumian, M

- Introduction to risk assessment and associated processes
- Hazard identification and characterisation
- Dose-response assessment: threshold and non-threshold
- Risk characterisation and risk assessment
- Status of nanomaterials risk assessment infrastructure in South Africa

Vetten, M

- In vitro and in vivo methodologies for toxicity testing

Utembe, W

- The implementation of models in the risk assessment of nanomaterials

Laboratory demonstrations:

Joel Maseki and Charlene Andraos

- Tests and instrumentation for exposure assessment to nanomaterials

Melissa Vetten and Kailen Boodhia

- Tests and instrumentation for hazard identification of nanomaterials

One-day Seminar on Hazard Identification of Nanomaterials

The Seminar was held on 17 March at the Faircity Quatermain Hotel in Sandton where the following presentations were made by Toxicology Section staff:

- Gulumian, M.: Hazard identification of nanoparticles: what we have done and what we still have to do
- Vetten, M.: CytoViva and other methodologies to identify intracellular distribution of nano-materials
- Utembe, W.: The importance of dissolution in the models that are implemented for the assessment of the delivered dose of nanomaterials
- Theodorou, P.: Good laboratory practice (GLP) and research conducted at the NIOH

In addition, the following presentations were made by the national collaborators on the project:

- Annie Joubert (UP): Highlights of research on apoptosis and autophagy and cancer therapy at UP
- Victor Wepener: Hazard identification of nanomaterials environment: where are we now and where we would like to be
- Derk Brouwer: The importance of metrics measured in the exposure assessment to nanomaterials
- Ozguncem Bozkulak, ACEA Biosciences: xCELLigence and its applications
- Lucky Sikhwivhilu: What nanomaterials can be synthesised at Mintek?
- Ewa Cukrowska: Instrumentation available in chemistry department at Wits for study nanomaterials

CAPITAL INVESTMENT

The Section has finalised funding through the MHSC's Seed Funding Initiative to upgrade the Cytoviva HSI instrument to a 3-D system. This upgrade will improve nanoparticle and microparticle toxicity studies and their risk assessment, and thus advance the section's ability to support the mining sector.

One laboratory was renovated and equipment purchased for use as a laboratory to study dissolution of nanomaterials. Additional major capital expenditure investments for the section included a hypoxia chamber and an xCELLigence system.

HONOURS

- Prof. M. Gulumian received a Lifetime Achievement Award for Outstanding Contributions to the Field of Particle Toxicology at the 11th International Particle Toxicology Conference in Singapore from 26 to 30 September 2016. This prestigious award honours scientists who make pioneering contributions to the field of particle, fibre and nanotoxicology, evidenced by excellent publications in peer-reviewed scientific journals, invited presentations at scientific meetings, contributions to scientific guidance documents, combined with significant educational contributions and outstanding peer recognition based on highest personal and scientific integrity.
- Prof. Gulumian is a council member of SA Council for Natural Scientific Professions (SACNASP) and attends their meetings.
- Inhalation and respiratory specialty section leadership, Society of Toxicology (SOT): Prof. Gulumian was invited to join three other experts to assist this specialty group in issuing a statement on nanoparticle inhalation to the media, and/or the general public.
- Prof. Gulumian has been appointed by the Department of Environmental Affairs to serve on the steering committee meeting for the development of chemical research and innovation. She attended the meeting held on 16 August 2016 at Environment House in Pretoria.

PROFESSIONAL DEVELOPMENT

Postgraduates enrolled: Three PhDs at Wits, one MSc at Wits and one MTech at the Tshwane University of Technology (TUT):

- Millicent Magogotya obtained her BTech with six distinctions from TUT.
- Wells Utembe graduated in the Interdisciplinary PhD Programme in Public and Population Health of the School of Public Health at Wits.

Figure 15: Participants at the 4th South African Nanoscience and Nanotechnology Summer School, held from 4 to 9 December 2016 at North West University.

Safety, Health and Environment (SHE) Department

Head
Mr David Jones

STAFFING

In the year under review three newly created posts were filled, namely the Waste Assurance Manager by Ms Mmashela Kgole, the Occupational Health Nurse (OHN) Manager in the Eastern Cape by Sister Ursula Peffer, and the Safety Health and Environment Officer in the Eastern Cape by Ms Thembakazi Nyati.

We are pleased that we were able to fill the vacant post left by the late Mr Mackson Mulugisi, OHN Manager for Limpopo/Mpumalanga with Sister Cynthia Mafolo.

The NIOH Occupational Medicine Section acts as the occupational medicine practitioner (OMP) for the NHLS and provides guidance and caring for the NHLS employees. Dr Odette Volmink continues to assist in this position. We are grateful to the Occupational Medicine Section and Dr Volmink, in particular, for invaluable guidance. The funded vacant positions for the OMP as well as a Waste Assurance Officer have been advertised and we hope to fill them early in the new financial year.

CLINICAL

The Occupational Medicine Section provides guidance and expert medical support to specific cases and incidents. Of particular note were the following:

- Possible exposure to Brucella
- Possible exposure to Congo fever
- Possible exposure to Creuzfeld Jacob disease
- Employees diagnosed with TB
- Employees with Hepatitis B
- Exposure or possible exposure to chemicals, noise and other biological agents.

Under the guidance of Dr Volmink, occupational health nurses continued with the project to check the levels of compliance with regard to Hepatitis B immunisation and surveillance for tuberculosis. The information collected is being captured into the OHASIS Workforce Health module.

The level of compliance for Hepatitis B immunisation amongst potentially at risk employees, including those currently receiving vaccinations, has now reached 92.1%.

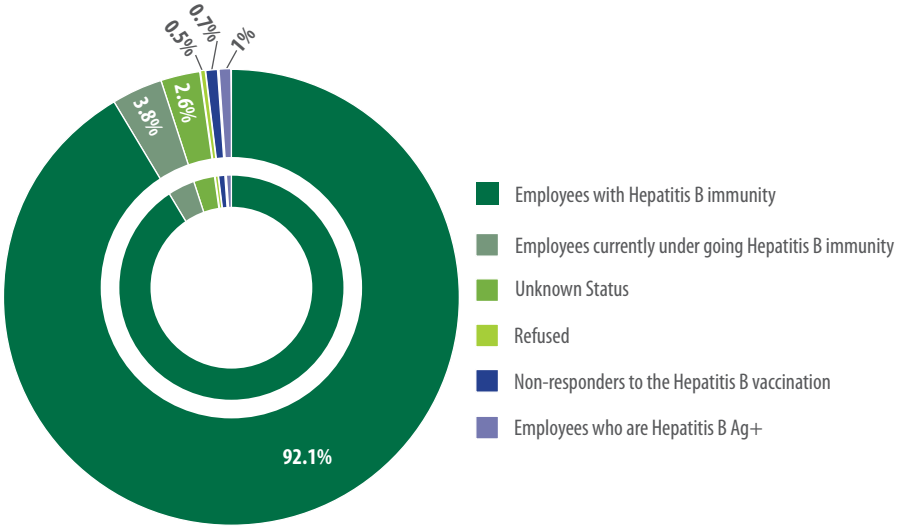


Figure 16: Diagrammatic representation of total NHLS employees Hepatitis B immunization status as at March 2017

Excellent progress has also been made in ensuring that all employees have had baseline chest x-rays. To date, 93.02% of employees have had their baseline chest x-rays done.

We would like to place on record our sincere gratitude to the relevant Area Executives for their kind assistance in ensuring that these processes are in place.

SPECIAL INVESTIGATIONS AND NIOH SUPPORT

There was continued expert support from the various Sections in the NIOH, including Occupational Hygiene, Occupational Medicine, Immunology and Microbiology, IT and Finance. Examples of expert opinion and guidance related to:

- The fit testing of N95 respirators for staff
- Compliance with legal requirements regarding medical surveillance
- Consulting with employees and their treating healthcare professionals regarding specific occupational medical concerns
- Noise surveillance
- Chemical exposure monitoring
- Ergonomic assessments
- Immunology advice
- Ongoing development of OHASIS.

OCCUPATIONAL HEALTH INFORMATION SYSTEM (OHASIS)

The OHASIS health information system, currently used at the NHLS, has progressed from a paper-based system to an online system and has now been upgraded to Version 4, developed in-house by the NIOH. Version 3 was developed jointly with the original developers, the University of British Columbia.

Training of identified persons in facilities using online resources accessed via the intranet is continuing.

To date, 711 employees (up from 449 last year) have been trained and loaded as users of OHASIS live . This means that they are able to input data into the Incident Reporting and Investigations and/ Waste Tracking modules and are also able to access reports. Version 4 of OHASIS allows for any employee to self-report incidents on the system.

The development and piloting of the newly created Equipment Maintenance Module has begun with Graaff-Reinet as a rural site. The module is working well and it is now planned to pilot it at an NICD site.

An additional module to assist health and safety committees to meet their legal requirements is planned for the OHASIS. It is envisaged that this module will assist with setting up of agendas, dissemination of minutes, as well as records of various checklists completed by safety appointees (health and safety representatives, first aiders and fire wardens).

The value of the OHASIS system is well recognised beyond the NHLS and a rollout in the Gauteng Department of Health and the Namibian Institute for Pathology were done during the year under review. Other entities that have expressed interest in the system include the Western Cape and Mpumalanga Departments of Health.

