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NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service

OccuZone

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IN THIS ISSUE

MESSAGE FROM THE CHIEF EDITOR

I am delighted to bring you the second issue of NIOH OccuZone. I would like to thank everyone for the enthusiasm generated by the inaugural issue of the NIOH OccuZone newsletter. We are particularly grateful to those whose contributions made the initial issue a success. The numerous positive comments and feedback we have received regarding the design and content has heartened us further to be steadfast in our mission to keeping you up to date with the latest developments of the institute.

In this issue, we will recount the various projects and activities in which the NIOH staff were actively involved in the second quarter of this financial year. Firstly, we highlight our research activities with a special focus on the informal economy, as there is a great need for research to understand the risks and assess interventions aimed at improving the health and safety of workers in this sector. Furthermore, we showcase the scientific papers produced by our researchers, which contribute to the body of knowledge in OHS and profile one of our emerging researchers. Secondly, we look at one of the essential functions of the NIOH - surveillance of occupational exposures and health outcomes. Lastly, we have selected three specialised services and new advances that the institute prides itself in, upcoming teaching and training events as well as showcasing the institute's achievements during the second quarter.

A heartfelt thank you to the editorial team and to all the staff who contributed toward writing the informative content found within this issue.

As we approach the end of the year and the festive season, I wish our readers a safe and enjoyable festive season and I look forward to an exciting new year where we can share with all of you more news and activities related to the Institute.

To subscribe please send an email to:
newsletter@nioh.ac.za

Happy reading!

Chief Editor
Angel Mzoneli

Research

Message from the Research Committee Chair

In this 2nd edition we focus on the informal economy as more than 60% of the world's population is in the informal economy. Approximately 90% of the world's informal employment is in the emerging and developing countries, and the total number of vulnerable workers is estimated around 2 billion. The majority of workers are vulnerable and carry the largest work-related disease burden. The 60th World Health Assembly mandated the World Health Organizarion (WHO) through the Global Plan of Action on Workers' Health (WHA60.29) to provide basic occupational health services to workers in the informal economy. Given WHO's unique mandate, reach, and convening power, it's ideally placed to advance the global health agenda for workers in the informal economy.

The NIOH is a coordinating centre for the WHO global master plan project on "workers in vulnerable situations: informal economy workers". The collaboration with WHO and its occupational health network, is to strengthen the evidence base on health outcomes and intervention effectiveness; prepare a collection of case studies, policies and best practices as well as a set of strategic and policy options to be used by ministries

Dr. Tanusha Singh

RESEARCH FOCUS

In South Africa, workplace contribution to ill-health is mostly unmeasured therefore, there is a need for research to understand the risks and assess interventions aimed at improving the health and safety of workers in the informal economy. The Institute's role in research in this sphere is to strengthen the global evidence on health outcomes and health service use of informal economy in collaboration with WHO. It is also engaged in sector specific projects in the informal economy such as farm workers, golf caddy workers, street hawkers, street waste pickers and landfill waste reclaimers. Here we provide a summary of one such project. We look forward to engage with you on collaborative ideas on strengthening occupational health and safety in the informal economy.

Respirable dust exposures and respiratory symptoms in informal waste reclaimers at a South African landfill site

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Note: This research is undergoing peer review process

Informal waste reclaimers are a common sight in most cities and municipal landfill sites globally. They experience various health hazards as they sought income from reclaiming. The burden of disease that may be associated with reclaiming activities remains a concern. This study aimed to quantify respirable dust exposure of informal waste reclaimers in relation to respiratory symptoms.

Personal respirable dust levels were measured over nine days in April 2016 after summer rainfalls. 62 personal respirable dust samples that were collected were gravimetrically weighed and quantified for respirable crystalline silica (RCS) following MDHS 101/2 method. A modified European Community Respiratory Health Survey questionnaire was completed by 53 participants through interviews in English or Sepedi. Soil samples representative of the landfill activity areas were collected for characterization.

The geometric mean for personal dust concentration (eight hour time weighted average) was 0.44 mg/m3 for respirable dust. Nine personal samples had detectable levels of RCS, with one sample exceeding the South African exposure limit of 0.1mg/m3. Chemical composition of the soil samples contained silica across the landfill. Highest silica composition was observed in the waste offloading area, where reclaimers conduct their activities. Logistic regression analysis of symptoms reported using the questionnaire interviews indicated that the number of working years at the landfill significantly decreased the likelihood of coughing (OR: 0.87; 95%CI: 0.78-0.98) (unadjusted). This was an unexpected outcome. Men were more likely to experience chronic cough (OR: 3.42; 95%CI: 0.98-11.96) (unadjusted). Personal respirable dust levels and respiratory symptoms were not associated. RCS exposure levels is a concern due to its association with increased risk for silicosis. Seasonal variation should be assessed in further studies to compare the levels of exposure.

PUBLICATIONS

Title: A case-control study of night shift work and breast cancer in black women in a large academic referral hospital in Johannesburg, South Africa

Author(s): O.N Volmink, S. Kgalamono, E. Singh, F. Made, D. Rees

Source: Occupational Health Southern Africa Vol 25 No 4; July/August 2019

Abstract: The breast is the most common cancer site among South African women. Shift work has been classified as a probable breast carcinogen.

Objective: We examined the association between the likelihood of night shift work and breast cancer in black women older than 35 years, attending a large academic referral hospital in Johannesburg.

Methods: An unmatched case-control study was undertaken, using secondary data from the Johannesburg Cancer Case- Control Study (JCCS). Women recruited from 2001 to 2009 were included. An expert panel classified the likelihood of night shift work for the occupations in the JCCS database into high probability of night shift work, possibility of night shift work, and unlikelihood of night shift work. Logistic regression analysis was used to assess the associations between night shift work and breast cancer.

Results: There were 1 418 cases with breast cancer and 2 733 controls. Univariate analyses showed significant associations between the possibility and high probability of doing night shift work and breast cancer: OR 1.66 (95% CI: 1.41-1.97) and OR 1.76 (95% CI: 1.44-2.15), respectively. The significant positive associations remained after adjusting for confounders: OR 1.54 (95% CI: 1.29-1.85) for the possibility of night shift work, and OR 1.56 (95% CI: 1.26-1.92) for high probability.

Conclusion: Associations between the likelihood of night shift work and breast cancer were found, but the crude measure of night shift work means that the associations may be spurious. There is a need for more rigorous methodology to measure night shift work and its association with breast cancer in this population.

Title: Factors associated with multisite musculoskeletal pain in nurses and bank workers in South Africa

Author(s): F. Made

Source: Occupational Health Southern Africa Vol 25 No 4; July/August 2019

Abstract: Work-related multisite musculoskeletal pain (MSP) results in reduced work productivity and disability. The multi-country Cultural and Psychosocial Influences on Disability (CUPID) study investigates common risk factors associated with musculoskeletal symptoms in workers performing jobs with different physical stressors.

Background: Work-related multisite musculoskeletal pain (MSP) results in reduced work productivity and disability. The multi-country Cultural and Psychosocial Influences on Disability (CUPID) study investigates common risk factors associated with musculoskeletal symptoms in workers performing jobs with different physical stressors.