A breakdown of some of the actions following the 448 incidents recorded into the OHASIS in the year under review, compared to the 374 incidents recorded for the last financial year, and 272 in the year before, are reflected below.

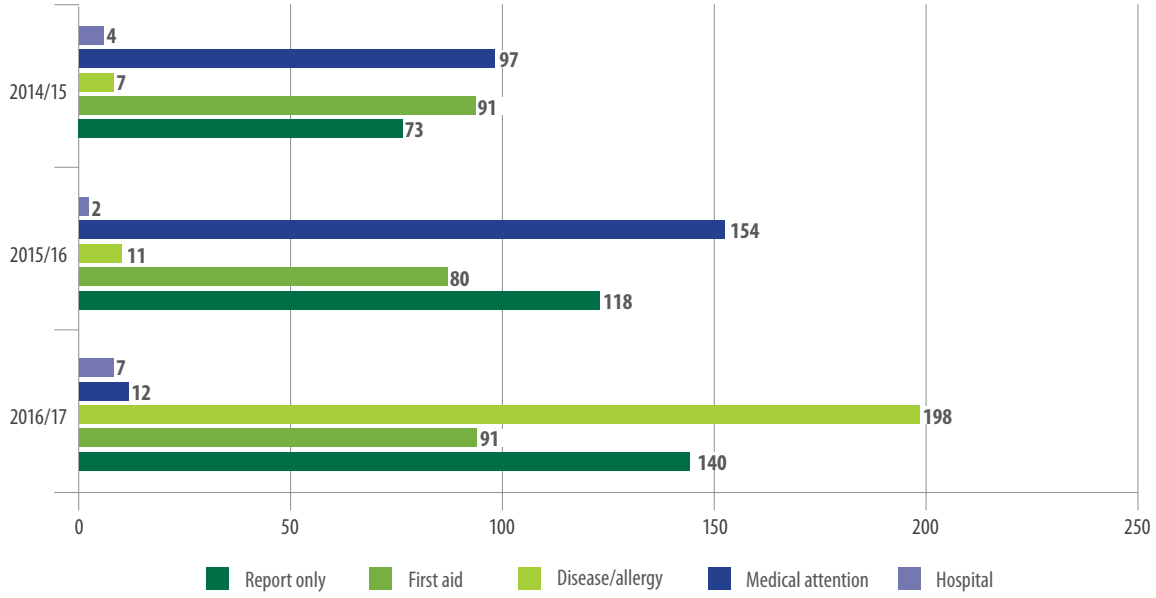


Figure 17: Incidents recorded in OHASIS by actions following the incident

AUDITS AND RISK ASSESSMENTS

During the period under review the SHE Officers under the guidance of Ms Michelle Morgan continued with the process of auditing facilities. The audits were based on the type of information that the Department of Labour could look at and is based largely on the OHS Act and Regulations.

During the year under review, 358 safety audits were conducted, as opposed to 346 in the previous financial year. It is encouraging to see that the number of facilities which achieved a 100% score increased from 1 in the 2013/14 financial year, 9 in the 2014/15 financial year and 16 in the 2015/16 financial year, to 27 in the year under review. It is noteworthy that of the 358 facilities audited in the year under review, only 15.36% scored less than 90% as opposed to 20.52% in the previous financial year.

In an ongoing effort for compliance with legislation and to assess the level of risks of employees' exposure, the SHE Department evaluated different risk assessments by the various facilities. To assist facilities where risk assessments were found to be wanting, the SHE Department facilitated improvements to risk assessments, where necessary, to ensure compliance.

HAZARDOUS WASTE

The need for a new section dedicated to ensuring NHLS facilities, as well as service providers, comply with legislation and policy framework to the management of waste was identified and steps have been taken to set up the section in the SHE Department.

Government's continuously updated legislation on the management of waste requires that NHLS, as a generator of different categories of waste, must have the necessary policy and standards of waste management for compliance. The Waste Assurance Section has reviewed the NHLS policy, audit checklist and the on-line training course on waste management to ensure that the documents are in line with the provisions of legislation and policy framework on the management of waste, and to improve the waste management standards in the NHLS.

Specifications were drafted for the chemical waste management and healthcare risk waste management tenders to ensure that suitable service providers are appointed to remove, treat and dispose the waste.

The Waste Assurance Section has observed an improvement in the reporting of waste quantities by facilities using OHASIS, which enables an overview of the amount and categories of health care risk waste generated for the NHLS. In addition, it enables tracking of the waste from cradle-to-grave and monitoring of services by the service providers once the waste has been removed from the facilities.

The Department of Environmental Affairs has identified healthcare risk waste as a priority area, and the generators have been identified as the next area of focus for the department.

The Waste Assurance Section continuously engages with the relevant authorities and service providers to ensure that the facilities comply with the provisions of legislation and to keep up to date with the developments in the waste management sector.

FIT TESTING

During the year under review, a total of 1,576 fit tests were done on employees in the NHLS to ensure that the correct make and size N95 respirator is used thus providing proposer protection for employees.

CONFERENCES AND TRAINING

Health and Safety Representative Training

Online training of health and safety representatives and managers was co-ordinated by the SHE Department during the year under review. An ongoing effort was made to ensure that any new health and safety representatives completed the course available on the intranet.

Other Training and Presentations

In the last annual report, it was indicated that grant funding to produce induction biosafety / biosecurity videos had been requested. The videos have been produced and will be made available, pending final stages of editing. The SHE Department looks forward to distributing copies of the final product aimed at providing basic biosafety and biosecurity induction for all new employees, newly appointed managers, visitors and security guards at every NHLS laboratory. The videos will also be available on the intranet.

Three of our OHN Managers, Sisters Marlinee Naidoo, Paulinah Letsoalo and Maleshwane Magasa, attended the 2016 SASOHN conference held in Port Elizabeth.

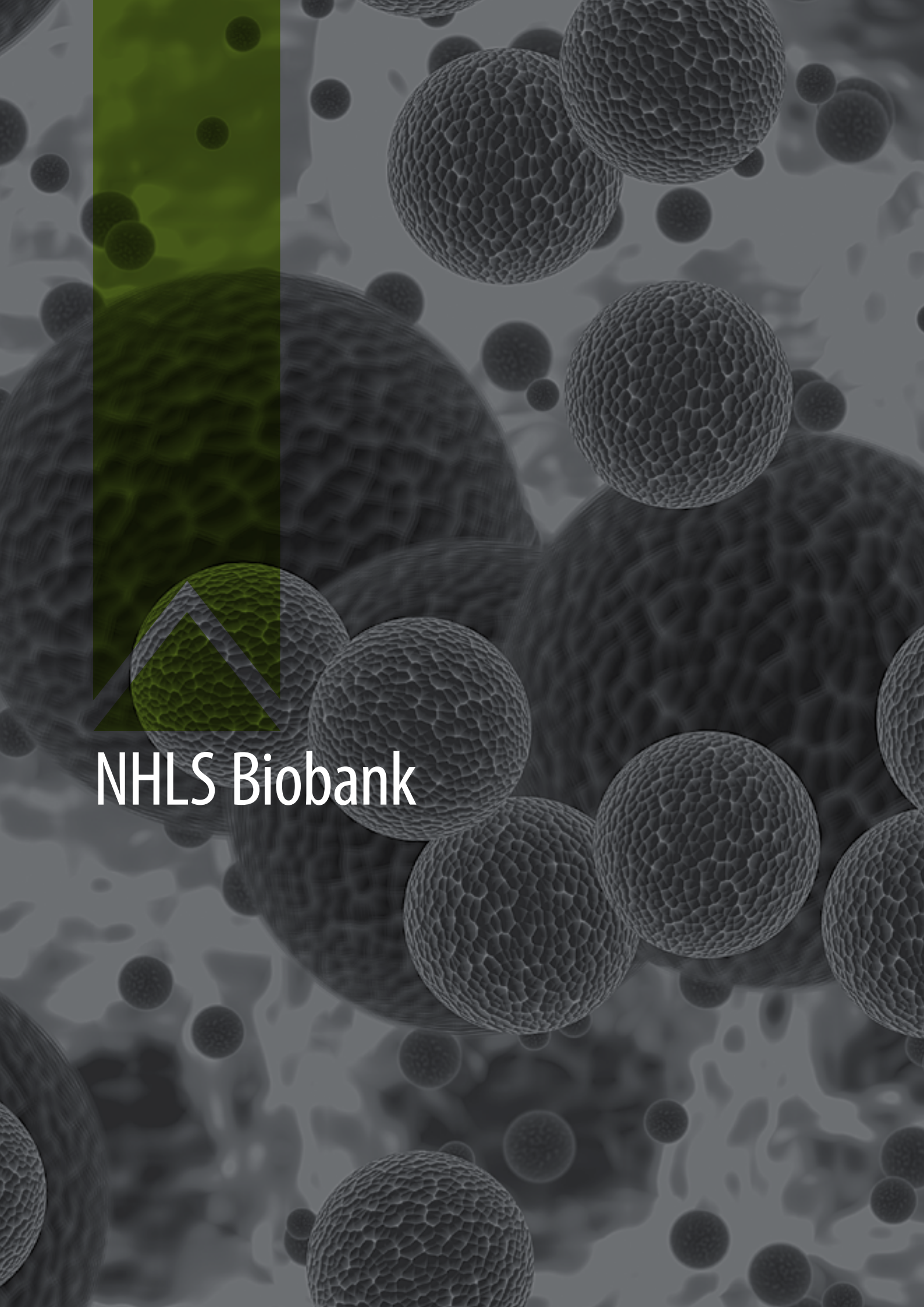
Mr David Jones attended the Second African Conference on Emerging Infectious Diseases and Biosecurity held in Lagos, Nigeria where a presentation was made: 'Using an Online Health Information System to Promote Biosafety and Biosecurity'. At the conference he was invited to do the same presentation at the Canadian Biosecurity Symposium in June 2017.

Figure 18: SHE Department at the Yearend Function

Back Row: Ncebakazi Mvakade, Michelle Morgan, Nontutuzelo Fatyela, Maleshwane Magasa, Noluthando Masiza, Paulinah Letsoalo, Sinah Mokoena, Mmashela Kgole, Nonjabulo Xulu, Odette Volmink; Front Row: Ursula Peffer, Thembakazi Nyati, Marlinee Naidoo, David Jones, Anna Potgieter; Absent: Lasi Maja

Figure 19: Rollout team for OHASIS in Namibia

From left to right: Lincoln Darwin (NIOH), Douglas Chiwara (NIP), David Jones (NIOH), Julius Antonius (NIP)


NHLS Biobank

SERVICES

The role of the NHLS Biobank is to store biospecimens at specific temperatures and data for current and future research. The Biobank has grown since last year in terms of service and infrastructure and security. The Section has added a biometric system to its current security features which include 24-hour CCTV cameras. This is to ensure that specimens are fully secured and that personnel movements are monitored. The Biobank's current facility can accommodate more than 700,000 specimens; currently it has over 600,000 specimens. The Section has renovated another area with capacity to accommodate more than four million specimens. The new facility is almost complete and will be functional from July 2017. Samples stored at the Biobank range from serum, plasma TB micro banks urine and buffy coats. A Biobank information system is still in use to capture data for researchers. The receiving area at the Biobank is used to receive routine specimens for other NIOH laboratories.

The NHLS Biobank in Braamfontein and the Biobank in Tygerberg Hospital, Cape Town have formed a National Steering Committee on Biobanking (NSCOB). The committee is expected to:

- Establish a biobanking policy with a governance structure and guidelines for biobanking ethics, community engagement and a national biobank strategy and framework for harmonised biobanking and biocontainment in the NHLS;
- Adhere and comply with South African legislation, regulations, rules, health practices and also consider the international best practices for guidance;
- Undertake a survey of the current status of NHLS biobanking practices and anticipate the future requirements of NHLS biobanking;
- Strengthen the existing Biobanks and develop a model to establish a network of satellite biobanks in the organisation;
- Propose the composition and scope of an NHLS Biobanking Advisory Committee (NBAC); and
- Engage on an ongoing basis with the DoH and the DST on the practice of human biobanking in South Africa.

Head
Mr Bonginkosi Duma

BIOBANK WEBSITE

The Biobank has a fully functional website (www.nationalbiobank.nhls.ac.za), which provides valuable information for stakeholders and new clients.

Figure 20: Landing page of the NHLS Biobank website

PROFESSIONAL DEVELOPMENT

The Biobank has employed a permanent medical scientist, Mantombi Maseme, with both medical and pharmaceutical experience. A new candidate is being pursued for the bioinformatics position (open since last year) as the candidate appointed did not have the necessary qualifications.

Biobank staff attended the Annual Research and Academic Conference of the South African National Defence Force (SANDF) in Pretoria organised by the South African Military Health Services (SAMHS), a branch of the SANDF. Mantombi Maseme presented a topic: 'The importance of biobanking in healthcare research'. The presentation not only highlighted the significance of biobanking in research but also created awareness of the existence of the NHLS Biobank.

The Section also showcased its services at an exhibition held during the conference, which was received with excitement and enthusiasm by conference attendees.

Figure 21: Left: General Currie and Surgeon General Lt Aubrey Sedibe (SANDF), and Bonginkosi Duma and Mantombi Maseme (NHLS-NIOH)

VISITORS

The Biobank hosted visitors from the State Security Agency responsible for the government infrastructure programmes. The visitors were interested in the Biobank infrastructure as a future strategic infrastructure for national research and biosecurity.

MEMBERSHIP

The Biobank maintains membership of the International Society of Biobanking and Biorepositories (ISBER) and European, Middle Eastern and African Society for Biopreservation and Biobanking (ESBB) to remain in line with international standards. The Department also attends meetings organised by the Biobank society to keep abreast of the developments around the world, such as the ISBER Biobank Meeting in Berlin, Germany, from 4 to 8 April 2016. A paper was presented a paper on the implementation of the Biobank laboratory information management system (LIMS) system.

The ESBB held a meeting from 12 to 16 September 2016 in Vienna, Austria. Bonginkosi Duma from NIOH was part of the Scientific Programme Committee for the Vienna conference. The conference also introduced the first qualification in biobanking, a Master's degree in biobanking. This online course will be offered by the University of Graz in Austria. Bonginkosi is one of the first students in the world to be accepted for the course and he is the only African student to be accepted for the September 2017 intake.

Information Services Section

Information Services serves as a support function for the NIOH and the NHLS, and acts as a gateway to occupational health information, not only for the organisation, but also for external patrons. The Section comprises South Africa's national reference library for occupational health (AJ Orenstein Memorial Library), the only specialist reference library in southern Africa dealing exclusively with occupational health topics, housing an extensive collection of information resources; the query-handling service for at responding and facilitating access to technical and scientific occupational health information, guidance and expert advisory services within the institute; the archive for comprehensively collecting, documenting and preserving the character and identity of the organisation and providing evidence of its historical development and changes over time; and the institutional repository, a digital collection of the organisation's intellectual output. Additionally, 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, the Information Services Section expanded its offerings to include access to the library collections of the NHLS (formally known as the South African Institute for Medical Research [SAIMR] Library), located in Braamfontein. The Information Services Sections serves the needs of all NHLS staff, including those located in laboratories, and the eight medical schools throughout South Africa. Collections of the NICD are now housed at the NIOH resource centre and continue to provide a significant remote information service to the NICD community.

Head
Ms Angel Mzoneli

SERVICES

Information Services supports the promotion of good occupational health practice by offering 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 primary objective of the service 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, a wide variety of information resources is provided. 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 occupational health 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 professionals, university students, workers, management, health and safety representatives, and labour union officials.

Information Services received and responded to requests for technical and scientific information on occupational health issues through its query-handling service. These queries came through the interactive web-based tool to capture occupational health information queries and requests from government departments, employers, employees, occupational health practitioners, labour unions and the general public, and were captured on the query ticket system, ensuring a 24-hour turnaround time. Queries received included but were not limited to:

- 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);
- Information on NIOH training interventions;
- Information on NIOH autopsy services offered for deceased miners;
- Information held by the MBOD and outcomes on applications for compensation of second-degree benefits;
- Information on NIOH occupational health studies;
- Requests for risk assessments or occupational hygiene surveys; and
- Assistance requested by university students for research guidelines.

Of note is that queries received and captured on the system came mainly from provinces throughout the country (university students, government departments, private industry, construction and mining companies, occupational health practitioners, doctors, and academic institutions); neighbouring countries; a few from some American, European and Asian countries; and many more with no geographic location indicated by the requestors. This confirms the national and international role played by the Information Services Section. For the reporting year, the NIOH Library and the Query Handling Service received 1,035 queries, of which 1,020 were successfully addressed.

To enhance the library collections, the section subscribed to 31 journal titles, 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 subscribed to the Medline complete database and a Clinical e-Book Collection. This is an EBSCO Health database which provides full-text access to over 2,400 medical journal titles and medical/ clinical electronic books. It also added open-access electronic resources/databases to the library collection, which can be accessed by researchers through the library page on the intranet. Information Services also acquired InMagic Genie – an upgraded web-based library system, allowing users to browse through library collections from their desktops. Information Services provided researchers with the necessary literature to carry out their projects. A total of 25 scientific papers were produced and published by NIOH researchers, which were uploaded onto the website for ease of access. Information Services also disseminated 16 publication summaries from the research output to regional occupational health co-ordinators and other occupational health practitioners in South Africa.

In marking the NIOH 60th anniversary, the Information Services Section played a significant role by successfully putting up an exhibition on the history of NIOH. The works on display reflected how the organisation has evolved over time. Furthermore, the Information Services played a crucial role in the Gender Audit process and contributed to the article published by the Gender Committee, titled *10 keys for gender sensitive occupational safety and health practice: A brief overview* as well as in planning the hugely successful International Women's Day event.

The libraries commemorated international and national events by putting up displays and exhibitions of the various library resources available in support of different themes, including World TB Month, World AIDS Day, Cancer Awareness Week, and Library Week.

TEACHING AND TRAINING

To fulfil the teaching and training function of the NIOH, Information Services delivered a lecture on sourcing occupational health information to MPH students at Wits. As part of the Information Services experiential learning programme, the section hosted ten university students as well as six from the Durban University of Technology and four from the University of Limpopo. The programme offers practical training to final-year Information Science students to assist them in balancing theoretical knowledge with hands-on experience. The libraries also provided training to new employees and interns on information search tools, such as TDNet, a portal for electronic journals, and EBSCO Medline Complete, an electronic database of medical scientific journals. Staff from various sections was trained on the use of the query ticket system, specifically capturing and responding to queries. Information Services also held library orientation sessions for occupational health nurses, registrars, and officials from provincial government departments, health practitioners, university students and international visitors.