Objective: To compare risk factors of multisite MSP in nurses and bank workers.

Methods: Data obtained from South Africa for the CUPID study (251 nurses and 236 bank workers) were used in this crosssectional study of multisite MSP. Logistic regression modelling was used to identify factors (sociodemographic factors, physical loading at work and psychosocial factors) associated with multisite MSP in nurses and bank workers.

Results: The prevalence of multisite MSP was 61.0% and 59.3% in nurses and bank workers, respectively. Somatic symptoms of distress, job dissatisfaction and past injuries were significantly associated with multisite MSP in nurses (AOR = 2.83, 95% CI 1.24-4.07; AOR = 1.96, 95% CI: 1.04-3.69 and AOR = 2.42, 95% CI: 1.15-5.07, respectively) and bank workers (AOR = 4.56, 95% CI: 2.22-9.36; AOR = 2.34, 95% CI: 1.14-4.15 and AOR = 3.26, 95% CI: 1.67-7.71, respectively). Among nurses, age (AOR = 1.40, 95% CI: 1.03-1.88), having a frightening experience (AOR = 2.25, 95% CI: 1.24-4.07), and adverse health beliefs (AOR = 1.33, 95% CI: 1.09-1.61) were also significantly associated with multisite MSP. In bank workers, financial difficulties (AOR = 2.05, 95% CI: 1.04-4.04), being female (AOR = 1.84, 95% CI: 0.98-3.45), and having a secondary school education (AOR = 2.00, 95% CI: 1.08-3.70) were significantly associated with multisite MSP.

Conclusion: Despite differences in work activities, multisite MSP was similarly high in nurses and bank workers. Psychosocial factors were significantly associated with MSP in both groups. Differences in risk factors by occupation should be considered when designing interventions such as education and counselling to reduce the occurrence of multisite MSP.

Keywords: CUPID study; MSP; psychosocial factors, physical loading at work

Title: Regulatory control and management of public health pesticides in South Africa

Author(s): W. Utembe

Source: Outlooks on Pest Management- August 2019

Abstract: Pesticides used in residential settings may have harmful health effects. There are reports about pesticide poisoning in South Africa, especially among children under the age of five years. The Department of Agriculture, Forestry and Fisheries and the Department of Health use the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36) to ensure that pesticides are only registered after a rigorous science-based risk assessment. The Act 36 was designed primarily for agricultural pesticides. Therefore, guidelines have recently been developed to facilitate registration of PHPs. However, these guidelines do not provide guidance on acceptable methods for estimating residential exposures. Furthermore, inadequate monitoring and regulation of pesticides have resulted in the use of highly toxic pesticides in residential and commercial settings. Responsible government agencies and independent poisoning information centres (PICs) lack the capacity routinely to report and investigate all pesticide-poisoning incidents adequately and comprehensively. Therefore, there is need to strengthen the capacity of responsible agencies as well as to conduct a revision of Act 36 in order to address critical gaps with regards to the registration, monitoring and surveillance of PHPs.

Keywords: public health pesticides; exposure; vector control; pesticide poisoning; pesticide registration

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Title: Effectiveness of N95 respirators for nanoparticle exposure control (2000-2016): a systematic review and meta-analysis

Author(s): L. Ntlailane and J. Wichmann

Source: Journal of Nanoparticle Research. August 2019, 21:170

Abstract: Workers are increasingly exposed to nanoparticles, mostly via inhalation. Respiratory protection is recommended as an additional control measure. Particulate respirators are certified for protection against micro-sized particles, where a most penetrating particle size (MPPS) of 100–400 nm is assumed. Commonly used N95 respirators are certified by the National Institute for Occupational Safety and Health after passing a 95% collection efficiency test. Electret media used in respirators have been demonstrated to be shifting the MPPS to a nanosized region. Experimental studies have therefore been conducted to assess N95 respirator penetration specifically by nanoparticles. This systematic review and meta-analysis was aimed at systematically reviewing these studies and meta-analysing the mean penetration percentage (PP). The review was conducted following a Preferred Reporting Items for Systematic Reviews and Meta-Analyses guideline. Fourteen studies were selected to be reviewed qualitatively, while 13 of these with 29 data points were included in the meta-analysis. Sensitivity analysis was performed based on a respirator mounting protocol, while subgroup analysis was done for aerosol dispersity and repeated for the respirator mounting protocol. The size range of particles used across the reviewed studies was 1 nm–10 µm. The MPPS for all studies was in the nanosized particle range, with the lowest at approximately 39 nm. The estimated mean PP was between 1 and 6%, exceeding the 5% guideline threshold for four of the studies. All the meta-analysed mean PPs were however below the 5% guideline. This means that the N95 respirators may be effective for nanoparticles in workplaces, but subject to factors including respirator characteristics and particle dispersity.

Keywords: nanoparticles; N95 respirator; effectiveness; penetration; exposure control; protection; environmental health and safety issues

Title: Common mental health disorders among informal waste pickers in Johannesburg, SA 2018 – A cross-sectional study

Author(s): **M. Makhubele**, K. Ravhuhali, L. Kuonza, A. Mathee, S. Kgalamono et al.

Source: International Journal of Environmental Research and Public Health 2019, 16, 2618

Abstract: Waste-picking is an income-generating opportunity for individuals living in poverty. Waste picking is associated with a range of risk factors for common mental disorders (CMD). This study aimed to determine the prevalence and factors associated with CMD among waste pickers in Johannesburg.

A cross-sectional study analyzed secondary data for 365 waste pickers. A validated Self-Reporting Questionnaire (SRQ-20) was used to assess CMD. Multivariable logistic regression was fitted to identify factors associated with CMD. The overall prevalence of CMD among waste pickers was 37.3%. The odds of having CMD were 2.5 and 3.2 higher in females and cigarette smokers, respectively (p = 0.019 and p = 0.003). Life enjoyment (Adjusted odds ratio [aOR] 0.54, p = 0.02) and a good quality of life (aOR 0.34, p _ 0.001) were associated with lower odds of CMD. The high prevalence of CMD among waste pickers was significantly associated with cigarette smoking, being female, not enjoying life, and a poor quality of life. Mental health awareness of CMD will assist with the prevention, early detection, and comprehensive management of CMD among waste pickers.