PROFESSIONAL DEVELOPMENT

Staff in the Section attended various training interventions and workshops to enhance skills in sourcing information and carrying out duties, e.g., InMagic Genie, TDNet, PubMed and Medical Subject Headings, EBSCO Medline Complete and Sabinet workshops. Staff members also attended various internal skills development courses, including Excel, PowerPoint, project management, leadership skills, ISO 9001:2015 QMS, emotional intelligence, conflict management and negotiation skills, business and report writing, gender mainstreaming, disaster management and community preparedness, business writing and minute taking, basic first aid and basic fire fighting, and scientific writing and publishing.

Postgraduate degrees completed: Three (Bachelor of Arts Honours in information science at the University of South Africa).

Graphics, Marketing and Communication Section

Head
Mrs Shanaz Hampson

The Graphics, Marketing and Communication Section provides a support function to the NIOH and the NHLS. Its primary objectives are the promotion of good occupational health and safety practices through national and international training and outreach programmes. The Section co-ordinates training programmes of the NIOH, organises programmes for visitors, and provides an event management, marketing, communications, public relations and graphic design service internally and externally, locally and internationally. As the custodian of the NIOH brand and public image, the section aspires to build the NIOH's reputation and brand awareness through pro-active marketing, communication and information dissemination to internal and external stakeholders, in order to support the organisation's strategic objectives. The section also manages and co-ordinates the NIOH programme for Continuing Professional Development (CPD) through the HPCSA, and provides support to the NIOH's Training Unit.

The central function of the Section is to convey the organisation's messages to internal and external stakeholders through various communication channels available, which include the intranet, newsletters, e-mail and internet. The section also plays a crucial role in media relations.

In 2016, the NIOH celebrated 60 years of a rich history that has contributed to the promotion of healthy, safe and sustainable workplaces through cutting-edge research, service delivery and training. The NIOH hosted various events and training programmes throughout the period under review to celebrate and honour this significant anniversary; as an institute, the NIOH took a stance to profile a more preventive approach to OHS. It is imperative that the NIOH supports all efforts to nurture a culture of sustainable prevention of occupational injuries and diseases as well as non-communicable diseases that may be exacerbated by conditions at work. Looking ahead, the Institute plans to contribute more to supporting efforts related to inequality at work and OHS in the informal economy by addressing the decent work deficit in the country.

During the period under review, the Section expanded its service capacity through the employment of an editorial specialist who also has media relations experience to assist in strategically positioning the Institute.

SERVICES

During the reporting period, Section staff contributed to the management and provision of content for the websites of the NIOH, the National Cancer Registry (NCR), and the NHLS's Biobank, as well as the NHLS intranet site. The website platforms serve as robust information dissemination portals, and the section ensured consistency of content, layout and design, both in alignment with the corporate identity of the NHLS as well as through the activation of topical content for all stakeholders. In consultation with the Executive Director, the Section identified the need for a thorough redesign and development of the NIOH website in the next financial year. The purpose of this project is to enhance the brand identity and position the institute's website portal as a 'touch point' providing quality OHS information dissemination. This will be done through topical website content and quick access to toolkits and information fact sheets – thereby enabling focused, tailored communication to stakeholders.

During the period under review, the Section, together with the Information Services Section, developed and finalised design concepts and content for the first permanent fixed exhibition on the NIOH premises. This exhibit earmarks and delineates the NIOH's 60 years of existence through a historical look at its past and present, and also looks ahead to the future. The planning team was working with Ms R. Keene from Wits, who has extensive curator and archival exhibition experience, as well as Mr M. Sinoff who was contracted to build the physical structure and layout of the exhibit. The exhibition was launched as part of the official NIOH 60th anniversary celebrations on 30 November 2016.

Figure 22: Left-Right: NIOH Exhibition launch; Guests at the Anniversary event enjoying the exhibit

Figure 23: Senior staff cutting the cake at NIOH 60th Anniversary Celebrations. Left-Right: Dr Ruxana Jina, Mr Bonginkosi Duma, Dr Tanusha Singh, Ms Angel Mzoneli, Prof David Rees, Dr Sophia Kisting, Prof Jim Phillips, Dr Naseema Vorajee, Dr Muzimkhulu Zungu, Mr David Jones, Mr Jay Hira, Dr Spo Kgalamono and Mr Daniel Afrika.

MARKETING AND STAKEHOLDER RELATIONS

Stakeholder engagement provides opportunities to 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 realise fully the benefits of stakeholder engagement in their organisations, and to compete in an increasingly complex and ever-changing business environment, while at the same time bringing about systemic change towards sustainable development.

Good working relationships were established with the media, including TV, radio and various print outlets, by communicating key organisational events and activities, and responding to the media as and when the need arose. The section facilitated a number of media interactions which included television, radio and print interviews by the NIOH Executive Director and NIOH subject matter experts. The section ensured that marketing negotiations almost always allowed for editorial or 'thought-leader' content to be published in addition to an advertisement; this was done in an attempt to broaden the stakeholder reach and provide the necessary strategic brand positioning of the Institute. The impact of such features and opinion pieces in OHS is enormous as it provides opportunities for awareness in OHS and drives stakeholder engagement.

Staff members in the Section were responsible for co-ordinating and arranging visits by key stakeholders, to re-establish links and initiate new collaborative endeavours. During the reporting year, meetings were held with representatives from the MBOD; the Department of Labour and the Compensation Commissioner; provincial occupational health co-ordinators; the Chamber of Mines; OECD; the MHSC;

National Institute for Occupational Safety and Health (NIOSH-CDC, [US]); the International Atomic Energy Agency (IAEA); the WHO; the ILO; the Gender Research Alliance; the American Society for Tropical Medicine; the Organisation for Applied Scientific Research (TNO, Netherlands); the RSR; the Asbestos Relief Trust (ART), and Kgalagadi Relief Trust (KRT).

The Section also co-ordinated visitor programmes for occupational health nursing students from Wits and from industry; DOH doctors from the Wits School of Public Health and the UP's School of Health Systems and Public Health; occupational medicine registrars from UCT and Stellenbosch University; visiting academics from Sciences PO University in Paris, France; officials from the City of Johannesburg Municipality; and colleagues from Pikitup in Johannesburg.

Special presentation sessions were given to NIOH staff by visiting academics on a variety of topics, including 'Your Digital Footprint', Liana Meadon, E-learning Centre at Wits; and 'Genomics and Society', Prof. Himla Soodyall, Division of Human Genetics, NHLS and Wits.

INFORMATION DISSEMINATION

The Section 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 were taken from the website or were sent directly to the Section.

Staff fostered online links with the web platforms of many occupational health-related organisations and societies, allowing the NHLS and NIOH to act as a single entry point for these information resources.

Direct marketing and information dissemination were undertaken through advertising and editorial placements in the following publications: *Leadership, Mining Prospectus, Mining Decisions and Wellness* as well the *Occupational Health Southern Africa (OHSA) Journal.*

LOCAL AND INTERNATIONAL COLLABORATION IN OCCUPATIONAL HEALTH

Together with other Sections at the NIOH, collaboration, networking, and the fostering and maintaining of links with international organisations were maintained. These included the WHO; ILO; the International Commission on Occupational Health (ICOH); NIOSH-CDC, USA; the HSL of the UK, Sandia Laboratories, USA, as well as local societies and stakeholders, namely the national and provincial departments of Health; the departments of Labour and Mineral Resources; the SASOM; the African Regional Association for Occupational Health (ARAOH); the SASOHN; the SAIOH; the Mine Medical Professionals Association (MMPA), the Gender Research Alliance, academia, union representatives, employers, employees, and public and private sector groups.

During the first quarter a specialised workshop was arranged at the SASOM Congress, Occupational Allergies: Clinical Value of Testing. This half-day interactive workshop was devised by the Immunology and Microbiology Section to impart knowledge to participants on the clinical value of SPT, tests of sensitisation, the practicalities of occupational contact dermatitis, and ended with a practical demonstration of SPT and PT. The programme was accredited through the HPCSA for three CPD points and was well attended.

The NIOH, in consultation and collaboration with the Centre for Learning and Teaching Development (CLTD) at Wits, was also involved in the conceptualisation, storyboard and mapping of a mobile application being developed for the Institute by the university. This application is an ethics tool for use by OHS professionals who may have any ethical challenges or queries. A panel of ethics experts will then be given access to the application to answer any questions posed by the OHS professionals. The app was launched on November 30, 2016 and formed part of the NIOH 60th anniversary celebrations.

The NIOH's commitment to the concept of decent work and the protection and promotion of workers' health continued, with the NIOH hosting a one-day consultative workshop, Occupational Health and Decent Work for the Construction Industry, during the last quarter of the period under review. The construction industry is usually one of three industries with the highest rate of work-related injury risk. The hazards associated with construction work include traumatic injury, and chemical, physical, biological, poor ergonomics and psychosocial hazards. These hazards can cause occupational and work-related diseases (diseases caused by exposure to occupational hazards encountered in the course of work carried out under a contract of employment). The workshop served as a platform of knowledge sharing and for improvement of OEHS for construction workers in South Africa. The workshop aimed to outline the relevant legal and legislative framework for OEHS, in particular, the prevention of occupational diseases in the construction industry; highlight the burden of occupational diseases in the construction industry and compensation needs; discuss the provision of preventative OEHS services, including occupational risk assessment and medical surveillance, while emphasising a gender inclusive and ethical approach in the construction industry; discuss challenges and opportunities to nurture prevention strategies in occupational health for occupational diseases; and identify participatory research projects to enhance collaboration to improve conditions of work and OEHS.

Figure 24: Exhibitors from Amtronix sharing their new products to assist with noise-induced hearing loss (NIHL); Intensive tripartite panel discussions during the workshop; and a guest visiting the exhibition stands.

In keeping with the preventive approach to OHS, the NIOH felt it particularly essential to host a four-day international training workshop in collaboration with the ILO on the ILO International Classification of Radiographs of Pneumoconioses. The aim of the workshop was to ensure that a group of South African doctors knows and applies the classification in a consistent manner in accordance with international best practice. To achieve this aim, international experts presented the workshop, supported by experienced South African readers. A secondary, but important, aim was to discuss the prevention of pneumoconioses in South Africa.

The workshop included both theoretical and practical aspects of recognising pneumoconioses and the use of the ILO classification system. It also covered other radiologic features associated, or sometimes confused, with occupational lung disease. This workshop was well attended with over 44 attendees and was particularly suited to occupational medicine practitioners and radiologists who are required to interpret radiological images of individuals exposed to mineral dusts. The ILO describes its International Classification of Radiographs of Pneumoconioses as a powerful tool used throughout the world to improve workers' health surveillance, conduct epidemiological research and make comparisons of statistical data. The classification is also very useful for describing radiological features in individual patients and for monitoring progression over time. Some countries, including South Africa, have established requirements for use of the classification in the assessment of compensation claims, although the classification was not originally designed for this purpose. The value of the classification depends critically on the consistency with which users apply the guidelines published by the ILO and the standard radiographs that accompany these guidelines.

Figure 25: ILO CXR Organising team. Left-Right: Prof. Jack Parker (West Virginia University – USA); Prof. David Rees (NIOH – SA); Prof. Kurt Hering (Klinikum Westfalen – Germany); Dr Sophia Kisting (NIOH – SA); Dr Spo Kgalamono (NIOH – SA); Prof. Igor Fedotov (ILO – Switzerland) and Dr Fransisco Santos-O'Connor (ILO – Switzerland)

Figure 26: Organisers and some participants. Left – Right: Dr Cornelia le Roux, Dr Spo Kgalamono (NIOH-Organiser), Prof David Rees (NIOH-Organiser), Dr Jaco Folmer, Dr Dingani Moyo (Zimbabwe), Dr Vanessa Govender (MBOD), Dr Odette Volmink (NIOH)

In supporting the need for a greater focus on gender concerns in the workplace, the NIOH held its second annual event on Gender, Health and the World of Work Programme during the fourth quarter of the reporting period. This NIOH programme involves staff from all Sections, serves to help mainstream gender concerns in occupational health and safety in the South African world of work, and contributes to the realisation of decent work for all. In addition, the programme aims to facilitate a greater gender responsive approach in workplaces, including the informal sector, by collaborating with role players in workplaces in different sectors of the economy and in institutions of higher learning. The NIOH Gender@Work programme is particularly enthusiastic about engaging with workers and their trade unions, employers, and all government departments engaged in the world of work. The launch event early in 2016 and the follow-up event in March 2017 marked the continuation of a quest to bring the SDGs of health, decent work, gender equity, youth employment and sustainable economies to the forefront of occupational health in South Africa. The event was a success with more than 90 attendees, six renowned speakers, including Mr Franklin Muchiri, ILO occupational health and safety regional specialist; Dr Asanda Benya who conducted her research on women miners by working underground as a miner; Ms Vanessa Pillay from WIEGO, and Prof. Laetitia Rispel, along with a vigorous panel discussion. The panel discussion was distinguished by the tripartite representation of the departments of Labour, Women, and Public Service and Administration, as well as unions and business.

Dr Kisting stressed that "new workplace knowledge in the form of research is fundamental to help prevent occupational injuries and diseases. New knowledge which is gender informed helps shape policy and practice in public health, in surveillance as well as the development of OHS services. It is also an investment in the future and promotes equity at work. Similarly, well targeted gender-informed OHS training and good OHS service delivery in the public and private sectors can result in the reduction of absenteeism, greater sustainability of workplaces and ultimately sustainability of economies. Above all it engenders respect and the protection of human rights at work".

Figure 27: Panel discussions by key stakeholders; Dr Franklin Muchiri (ILO) and Dr Kisting networking during the tea break; Panel discussions at the Gender and the World of Work event, PRF Auditorium, NICD, Johannesburg.

International Liaison

Manager
Dr Tanusha Singh

OUTREACH TO THE SADC AND REST OF AFRICAN REGION

The TB/HIV Unit in collaboration with the ILO, the WHO and the UBC, Zimbabwe, Mozambique, and Gauteng and Mpumalanga Provincial Departments of Health, South Africa continues plans to implement HealthWISE. The Unit prepared a draft protocol on tackling discrimination, harassment and violence in the workplace in line with HealthWISE and also developed tools to monitor ongoing HealthWISE projects in Mozambique, South Africa and Zimbabwe.

INTERNATIONAL COLLABORATIONS IN OCCUPATIONAL HEALTH

A French delegation consisting of two key members, Odile Macchi (sociologist and associate researcher for the Silicosis Project) and Catherine Cavalin (researcher at Sciences PO's Centre for European Studies and associate researcher at the Ministry of Research, Ministry of Labour and employment), visited the NIOH to strengthen the France–South Arica partnership on silicosis. The rise of silicosis disease in Europe and the Middle East as well as other parts of the world (particularly in relation to Caesarstone manufacture) has developed renewed interest in the legal, social, historical, public health and scientific and pathological aspects of the disease.

The Pathology Division also has collaborative links with Japan, hence the regular visits by Prof. Koichi Honma, an anatomical pathologist, since 2001. His interest is in archival autopsy cases dating back to 1975 in order to complete the computer filing of the autopsy data. The main disease focus is on the prevalence of tuberculosis, schistosomiasis and other specific types of infection before the outbreak of HIV. His investigation include early patho-morphogenesis of silicosis and asbestosis paying special attention to and describing the evolution of authentic asbestosis which many Western textbooks fail to do correctly, due to a limited number of cases and, therefore, lack of diagnostic experience. He is examining many pathologic conditions associated with exposure to dust, which include evolution of intrapulmonary lymphoid tissue.

In her capacity as the Vice-President of Internal Union of Toxicology (IUTOX), Prof. Gulumian participated in a training workshop on 21–23 June 2016, Nairobi, Kenya, on risk assessment where she made a presentation on the importance of exposure assessment in the risk assessment process,. She also participated in two teleconferences during the year to discuss aspects of the registration and recognition of toxicologists globally including those working on nanotechnologies.

EU FP20 CaLIBRAte PROJECT

CaLIBRAte is an EU-based interdisciplinary group of researchers whose objective is to establish a versatile risk governance framework for assessment and management of human and environmental risks of nanomaterials and nanomaterial-enabled products. The Toxicology Section contributed to the project through Work Package 2 on human risk assessment models which aims to compile and further develop human exposure, hazard and risk assessment models to enable integrated qualitative to quantitative occupational and consumer risk assessment, as well as integrate and assess the value of innovative technologies (in vitro, high throughput screening, omics, bioinformatics, internal dose assessment and physiologically based pharmacokinetic modelling, physicochemical modelling) in these models.

EU FP7 NANOSOLUTIONS PROJECT

As a collaborator in the EU FP7 project, the NIOH performed nanoparticle analyses of lung tissue for the FIOH. A report was compiled and submitted to Prof. Richard Handy from the Nanosolutions consortium. Five international conference presentations emanated (Malaga, Spain, 7–9 February 2017) from this collaborative work. Prof. Gulumian also attended the Nanosolutions final consortium meeting at the conference to discuss contribution to the Working Part (WP6) on cell models and WP7 on cross-species models.

WORLD HEALTH ORGANIZATION

The NIOH hosted the WHO inter-country Workshop on occupational health and safety in the preparedness and response to outbreaks and public health emergencies, held 14–17 June 2016 at the Birchwood Conference Centre. The unprecedented number of health workers affected by the Ebola outbreak called for strengthening occupational health and safety in healthcare services. The NIOH played an integral part in the event attended by senior Members of State from 22 African countries, who are responsible for occupational health and safety and for outbreak preparedness and response. The overall purpose of the workshop was to enable high-priority African countries to organise the protection of health and safety of emergency responders and healthcare workers in the case of outbreaks and public health emergencies. The WHO aims to build capacity, and strengthen the healthcare workers force and its preparedness for outbreak response. NIOH delivered the following presentations: Occupational health and safety risks: airborne infectious diseases (Dr Sophia Kisting and Dr Tanusha Singh); and National Programme for OHS of HCWs in SA (Dr Muzi Zungu). A comprehensive feedback reported was compiled and submitted to the WHO in Geneva.

Dr Tanusha Singh attended the WHO coordination meeting in Washington, 28–29 September 2016. The aim was to discuss the role of the selected WHO Collaborating Centres (CCs) in coordinating the seven Global Master Plan priority projects. NIOH is responsible for priority number 7: knowledge networks on occupational health and safety for vulnerable groups and high risk sectors. Apart from gender and child labour, informal economy workers were identified as the main group. The objective is to look at cost-effective interventions, collect case studies from the various CCs of the different regions, and formalisation of the informal economy, health financing and social determinants. The output for the project will be a global report on health problems and interventions in the informal economy.