Keywords: common mental disorders; waste pickers; landfill sites

Title: Eco-friendly synthesis of Glutathione-Capped CdTe/CdSe/ZnSe Core/ Double shell quantum dots: Its cytotoxicity and genotoxicity effects on Chinese hamster ovary cells

Author(s): N.M. Monaheng, S. Parani, **M. Gulumian**, O.S. Oluwafemi

Source: Toxicology Research (2019), DOI: 10.1039/C9TX00113A

Abstract: In this work, we report green one-pot synthesis, cytotoxicity and genotoxicity of glutathione capped CdTe/CdSe/ZnSe heterostructured quantum dots (QDs) using label-free xCELLigence RTCA system as well as Cytokinesis Blocked Micronucleus assay. The as-synthesised nanocrystals displayed good optical properties and were spherical in shape with average particle diameter of 5.9 ± 1.13 nm. The intracellular uptake study showed that most of the as-synthesised glutathione stabilized QDs penetrated the cell membranes and were found randomly localized in the cytoplasm of Chinese Hamster Ovary (CHO) cells even at lower concentration of 0.5 µg/ml. The QDs showed no cytotoxicity to Chinese Hamster Ovary (CHO) cells at six concentrations tested (0.5, 1.0, 2.5, 5.0, 10, 25 µg/ml). However, at 50 and 100 µg/ml the material was cytotoxic at significant p values of 3.1E-4 and 9.47E-10, respectively. Likewise, the material was found to be genotoxic at almost all concentrations tested. The genotoxicity of the nanocrystals in question confer an unfavorable potential on all complex heterostructured nanocrystals. Hence, more studies are needed to negate the prevailing assumption that multishell passivation provides enough protection against intracellular QDs core dissolution or the production of reactive oxygen species (ROS) before these nanomaterials can be used in-vivo for human health applications.

Title: Evaluation of phytochemicals, antioxidants, trace elements in Kigelia Africana fruit extracts and chemical profiling analysis using UHPLC-qTOF-MS2 Spectrometry

Author(s): O.F. Fagbohun, O.O. Babalola, **J.S. Joseph**, S. Malindisa, T.A.M. Msagati

Source: Biological Trace Element Research (2019). https://doi.org/10.1007/s12011-019-01869-2

Abstract: The study aimed at evaluating the phytochemical composition, antioxidant potentials and the levels of trace elements in the fruit extract of Kigelia africana obtained by different extraction solvents in order to ascertain its numerous pharmacological activities and identify the different chemical compounds responsible for these activities. The crude extract in ethanol and four other solvent fractions (hexane, ethylacetate, butanol and aqueous) were obtained for phytochemical screening. Antioxidant potentials of K. africana fruit were investigated spectrophotometrically using hydroxyl ion scavenging (OH–) activity, metal ion chelating activity, anti-lipid peroxidation activity as well as total antioxidant capacity assays. Trace element (Mn, Zn, Cd, Ni, Cu, Pb, Cr, Co and Fe) levels were measured using a plasma-emission spectrometer that has an auto sampler AS 93-plus and coupled with Nebulizer CETAC U-6000AT+ after microwave acid digestion of the fruit extracts.

Chemical identification was performed using ultra-highpressure liquid chromatography-quadrupole time-of-flight tandem mass spectrometry (UHPLC-qTOF-MS2). Kigelia africana fruit extracts obtained showed a variety of bioactive phytochemical compounds including phenolic acids, flavonoids, saponins, tannins and glycosides. The total antioxidant capacity activities of the aqueous, butanol, ethanol, hexane and ethylacetate extracts are 15.04, 52.11, 44.95, 79.27 and 175.20 mg AAE/g. Metal ion chelating activity showed significant correlation with lipid peroxidation inhibition activity at $p \leq 0.01$ and with OH– scavenging activity at $p \leq 0.05$. PCA analysis revealed that all the extract/fractions have higher total antioxidant activities compared to aqueous extract with hexane extract exhibiting the highest radical scavenging potential.

HCA showed similarities with three well-defined clusters and PLS regression was used to predict total antioxidant activity. High sensitivity by low values of limits of detection and quantification was observed ranging from 0.021 to 0.085 mg/ml and 0.063 to 0.258mg/ml for Zn and Fe respectively. Ethylacetate extract had high concentration of Fe (0.5656 mg/kg). For the standardization of the K. africana fruit extract, 244 chemical compounds were identified by measuring m/z values with threshold override of 100,000 and analysing mass spectrometer fragmentation behaviour while 16 of these were confirmed. Kigelia africana fruit extract is a good source of antioxidant and possess maximum accepted concentration of trace elements according to European legislation (1881/2006/EC). The metabolites identified exhibited numerous pharmacological activities. The method and results suggest the applicability for commercial use of this K. africana fruit in the treatment of oxidative-related diseases.

Keywords: Free radicals; Phytochemicals; Antioxidant; Kigelia Africana; Trace elements; Reactive oxygen species; ICP-OES, UHPLC-qTOF-MS2

Title: The effect on fit of multiple consecutive donning and doffing of N95 filtering facepiece respirators

Author(s): C.D. Vuma, J. Manganyi, K. Wilson and D. Rees

Source: Annals of Work Exposures and Health, 2019, 1-7. DOI: 10.1093/annweh/wxz060

Abstract: N95 filtering facepiece respirators (FFRs) are widely used in healthcare to reduce transmission of airborne infectious diseases. These respirators are generally described as single use or limited reuse devices, but cost and operational issues mean that they may be donned and doffed multiple times. There is scant research on the effect of this practice on adequacy of fit.

Objective: The purpose of this study was to measure the effect on respirator fit of multiple donning and doffing of N95 FFRs.

Methods: This was an experiment in which 16 women and 9 men employed by the National Institute for Occupational Health (NIOH), Johannesburg, donned their same N95 FFR six times. All 25 were trained in the correct wearing of the devices before the experiment. Four models of respirators were used: the six who did not use respirators at work (novice subjects) were issued a 3M 1860 FFR and the others used their currently supplied one. During the experiment subjects donned their respirators under the supervision of the tester. Quantitative fit testing was done in the NIOH Occupational Hygiene laboratory after each donning according to the OSHA-Accepted Fit Test Protocol using the TSI PortaCount Pro+ Model 8038 Respirator Fit Tester. During the test, fit was measured after each of seven exercises and then an overall fit factor was computed. Only individuals who achieved an initial overall fit factor of ≥100 were allowed to continue participation in the study. Median overall fit factors were calculated for the 25 subjects for each donning and changes across them was examined using Wilcoxon rank sum tests. Men and women and frequent and infrequent users were compared across the six tests. Infrequent use was defined as subjects who wore respirators ≤ once per week, and novice subjects.

Results: Two subjects (8%) had an overall fit factor <100 at fit Test 2, 6 (24%) at Test 3, and 8 (32%) at Tests 4, 5, and 6. Thirteen respirator users (52%) achieved ≥100 throughout the fit testing, so 12 had at least one failure at either Tests 2–6. Five of the 12 subjects with at least one failure showed persistent failures on all subsequent donnings. Six subjects out of 12 (50%) who failed a fit test achieved an overall fit factor >100 at a subsequent test. There was a significant difference between the median first and sixth overall fit factors (195 versus 150; P = 0.0271), but not between the second and sixth (161 versus 150; P = 0.3584). Men and women had similar overall fit factors, but infrequent users had larger average overall fit factors than frequent users after all six donnings.

Conclusion: Forty-eight percent of study subjects failed at least one fit test after re-donning an N95 FFR. The fit test data suggest that donning practices probably accounted for the fit test failures. The 50% of subjects who produced overall fit factors ≥100 after a test of <100 supports this contention.

Keywords: filtering facepiece respirator; overall fit factor; respirator fit; respirator re-donning

Title: A study protocol to determine the association between lifetime lead exposure and violent criminal behaviour in young males in conflict with the law.