Dr Sophia Kisting and Dr Tanusha Singh participated in online meetings with Dr Ivan Ivanov and Dr Frank Pega of the WHO, Geneva (on 25 and 27 January 2017) on the topic, Knowledge Networks on Occupational Health and Safety for Vulnerable Groups and High-risk Sectors. The terms of reference and timelines was discussed for the various priority areas. The meeting covered the NIOH's role as a CC for priority 7 of the WHO Global Plan of Action. NIOH will provide leadership for this priority and chair a meeting with other CCs working in this area for the three-year cycle beginning 2017. The work is important for the SDGs and for decent working conditions for all.

The NIOH has a long history of diagnosis and research into occupational lung disease. The Pathology Division of the NIOH is a centre of excellence for lung disease and receives requests for consultations from many centres throughout the country. To maintain expertise in the field, our pathologists need to keep abreast of the latest trends and practices in the world. Dr Vorajee had the privilege of working from 11 to 21 July 2016.with senior pathologists, Dr Mary-Christine Aubry and Dr Eunhee Yi, contributors to the recently published WHO Classification of Tumours of the Lung, Pleura, Thymus and Heart, at the Mayo Clinic in Rochester, Minnesota.

Prof. Gulumian has attended the Fourth WHO Workshop on WHO Guidelines on Nanomaterials and Workers' Health of the Guideline Development Group, held at the Federal Institute for Occupational Safety and Health, Dortmund, Germany, from 18 to 19 April 2016.

The Epidemiology and Surveillance Section continued work on the systematic review on the incidence and prevalence of active tuberculosis in three industries in South Africa. The industries that were being investigated included: mining (gold, platinum and coal), construction and health care work. The objective of this review was to obtain a pooled estimated incidence and prevalence and a pooled estimated risk of active tuberculosis infection in specific worker populations from the years 2006–2015.

INTERNATIONAL LABOUR ORGANIZATION

At the request of the ILO, the Occupational Hygiene Section (Mr Gaby Mizan) and Pathology Division (Prof. Jim Phillips) assisted the Government of Mauritius with an awareness and training programme on asbestos. Mauritius banned the import of asbestos in 2004 and has recently introduced legislation to deal with asbestos-containing products that remain in the environment. Awareness training was given to a tripartite group of delegates in order to enhance capacity in the identification, safe handling and monitoring of work carried out in terms of the new regulations. Meetings were also held with the Fibre Technology Laboratory, Mauritius Standards Bureau; the Director: Solid Waste Management Division, Ministry of Environment; the Director: Occupational Safety and Health, Ministry of Labour, Industrial Relations, Employment and Training; and the Hon. Minister S. S. Callichurn. Discussions were also held with Dr S. Sivapragasam, Head: Occupational Health Unit, Ministry of Health and Quality of Life along with some of her staff and representatives of workers' organisations. The NIOH was able to facilitate points to be considered for a national asbestos plan and to convey to officials the point that issues relating to asbestos might be greater than anticipated. An assessment was made of the capacity of the Bureau of Standards to identify asbestos and do fibre counts in air, as required by the new regulations.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

One technical report entitled *Nanotechnologies – use and application of Acellular in vitro tests and methodologies to assess nanomaterial biodurability* was prepared by the Toxicology Section for ISOTC229. Discussion on a collaborative new work item proposal with South Korea entitled CNT and CNF Aerosol Characterization for Inhalation Exposure Studies was held. The expert panel supported the advancement of this proposal to the ISO/TC 229 for consideration and balloting.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

Prof. Gulumian attended the OECD Expert meeting (13–14 April 2016, Brussels, Belgium) on Grouping and Read-across for the Hazard Assessment of Manufactured Nanomaterials (MNs) The aim of the meeting was to further support the development of grouping and read-across of MN and in particular, to achieve a common understanding on which specific aspects need to be considered in a regulatory context when applying grouping and read-across in the hazard assessment of MNs. The proceedings from this meeting will provide initial input for a possible update of the OECD guidance document. Prof. Gulumian, Ms K. Potgieter and Dr W. Utembe contributed to finalising the OECD document on *Assessment of Biodurability of Nanomaterials and their Surface Ligands.* Prof. Gulumian also attended the 16th OECD Working Party on Manufactured Nanomaterials Meeting in Paris (1–16 September 2016) and made two presentations on the documents, A*ssessment of Biodurability of Nanomaterials and their Surface Ligands*; and *Gold Nanoparticles Occupational Exposure Assessment in a Pilot-scale Facility*. The EU and Germany will submit their final comments and the documents will be sent to the joint meeting for declassification. Prof. Gulumian was also invited to participate in a new project entitled Advancing adverse outcomes pathway (AOP) development for nanomaterial risk assessment and categorisation. The overall goal of the work is to advance the use of alternative testing in regulatory decision making. The plan is to develop a methodology for linking key events in an AOP to overall human health impact.

Publications 2016/17

Ärnlöv, J. … de Jager, P., et al. 2016, 'Estimates of global, regional, and national incidence, prevalence, and mortality of HIV, 1980-2015: the Global Burden of Disease Study 2015', *The Lancet HIV* 3(8), E361–E38.

Bello, B., Heederik, D., Kielkowski, D. & Wilson, K., 2016, 'Increased time-to-pregnancy is associated with domestic work in South Africa', *Reproductive Health*, 6 September,13, 106.

Brouwer, D. & Rees D., 2016 'Does the science support our practice? Letter to the Editor', *Occupational Health Southern Africa*, 22(2), 4-6.

George, J.M., Magogotya, M., Vetten, M.A., Buys, A.V. and Gulumian, M., 2017, 'An Investigation of the Genotoxicity and Interference of Gold Nanoparticles in Commonly Used In Vitro Mutagenicity and Genotoxicity Assays'. *Toxicological Sciences*, 2017 Mar 1;156(1):149-166.

Gulumian, M., Andraos, C., Boodhia, K., Sanabria, N., Utembe, W. & Vetten, M., 2016, 'Nanotoxicology at the NIOH and its relevance to particle toxicology and occupational health', *Occupational Health Southern Africa* 22(4), 15-19.

Gulumian, M., Verbeek, J., Andraos, C., Sanabria, N. & de Jager, P., 2016, 'Systematic Review of Screening and Surveillance Programs to Protect Workers from Nanomaterials', *PLOS One*, 11(11), 1–17.

Hampson, S., Kirsten, Z. and Singh, T., 2016, 'Workplace health protection and promotion communication: current perspectives', *Occupational Health Southern Africa*, 22(5), 17-20

Jack, S., Wilson, K., Matatiele, P., Mlangeni, N., Muleba, L., Tlotleng, N., Letsoalo, P., Nqini, B. and , Manganyi, J., 2016, '10 keys for gender sensitive occupational safety and health practice – a brief overview', *Occupational Health Southern Africa*, 22(4), 26-29.

Jina, R. and Kotzé, J.M., 2016, 'Improving the recording of clinical medicolegal findings in South Africa', *South African Medical Journal*, August 2, 106(9), 872-873.

Karodia, S., Phillips, J.I. and Esterhuysen, A.B., 2016, 'A study of naturally mummified human tissue from Historic Cave, Limpopo, South Africa', *Journal of Archaeological Science*, 6, 24-34.

Matatiele, P. and Gulumian, M., 2016, 'A cautionary approach in transitioning to 'green' energy technologies and practices is required', *Environ Health*.

Mathee, A., de Jager, P., Naidoo, S. and Naicker, N., 2017, 'Exposure to lead in South African shooting ranges', *Environmental Research*, 153, 93–98.

Matuka, D.O. and Singh, T.S., 2017, 'Work related infections Part 2: Prevention and control strategies', *Occupational Health Southern Africa*, January/February, 23 (1), 12–18.

Mizan, G.E., Rees, D., & Wilson, K. et al. 2016, 'Reproductive Health Hazards in Laboratory work', *Occupational Health Southern Africa*, 22(4), 30-33.

Mlangeni, M. & Senkubuge, F., 2016, 'Antiretroviral therapy programme outcomes in Tshwane district, South Africa: A 5-year retrospective study', *South African Medical Journal,* 106(4), 365-368.

Moyo, D. & Kgalamono, S.M.A., 2017, 'Diagnostic challenges of silico-tuberculosis in a case with progressive massive fibrosis – a Zimbabwe case report', *Occupational Health Southern Africa*, 23(1), 11–13.

Mwanga, H.H., Dalvie, M.A., Singh, T.S., Channa, K. and Jeebhay, M. F., 2016, 'Relationship between pesticide metabolites, cytokine patterns, and asthma-related outcomes in rural women workers', *International Journal of Environmental Research and Public Health*, 13, 957.

Naicker, N., de Jager, P., Naidoo, S. and Matthee, A., 2016, 'Household factors associated with self-harm in Johannesburg, South African urban-poor household', *PLOS One*, 11(1), 1–12.

O'Hara, L.M., Yassi, A., Bryce, E.A., Janse van Rensburg, A., Engelbrecht, M.C., Zungu, M., Nophale, L.E. &, FitzGerald, J.M., 2017, 'Infection control and tuberculosis in health care workers: an assessment of 28 hospitals in South Africa', *The International Journal of Tuberculosis and Lung Disease*, 21(3), 320-327.