Author(s): TP. Mbonane, A. Mathee, A. Swart, **N. Naicker**

Source: BMC Public Health (2019) 19:932. https://doi.org/10.1186/s1288

Background: Low-level lead exposure has harmful and persistent effects on behaviour. Recent studies have linked environmental lead exposure and the development of aggressive, violent and criminal behaviour. This protocol is designed to study an association between lifetime (bone) lead levels and violent criminal behaviour among young males in conflict with the law in Gauteng youth development centres.

Methods: This paper describes a study to determine a link between lifetime lead exposure and violent criminal behaviour. Lifetime lead exposure will be measured using bone lead measurement, while blood lead levels will be observed for current exposure. Thereafter, criminal records of participants will be reviewed whereas violent behaviour and risk factors will be observed using a questionnaire. The study focused on young males in conflict with the law in three centres within Gauteng Provence, South Africa. After stratifying the centres, we randomly selected participants.

The researcher shall adhere to ethical requirements throughout the study. Data will be analysed for descriptive and inferential analysis using Statistical Package for Social Science (SPSS).

Discussion: The study will provide a strong foundation for an improved understanding of the relationship between environmental contamination from lead exposure and aggression/violent criminal behaviour. Beyond the health sector, the study findings may be able to inform new approaches to crime prevention through environmental action with an emphasis on the role of non-health sectors.

Keywords: Bone, Blood, Lifetime, Lead exposure, Violent, Criminal, Behaviour, X-ray fluorescence, Environmental health

IN THE SPOTLIGHT

Millicent Magogotya, Biotechnologist

Why did you choose this career and research path?
I have opted to study Biotechnology because it is a growing field in the developing world of molecular biology and microorganisms to execute specific industrial procedures. It also entails biological sciences used to study the relation between workers and their environments. Since it is diverse, it will give me an opportunity to explore various branches within its scope. Nanotechnology is a fast growing technology in many bio-applications. Since it is used in cosmetics and other occupational settings like nanoparticle manufacturing and painting, the toxicity of engineered nanomaterials must be assessed since, their long and short-term health effects are not well known.

What training and qualifications did you undergo and where?
I studied ND. Biotechnology through the University of Johannesburg and obtained a BTech degree from Tshwane University of Technology. I am currently finalizing my MTech in Biotechnology.

What are the most enjoyable aspects of doing research?
The most enjoyable thing in research is being a pioneer in studies or investigations never published or conducted before and obtaining interesting results.

What are your research highlights to date?
Conducting research on human cell lines and assessing toxicity of gold nanoparticles. I also contributed to teaching and training new scientists and intern students. And, presenting research outcomes within the science community.

What are your career goals?
For my career to contribute to sustainable development by advancing within the Toxicology department to a senior position and pursuing a PhD study. My other goal is to impart my knowledge.

Surveillance

Occupational health surveillance data provides vital information on the prevalence possible associated risk factors. It allows trends to be determined and prevention programmes to be monitored and evaluated. Thus surveillance of occupational exposures and health outcomes is an essential function of the NIOH. In this issue the trends in respiratory allergies and affected industries over the last five years are presented.

Respiratory Allergy surveillance 2014-2018: Occupational Respiratory Allergy Unit (OAU)

Surveillance of occupational allergies is crucial to assess the nature, extent and distribution of allergens and respiratory diseases in occupational settings. Knowledge and awareness of occupational allergies are lacking in the primary health care setting. Thus, a specialised occupational allergy service is vital for the prevention and early treatment of morbidity related to occupational exposures.

This surveillance programme describes the demographic, occupational and respiratory health of patients attending the Occupational Allergy Unit (OAU) of the Immunology & Microbiology Section at the National Institute for Occupational Health (NIOH). The report presents data over a 5-year period.

From 2014 to 2018, 1296 patients were screened for respiratory allergens. Workers were predominantly employed in the mining industry (65%), followed by manufacturing (15%) and healthcare and research (6%) industries (Figure 1). Overall, approximately 54% of aeroallergen tests were positive (219/419). The most prevalent occupational allergens were food-related: rye, rice, corn and wheat (Figure 2). Atopic patients decreased from 39% in 2014 to 20% in 2018 (Figure 3). The prevalence of atopic workers was highest in the food industry, followed by mining and health care and research (Figure 4).

The results from this study show that despite some limitations, surveillance on allergy clinic data can provide useful information linking industries and allergens. In addition, surveillance of sensitised workers can assist in the early detection of occupational allergies. Thus workers in the food may benefit from targeted prevention strategies.

To strengthen the respiratory allergy surveillance programme and provide a comprehensive picture for South Africa, additional data is needed from other allergy centres throughout the country.

Interested investigators will be able to access the OAU clinic surveillance reports at http://www.nioh.ac.za.

For further information regarding the clinics please contact Dr Tanusha Singh at TanushaS@nioh.ac.za.

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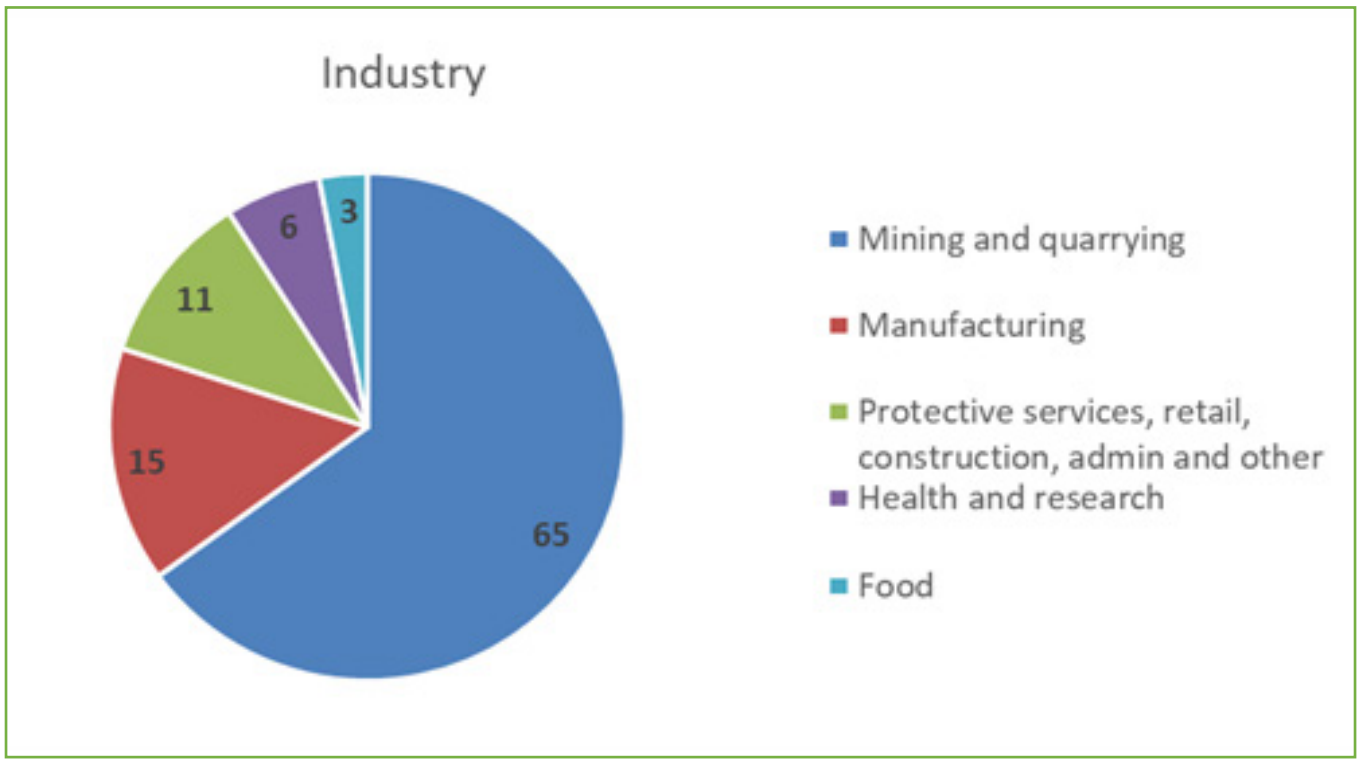