Phillips, J.I., Swanepoel, A.J. & Rees, D., 2016, 'Asbestos remains troublesome in South Africa after the ban', *Occupational Health Southern Africa*, 22(4), 20-23.

Ratshikhopha, M.E. & Singh, T.S., 2016, 'Sensitisation profiles of workers tested with bakery flour allergens', *Current Allergy and Clinical Immunology*, 29(3), 212.

Ratshikhopha, M.E., Singh, T.S., Lopata, A.L. & Jeebhay, M.F., 2016, 'Component resolved diagnosis as a tool for differentiating true latex allergy from clinically insignificant IgE sensitisation', *Occupational Health Southern Africa*, 22(4), 8-14.

Sarquis, L.M. … Nyantumbu, B., 2016, 'Classification of neck/shoulder pain in epidemiological research: a comparison of personal and occupational characteristics, disability, and prognosis among 12195 workers from 18 countries', *Pain*, 157(5), 1028-36.

Stone, V., Johnston, H.J., Balharry, D., Gernand, J.M. & Gulumian, M., 2016, 'Approaches to develop alternative testing strategies to inform human health risk assessment of nanomaterials', *Risk Analysis*, 36,(8).

Tlotleng, N., Vetten, M.A., Keter, F.K., Skepu, A., Tshikhudo, R. and Gulumian, M., 2016, 'Cytotoxicity, intracellular localization and exocytosis of citrate capped and PEG functionalized gold nanoparticles in human hepatocyte and kidney cells', *Cell Biology and Toxicology*, 32(4):305-21.

Van der Walt, A., Baatjies, R., Singh, T.S. & Jeebhay, M. F., 2016, 'Environmental factors associated with baseline and serial changes in fractional exhaled nitric oxide (FeNO) in spice mill workers', *Occupational and Environmental Medicine*, 73:614-620.

Vargas-Prada, S. … Nyantumbu, B., et al. 2016, 'Descriptive epidemiology of somatising tendency', *PLOS One*, 11(4), e0153748.

Wang, H. … de Jager, P. … Murray, C.J.L., et al. 2016, 'Estimates of global, regional, and national incidence, prevalence, and mortality of HIV, 1980–2015: the Global Burden of Disease Study 2015'. *The Lancet HIV*, 3(8), e361–387.

Wang, H. … de Jager, P., et al., 2016, 'Global, regional, national, and selected subnational levels of stillbirths, neonatal, infant, and under-5 mortality, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015', *The Lancet*, 388(10053), 1725–1774.

Wang, H. … de Jager, P, et al. 2016, 'Global, regional and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015', *The Lancet*, 388(10053), 1459–1544.

Wilson, K., Jones, D., Yassi, A., Spiegel, J. & Darwin, L., 2016, 'Oral Session 28 – Healthy WorkplacesO28-1 Impact of an occupational health information system in a medical laboratory service in South Africa', *Occupational and Environmental Medicine*, 73:Suppl 1 A52.

Yassi, A., Zungu, M., Spiegel, M., Kistnasamy, B., Lockhart, K., Jones, D., 2016, 'Protecting health workers from infectious disease transmission: an exploration of a Canadian-South African partnership of partnerships', *Globalization and Health*, 12,10.

Yassi, A., Adu, P., Nophale, L. & Zungu, M., 2016, 'Learning from a cluster randomized controlled trial to improve healthcare workers' access to prevention and care for tuberculosis and HIV in Free State, South Africa: the pivotal role of information systems', *Glob Health Action*, 9, 30528.

Reports

Malotle, MM., Ntlebi, V., Phosa, R. *A Food outbreak, Kalafong provincial tertiary Hospital (KPTH) Gauteng Province*, December 2015. Report No.: 01/2016

Malotle, MM., *Workplace assessment for tuberculosis infection control, Witbank TB specialized Hospita*l. Report No.: 02/2016.

Nthoke, T., Maeteletja, T., Manganyi, J., *Occupational health and safety risk assessment at the Department of Correctional Services, Leeuwkop Management area, Kyalami,* May 2016. Report No: OH10/16.

Maeteletja, T., Renton, K., *Occupational health and safety risk assessment at the Department of Correctional Services, Baviaanspoort Management area, Pretoria*, June 2016. Report No: OH 11/16.

Maeteletja, T., Nthoke, T., Rangongo, D., Renton, K., *Indoor air quality and illumination assessment at the Department of Public Services and Administration, Pretoria*, December 2016. Report No: OH18/16.

Singo, S., Renton, K. *Occupational health and safety risk assessment at the Department of Correctional Services, Pietermaritzburg Management area, Eastern Cape,* May 2016. Report No: OH 15/16.

Rangongo, D., Mizan, G. *Occupational health and safety risk assessment at the Department of Correctional Services, Kirkwood Management area, Eastern Cape*, June 2016. Report No: OH 09/16.

Ntlailane, L., Nthoke, T. *VOC Exposure Assessment at the National Health Laboratory Service, Cytology laboratory, September 2016*. Report No: OH 12/16.

Ntlailane, L., Singo, D. *Exposure Assessment to hazardous chemical substances at the Charlotte Maxeke hospital, National Health Laboratory Service, Anatomical pathology laboratory, September 2016.* Report No: OH17/16.

Ntlailane, L., Maeteletja, T. *Noise assessment at the NHLS TB laboratory, Braamfontein, September 2016*. Report No: OH 25/16.

Ntlailane, L., Singo, D. *Occupational health risk assessment at the Analytical services north laboratories, Department of Agriculture, Forestry and Fisheries, June 2016*. Report No: 39/15.

Ntlailane, L., Rangongo, D. *Exposure Assessment to hazardous chemical substances at the Chris Hani Baragwanath hospital, National Health Laboratory Services, Anatomical pathology laboratory, June 2016.* Report No: OH22/16.

Nkosi, B. & Nyantumbu-Mkhize, B. *Ergonomic risk assessment of a senior medical technologist's job and workstation in a Histopathology Laboratory at Charlotte Maxeke Academic Hospital, National Health Laboratory Service, April 2016*. Report No: EU 01/16.

Nyantumbu, B. *A follow-up on ergonomic risk assessment conducted two ago in the Immunology and Microbiology Section at the National Institute for Occupational Health of the National Health Laboratory Service, April 2016.* Report No: EU 02/16.

Nyantumbu, B. *Supplementary report to a follow-up on ergonomic risk assessment conducted two ago in the Immunology and Microbiology Section at the National Institute for Occupational Health of the National Health Laboratory Service, June 2016.* Report No: EU 02a/16.

Nkosi, B. & Nyantumbu-Mkhize, B. *Ergonomic risk assessment of a proficiency testing scheme manager's job and workstation in a Quality Assurance Department, National Health Laboratory Service, June 2016.* Report No: EU 03/16.

Nkosi, B. & Nyantumbu-Mkhize, B. *Ergonomic risk assessment of a Quality Assurance (QA) manager's job and workstation in a QA Department, National Health Laboratory Service, July 2016.* Report No: EU 04/16.

Nyantumbu-Mkhize, B. *Ergonomic risk assessment of a the Hewlett-Packard "All in one" computer workstation in the Occupational Medicine Section, National Institute for Occupational Health, National Health Laboratory Service, August 2016.* Report No: EU 05/16.

Nyantumbu-Mkhize, B. *Ergonomic risk assessment of an open plan office in National Cancer Registry at Sandringham, April 2016.* Report No: EU 06/16.

Nkosi, B. & Nyantumbu-Mkhize, B. *Ergonomic risk assessment of four staff members' jobs and workstations in Payroll Department, National Health Laboratory Service, October 2016.* Report No: EU 07/16.

Nkosi, B. & Nyantumbu-Mkhize, B. *Ergonomic risk assessment of "All in one" computer user's workstations at the National Institute for Occupational Health, National Health Laboratory Service, December 2016.* Report No: EU 08/16.

Nyantumbu-Mkhize, B. *Ergonomic risk assessment of four hospital administration areas in Embhuleni Hospital in Baadplaas, Elukwatini, Mpumalanga Province, March 2017.* Report No: EU 09/17.

Nkosi, B. & Nyantumbu-Mkhize, B. *Ergonomic risk assessment of a medical scientist job and workstation in Occupational Hygiene Section, National Institute for Occupational Health, National Laboratory service. March 2017.* Report No: EU 10/17.

Book Chapters

Bunderson-Schelvan, M., Hamilton, R.F. Trout, K. L., Jessop, F., Gulumian, M. & Holian, A., 2016, 'Approaching a unified theory for particle-induced inflammation', in T. Otsuki, Y. Yoshioka and A. Holian (eds.), *Biological Effects of Fibrous and Particulate Substances*, pp. 51–76, Springer Japan. ISBN 978-4-431-55731-9/ISBN 978-4-431-55732-6 (eBook).

Hougaard, K.S., Campagnolo, L., Fadeel, B., Gulumian, M., Kagan, V.E., Møller, P., Jacobsen, N.R. & Savolainen, K.M., 2017, 'Developmental Toxicity of Engineered Nanomaterials', in R.C. Gupta (ed.), *Reproductive and Developmental Toxicology*, 2nd edn., pp. 333-357, Academic Press. ISBN 9780128042397.