Figure 1: Industries represented in the OAU.

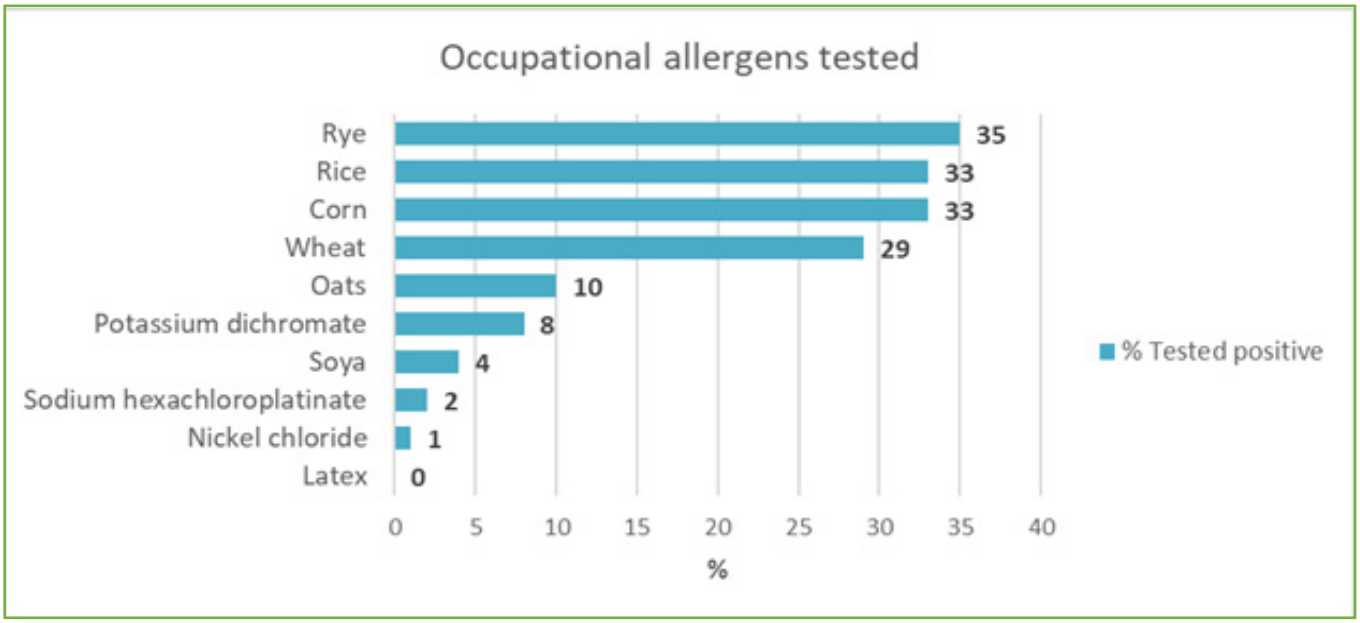

Figure 2: Percentage of workers that tested positive for occupational allergens

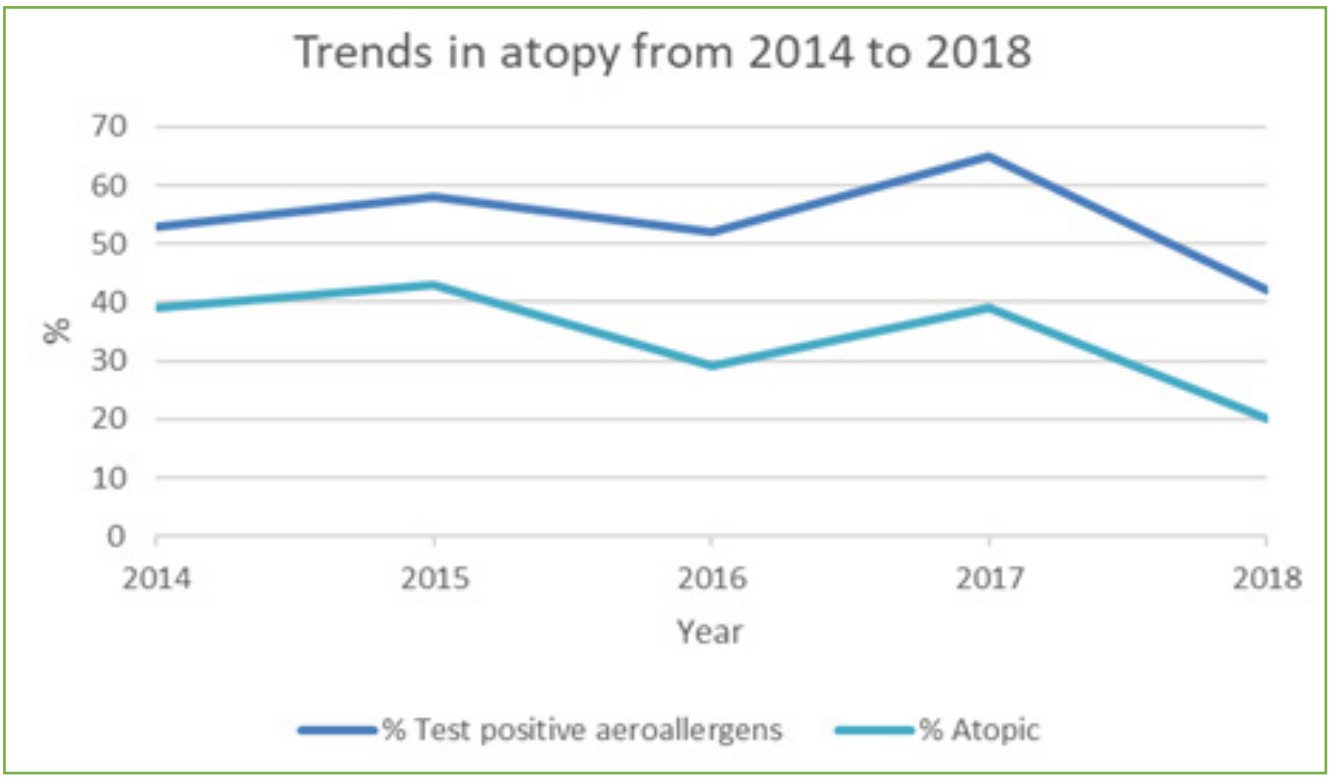

Figure 3: Trends in atopy from 2014 to 2018

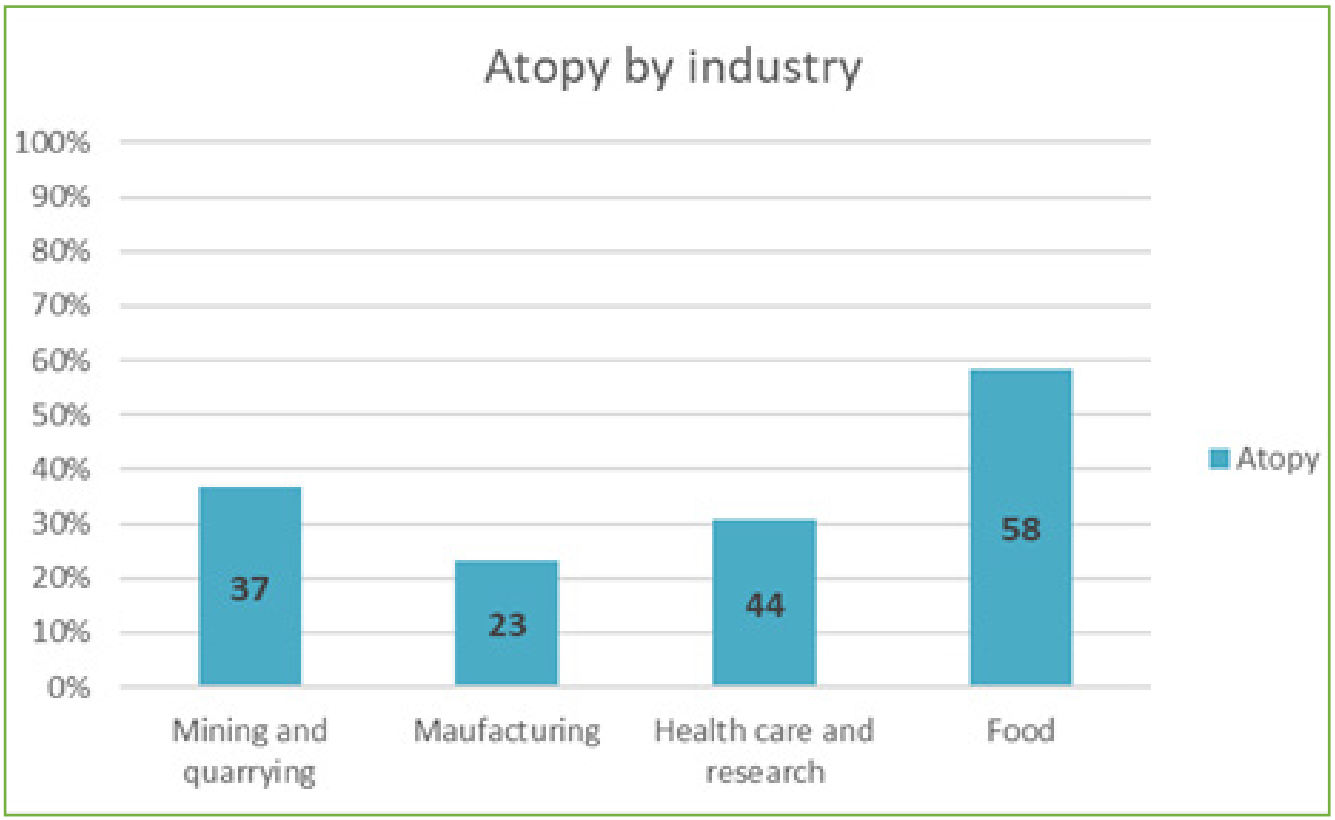

Figure 4: Atopy by industry

For more information on Occupational Health Surveillance at the NIOH please contact the Epidemiology and Surveillance Section: 011 712 6472 | NishaN@nioh.ac.za

Specialised Services

The NIOH provides specialised, cost effective occupational health and safety services to national and provincial government departments, various industries and trade unions as well as support for occupational health and safety within the NHLS. In this issue, our .service delivery highlights focus on *The complexities around Occupational Allergies*; *Conducting exposure assessment in a workplace with unusual work schedules*; **and** *The importance of the Biobank*.

THE COMPLEXITIES AROUND OCCUPATIONAL ALLERGIES (OA)

Many workers, across almost every industrial sector are potentially exposed to agents that can cause allergic diseases such as asthma, allergic contact dermatitis (ACD), urticaria, allergic rhinitis, hypersensitivity pneumonitis, and folliculitis. Occupational exposures are responsible for approximately 9-25% of all adult onset asthma cases and ACD represents approximately 20% of all work-related skin disorders. These agents are capable of inducing immune responses that are Immunologlobulin E (IgE), non-IgE mediated and IgG mediated. Identifying causative agents in cases of OA is of importance, both for the worker and for the workplace, in order to control exposure for these agents and to reduce OA disease. Workers can also develop different allergic reactions to different substances in the workplace. It is therefore important to ensure that possible mechanisms of action are identified and tested.