Rees, D. & Murray, J., 2016, 'Silica', in A. Newman Taylor, P. Cullinan, P. Blanc and A. Pickering (eds), Parkes' *Occupational Lung Disorders*, 3rd edn., pp. 187-205, CRC Press. Boca Raton, Florida, USA.

Conference Presentations: Oral Presentations

International

25th EPICOH Epidemiology in Occupational Health Conference, Barcelona, Spain, 4–7 September, 2016.

Rees, D. Nyantumbu, B. & Coggon, D., 2016. Musculoskeletal disorders at baseline and after a year in South African nurses.

The 6th International Conference on Nanoscience and Nanotechnology (NanoAfrica, 2016), UNISA Science Campus, Roodepoort, Johannesburg, 3–6 April 2016

George, J. An investigation into the possible interference of gold nanoparticles in chromosome aberration assay.

Nanomaterial Safety Assessment Conference, New Tools and Approaches for Nanomaterial Safety Assessment, Malaga, Spain, 7–9 February 2017

Gulumian, M., Vetten, M., Boodhia, K. Surface ligands and functional groups on the surfaces of nanomaterials as determinants of their intracellular uptake and toxicity: A consideration for the grouping of nanomaterials.

International Nanotoxicology Congress, Boston, United States of America, 1-4 June 2016

Gulumian M. Plenary Panel Discussion to address the following questions:

- What have we learned during the last decade?
- How reliable is research on nanomaterials in biological systems?
- What should we focus on during the next decade?
- Hot topics including bioprocessing or biotransformation to understand/decipher the fate of nanomaterials in vivo.

Environmental Risk Assessment Workshop, Nairobi, Kenya, 21–23 June 2016

Gulumian, M. (in her capacity as the Vice-President of IUTOX). The importance of exposure assessment in the risk assessment process.

11th International Particle Toxicology Conference, Singapore, 26–30 September 2016

Gulumian, M. A critical look at different approaches in the grouping of nanomaterials for the purpose of hazard and risk assessment.

Gulumian, M. Half a century contribution of South African National Institute for Occupational Health (NIOH) to particle toxicology.

Masekameni, M.D., Makonese, T., Gulumian, M. Influence of combustion phases on particle emissions in a residential coal-burning brazier.

Koekemoer, L.A., Braakhuis, H., Dekkers, S., Heusinkveld, H., Fokkens, P., Boere, J., Gulumian, M., Cassee, F. A comparison of two air-liquid interface systems.

The XIV International Congress of Toxicology in Merida, Mexico, 2–6 October 2016

Gulumian, M., Vetten, M., Boodhia, K. Toxicity assessment and intracellular uptake of gold nanoparticles: effect of ligands, functional groups and cell type.

Second African Conference on Emerging Infectious Diseases and Biosecurity, Lagos, Nigeria, 27–29 July 2016

Jones, D. Using an online health information system to promote biosafety and biosecurity.

THET Partnerships for Global Health annual conference, London, United Kingdom, 2017

Zungu, LM. Building a north-south-south community of practice to improve working conditions for health workers.

Conference Presentations: Oral Presentations

National

Mine Health and Safety Council Occupational Health Dialogue: *Occupational Health Beyond Compliance*. Cedar Park Hotel and Conference Centre, 30–31 March 2017.

Nyantumbu-Mkhize B. Ergonomics, musculoskeletal disorders and draft ergonomic regulations.

Occupational Health and Safety Mining Conference, Emperors Palace Hotel, 9–10 March 2017

Madzivhandila T. Characterisation of respirable crystalline silica in the selected abandoned mines around Roodepoort, Johannesburg, South Africa.

The 1st SA Nano Malaria Symposium, SAASTA auditorium, Pretoria, 26 April 2016

Gulumian M. Nanotechnology, Nanotoxicology and Nanomedicine: Friends, not foes.

DST-NRF Nanotechnology Symposium: Realising the Potential of Nanotechnology in South Africa, CSIR International Convention Centre, Pretoria, 27–28 June 2016 (plenary presentation)

Gulumian M. The role of health risk assessment in the advancement of nanotechnology in South Africa.

National Women's Day, NIOH, 11 August 2016 (a series of commemorative lectures)

Gulumian M. Women, new technologies and occupational health and safety.

All Africa Congress on Pharmacology and Pharmacy, Muldersdrift, Gauteng, South Africa, 5–8 October, 2016

Andraos C., Utembe W., Gulumian M. Mechanisms of interference of gold nanoparticles with a conventional assay system.

Potgieter K., Boodhia K., Meijboom R., Gulumian M. Dissolution kinetics of naked and surface modified CuO and Au nanoparticles exposed to simulated lung fluid, assessed with a static system.

Koekemoer L.A., Blum J., Hoffman-Budd C., Borbet T., Zelikoff J., Gulumian M. Exposure of pregnant mice to gold nanoparticles (AuNP): Effects on mother and offspring.

PhD Symposium, School of Public Health, University of Witwatersrand, Johannesburg, 28 November 2016

Utembe W. Health risk assessment of lead exposure among children in Blantyre, Malawi.

Utembe W. A policy brief entitled 'Exposure to lead among children in Blantyre: The extent of the problem and proposed reduction measures'.

SASOM Congress, Kopanong Hotel and Conference Centre, Benoni, .10–11 June 2016

Kgalamono S. An update on the diagnosis and management of occupational asthma.

Department of Labour, Hazardous Biological Agents (HBAs) seminar, Port Elizabeth, Eastern Cape, 20 September 2016.

Matuka DO. Cross contamination and infection control.

SAIOH Conference, Mpumalanga, 26–28 October 2016

Maeteletja T. Particulate matter exposure and respiratory symptoms in waste reclaimers at a landfill site.

Mizan GE. Reproductive health in laboratory work.

Asbestos Dialogue, Limpopo, 23–24 March 2017

Mizan GE. NIOH asbestos surveys.

Occupational Health and Safety in Mining Conference, Emperors Palace, 9–10 March 2017

Madzivhandila T. Characterisation of respirable crystalline silica in the selected abandoned mines around Roodepoort, Johannesburg, South Africa.

Conference Presentations: Poster Presentations

International

8th Nanotoxicology Congress, Boston, USA, 1–4 June 2016

Utembe W., Gulumian M. Dissolution of nanoparticles and the dose at target sites: An analysis of the impact and treatment of dissolution in dosimetry models.

11th International Particle Toxicology Conference, Singapore, 26–30 September 2016

Kariska P., Boodhia K., Meijboom R., Gulumian M. Dissolution kinetics of naked and surface modified CuO and Au nanoparticles exposed to simulated lung fluid, assessed with a static system.

Masekameni M.D., Makonese T., Gulumian M. Influence of combustion phases on gaseous and particle emissions In a residential coal-burning brazier.

14th International Congress of Toxicology, Merida, Mexico, 2–6 October 2016

Andraos C., Utembe W., Dekker K., Steyn H., Gulumian M. Possible non-cancer and cancer risk of communities surrounding gold mine tailings storage facilities in Gauteng and North-West due to silica dust inhalation.

Nanomaterial Safety Assessment Conference New Tools and Approaches for Nanomaterial Safety Assessment, Malaga, Spain, 7–9 February 2017

Boodhia K., Gulumian M. The influence of surface functionalization on the toxicity and intracellular uptake of gold nanoparticles of different sizes.

Conference Presentations: Poster Presentations

National

All Africa Congress on Pharmacology and Pharmacy, Misty Hills Hotel and Conference Centre, Muldersdrift, South Africa, 5–8 October 2016

George J.M., Magogotya M., Vetten M., Buys A.V., Gulumian M. An investigation of the genotoxicity and interference of gold nanoparticles in commonly used in vitro mutagenicity and genotoxicity assays.

Sanabria N.M., Vetten M., Vorster G., Gulumian M. Gold nanoparticles interference in RT-qPCR assay used to quantify Caspase.

Mahlake T., Sanabria N.A., Boodhia K., Gulumian M. Interference of gold nanoparticles with BCA assay.

Boodhia K. The influence of surface functionalization on the toxicity and intracellular uptake of gold nanoparticles of different sizes.

Koekemoer L.A., Blum J., Hoffman-Budd C., Borbet T., Zelikoff J., Gulumian M. Exposure of pregnant mice to gold nanoparticles (AuNP): Effects on mother and offspring.

PHASA Congress, East London, South Africa, 19–22 September 2016

Funcuza M., Masekameni D., Makonese T., Gulumian M., Maseki J. Size distribution of ultrafine particles from domestic coal combustion.

NACA, Nelspruit, Mpumalanga, 6–7 October 2016

Makonese T., Masekameni D., Gulumian M., Maseki J. Size distribution of ultrafine particles from domestic coal combustion.

Catalysis Society of South Africa, Champagne Valley, Central Drakensberg, KwaZulu-Natal, South Africa, 6– 9 November 2016

Potgieter K., Boodhia K., Meijboom R., Gulumian M. Dissolution kinetics of naked and surface modified CuO and Au nanoparticles exposed to simulated lung fluid.

25th Annual Congress Allergy Society of South Africa, Century City Conference Centre, Cape Town, 15–18 September 2016

Ratshikhopha M.E., Singh T.S. Sensitisation profiles of workers tested with bakery flour allergens.

Fourie A., Carman H., Singh T.S. Occupational contact urticarial.

SAIOH Conference, Mpumalanga, 27 October 2016 Keynote Address Singh TS. Hazardous biological agents: current and future trends

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