An example of an agent which can activate both IgE and cell-mediated responses and which is found commonly in different products is formaldehyde. Formaldehyde is found in metalworking fluids, embalming fluid & tissue fixatives, in many cosmetic products such as soaps, shampoos, hair dye, mouthwashes and in many other products including paints, detergents, disinfectants, etc. Exposure can thus occur in varied workplaces. The appropriate test for identifying an OA to this chemical will depend on the type of reaction that occurs. If the worker develops a respiratory or an urticarial reaction, tests for IgE mediated responses should be done. If, on the other hand, the worker has skin reactions such as contact dermatitis patch testing is recommended.

Another example, illustrating different allergic reactions to different allergens in the workplace is shown in a health worker who developed an IgE reaction to latex which resulted in respiratory symptoms but also a contact dermatitis resulting from a cell-mediated reaction to thiuram (rubber chemical), nickel, balsam of Peru (in soaps & cosmetics) and colophony (in glues –plasters). In addition, she was also atopic – (identified by skin prick testing). To identify all the possible reactions, it was important to take a comprehensive medical and exposure history to identify the appropriate allergen panel for testing and for the holistic management of worker.

The Immunology & Microbiology Section offers testing for both respiratory and skin allergens as indicated above and many other commercial agents. The laboratory can also test with certain workplace specific agents that the worker may be exposed to.

For more information regarding these services please contact :
Ms Anna Fourie (Occupational Allergy):
011 712 6424 | AnnaF@nioh.ac.za
Ms Edith Ratshikhopha (Respiratory Allergy):
011 712 6538 | EdithR@nioh.ac.za

Patient undergoing patch-testing

OCCUPATIONAL HYGIENE IN CORRECTIONAL CENTRES: CONDUCTING EXPOSURE ASSESSMENT IN A WORKPLACE WITH UNUSUAL WORK SCHEDULES

South Africa has about 240 correctional centres throughout the country, accommodating about 160 665 inmates. These correctional centres have programmes in place aimed towards the training and education of inmates on specific skills and knowledge such as welding, apprenticeship, textiles, furniture making, cooking/baking and agriculture, among others, which form an integral part of inmates' rehabilitation. Some of the correctional officials and inmates are involved in performing various tasks that could expose them to occupational health hazards including physical, chemical, ergonomic and biological hazards.

The Occupational Hygiene Section of the National Institute for Occupational Health (NIOH) had an opportunity to conduct quantitative exposure assessments in some of the correctional centres around the country, focusing on quantifying occupational exposures associated with production activities, routine tasks and maintenance activities. The correctional environment was found to be unique in terms of the application of traditional occupational hygiene principles. It was identified that inmates usually work for shorter shift durations, ranging from 2 to 6 hours per day, instead of the conventional 8-hour workday or 40-hour workweek. This phenomenon has led to some challenges during exposure measurements, particularly with regards to sampling durations, results interpretation and reporting for compliance purposes.

In occupational hygiene, the principle of "time-weighted average" (TWA) is applied to exposure levels to ensure that results can be compared to occupational exposure limits set over a referenced time period, which is eight hours in most instances. Good occupational hygiene practice requires full-shift sampling where possible, to obtain an accurate estimation of an employee's exposure. Another challenge with regards to hazardous chemical substances and related to the shortened sampling duration, was obtaining a sufficient amount of the contaminant in question on the applicable sampling media in order to be analysed reliably by an accredited testing laboratory.

Correctional facility environments can turn violent and as such the safety of occupational hygiene professionals when conducting exposure assessments at the correctional centres is always top priority. Therefore, safety considerations had to be factored in when selecting the measurement strategy so that personal safety of staff is not compromised.

The NIOH Occupational Hygiene Section is registered with the Department of Employment and Labour (AIA Certificate No. OH0079 – CI 042) and accredited by SANAS for ISO 17020.

For more information regarding occupational hygiene services, please contact :
Mrs Jeanneth Manganyi
011 712 6406 | JeannethM@nioh.ac.za

Noise measurements being conducted at the Boiler Room by Ibrahim O' Elimi

THE IMPORTANCE OF THE BIOBANK IN HEALTHCARE ADVANCEMENT IN SOUTH AFRICA

The National Health Laboratory Service (NHLS) Biobank was established to mitigate the growing burden of communicable and non-communicable diseases in South Africa and across the world.

The main purpose of the National Biobank is to manage, store and secure biomaterial collections and data for research purposes. The National Biobank is unique because it constitutes multiple components of biobanking including cancer, cell culture, genetics, molecular biology and nucleic acid storage histology and cytology. The ultimate objective of the Biobank is to enable research studies with statistically significant sample sizes within reasonable time frames, and to enhance preservation and innovation.

Currently, the biobank has over 1, 2 million samples and a capacity of 4 million samples.
The storage of samples in the biobank allows researchers to carry out their work when they are ready and with the right equipment. The stored samples for laboratory QC allows for future referenced samples for diagnosis. The research, QC and diagnosis quality is as good as the quality of your sample used.

Quality in Biobanking

The NHLS Biobank is the only one of its kind in South Africa and Africa that has a ISO9001 Certification. Internationally, there are less than 10 Biobanks that have this crucial certification.

The National Biobank is a member of different international Biobanking Societies and it participates in creating standards and processes for biobanks globally.

Biobanking with Community

The NHLS Biobank carries out community engagements on Biobanking and exhibitions from time to time when researchers are available and presentations can be done. The Biobank also hosts local and international vistors who come and view the Biobank's work processes.

You can view the NHLS Biobank website here:
www.nationalbiobank.nhls.ac.za

For more information regarding Biobank services, contact :
Mr Bonginkosi Duma 011 712 6521 | BonginkosiD@nioh.ac.za

Biobank Liquid Nitrogen tanks store specimen at -156 degree Celsius

The new facility has the capacity to store approximately four million samples

Teaching & Training

The training offered by the NIOH strives to promote development of the work environment, work communities and organizations, to enhance management of changes, and to further occupational health and expertise in these issues at workplaces. In the training sector, our goals with regard to impact are: a healthy and safe work environment; a healthy worker whose work ability is good; a work community that supports health and well-being. In this issue we look at the knowledge exchange and capacity building activities and initiatives undertaken by NIOH together with stakeholders and partners.

TRAINING CONDUCTED

Inspectors Training in Occupational Health and Hygiene - Mozambique

In an effort to build and strengthen capacity in occupational health and safety (OHS) in the African region, and in particular the sub-Saharan region, the Occupational Hygiene Section took part in a one-week training programme of Mozambique OHS inspectors and SHE officials. This training was was organised by the NEPAD Agency in Maputo, Mozambique. The training was conducted by Mr Gabriel Mizan from the NIOH Occupational Hygiene Section and the primary focus was on capacity building related to health risk assessment, workplace control and the use of occupational hygiene monitoring equipment.

The training programme included topics such as: principles of occupational health risk assessment, a practical session on the use of some environmental and occupational health monitoring equipment, legal framework and dealing with vulnerable workers. The programme also included a day visit to a nearby quarry to observe OHS practices and test the monitoring equipment in the field. The objective of this training was to provide OHS inspectors and SHE officials from the Mozambique Departments of health, labour and mining with some tools to be able to carry out effective occupational health and safety inspections and audits of workplaces and to carry out basic measurement of occupational stressors. 30 delegates from the ministries of health, labour, and mining attended this training and feedback received indicated that the training was very beneficial. Many participants expressed the need for additional training on specific topics in the field of occupational hygiene.

For more information on this training or to have a similar training conducted at your workplace contact:

Mr. Gabriel Mizan 011 712 6457 | GabrielM@nioh.ac.za

Day visit by participants to a quarry in Mozambique

Workshop on Actions for Protecting and Promoting the Safety and Health of Workers in the Informal Economy.

The NIOH co-hosted with the World Health Organization a workshop entitled "Actions for protecting and promoting the safety and health of workers in the informal economy" at the OSHAfrica Conference, Johannesburg, 18th September. The workshop was also supported by the International Labour Organisation. The main objective was to learn about which policies effectively protect and promote the safety and health of workers in the informal economy and which interventions are effective in protecting and promoting the safety and health of workers
in the informal economy.

Speakers included Nisha Naicker from NIOH; Namakau Kaingu, Chair of the Mining Industry Association of Southern Africa, Zambia; Chimwemwe Chamdimba, Principal Policy Specialist, New Economic Partnership for Africa's Development (NEPAD), African Union, South Africa; Charles Akong, Technical Officer, Public Health and Environment, WHO/AFRO, Congo and Franklin Muchiri, ILO, Geneva. Actions were put forward which for inclusion in a global strategy which will enable countries to improve universal health coverage and working conditions which should be informed by informal economy worker communities themselves.

For more information contact Dr Nisha Naicker:
011 712 6436 | NishaN@nioh.ac.za

Participants networking at the RWW Workshop

Reclaimed Water Workshop

The NIOH Waterborne Pathogen Unit hosted the 2nd Reclaimed Water & Occupational Health Risks Workshop on 25 July at the NHLS Sandringham, PRF Auditorium. The workshop aimed at developing a body of knowledge on water reuse in South Africa particularly with regards to the potential occupational health risks associated with the use of reclaimed water in different industries including but not limited to agriculture, mining, and power stations. A range of topics including water reuse status in South Africa, emerging contaminants, antibiotic resistance, microbiological water quality monitoring, guidelines & standards, and research collaborations were explored through presentations from leading experts and professionals.

The workshop brought together a total of 61 external participants representing various sectors such as municipalities, water utilities, industry, solution providers, researchers and academia.

For more information on this workshop contact :
Dr Annancietar Gomba from the
Waterborne Pathogens Unit :
011 712 6404 | NoncyG@nioh.ac.za

Participants networking at the RWW Workshop

OHS Workshops for Golf Caddies

The NIOH Epidemiology & Surveillance Section has been involved in a project aimed at assessing the working conditions and health outcomes of caddies working in golf courses in the City of Johannesburg. Golf caddies are informal workers and have very little control of hazardous exposures in their working environment. Thus, they generally have a higher health risk profile compared to formal economy workers. This is the first study in South Africa that aimed to assess working conditions and health outcomes of caddies and non-caddy staff in selected Johannesburg golf courses.

In August this year, the Epidemiology and Surveillance Section conducted a workshop for Golf Caddies. These workshops were developed to empower caddies in terms of occupational health and to communicate the outcomes of the NIOH working conditions and health outcomes survey. The main objective was to also create an open forum to discuss the areas of concern emerging from the survey. To date six workshops have been conducted with a positive response from both caddies and golf course management.

To learn more about the project visit the NIOH website at:
http://www.nioh.ac.za/working-conditions-and-health-outcomes-of-caddies-working-in-golf-courses-in-the-city-of-johannesburg/

To read the report detailing key findings and recommendations visit:
http://www.nioh.ac.za/wp-content/uploads/2019/05/Caddy-Report-Approved-Final.pdf

Caddies attending the workshop on OHS

Fieldworkers conducting health screening tests

Golf Caddies at work

CAPACITY DEVELOPMENT

UNIVERSITY CURRICULUM DEVELOPMENT

Representatives from the NIOH Occupational Hygiene Section attended a two-day Occupational and Environmental Health Curriculum Development Workshop facilitated by staff from the Department of Physiology and Environmental Health, University of Limpopo (UL). The NIOH was invited, among other stakeholders, including an Associate professor from Brigham Young University (USA), to give input and advisory support towards the building of a unique 4-year degree programme that will attract aspiring students to the field of occupational hygiene. The NIOH is highly regarded as a potential future employer for graduates from this programme. The workshop took place at Park Inn, Polokwane, Limpopo Province on 22 and 23 July 2019.

Capacity Development UL

NEW PARTNERSHIP FOR AFRICA'S DEVELOPMENT (AU-NEPAD)

The primary focus of the MoU between NIOH and NEPAD aims to build and strengthen capacity in OHS in the African region, and particularly in the Sub Saharan region. The detailed work plan that emanated from the MoU outlines the agreement to cooperate in the achievement of common objectives, which include the contribution to improve health of Africa's labour force for the economic development and social progress of African countries and regional integration of the continent.

NEPAD
TRANSFORMING AFRICA
African Union Development Agency (AUDA-NEPAD)

UPCOMING EVENTS

NIOH RESEARCH FORUM

The NIOH Research Forum is held monthly and is to promote the research of the Institute. The event is an hour long, showcasing two research projects. The upcoming meetings will be on the 16 October and 20 November 2019 from 10:00 – 11:00.

If you would like to attend kindly RSVP to: NtebogengK@nioh.ac.za

WEBSTER DAY

The NIOH will be hosting its biennial Webster Day seminar on 7 November 2019. The Webster Day serves as a platform to discuss current topics related to occupational health and safety; and to profile relevant innovative research in South Africa. This year, the theme addresses the Changing World of Work and some of the new challenges that employees and employers face in the 21st century, and the role of the NIOH in this changing landscape.

To RSVP for the event email MelissaV@nioh.ac.za

AMNIS DAY

The NIOH will host a workshop to be presented by Luminex on 8th November 2019, from 08:30 – 16:00. The event is planned as a full day course with 2 sessions, i.e. lectures in the morning and hands-on training in the afternoon. The lectures will showcase the AMNIS imaging cytometry capabilities for cellular visualization, applications in the toxicology world, as well as non-fluorescent particle tracking (related to nanoparticles). The afternoon wet-lab session will focus on AMNIS Data Analysis.

To RSVP to the event email NatashaS@nioh.ac.za or jwalters@luminexcorp.com by 31 October

LUNG FUNCTION TEST INTERPRETATION WORKSHOP FOR OMPS

The NIOH will be hosting one day Lung function tests interpretation workshop for occupational medical practitioners on the 28th of November 2019. This workshop provides an opportunity for the OMPs to hone their skills of interpretation and decision making based on lung function tests. Attendees will benefit from gaining skills to independently identify features of asthma from lung function tests, and better understand use and interpretation methacholine challenge tests as a diagnostic specialised test.

To express your interest in this workshop email: CynthiaD@nioh.ac.za by 28 October 2019

ANALYSIS AND INTERPRETATION OF ROUTINE SURVEILLANCE DATA TO IMPROVE OCCUPATIONAL HEALTH AND SAFETY

The NIOH will be hosting a three day workshop in February 2020. This surveillance data analysis workshop will provide practical training in the analysis, evaluation and interpretation of surveillance data. This workshop will allow all health and safety professionals along with HR practitioners to analyze and produce meaningful reports using all routine data collected in their workplaces to the fullest. Surveillance data can be used to improve health and safety, productivity and profitability.

To learn more about the workshop contact:

More info regarding the above-mentioned upcoming events will be posted on our website: www.nioh.ac.za/events

Health Calendar Days

The NIOH observes many national health calendar days in addition to international days as set out by the United Nations (UN) with the aim of highlighting workplace interventions that could be made.

PAST AWARENESS DAYS

- ### World Environmental Health Day - 26 September

  Environmental Health Day addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. The day is targeted towards preventing disease and creating health-supportive environments. The theme for 2019 is "Climate change challenges, Time for Global Environmental Health to Act in Unison". The NIOH encourages all workplaces to be aware of the pollutants and emissions they generate that may have possible negative health effects on workers and surrounding communities at large.

UPCOMING AWARENESS DAYS

- ### Mental Health Awareness Day - 10 October

  World Mental Health Day is commemorated on 10 October every year, with the purpose of creating awareness of mental health issues globally and mobilising efforts in support of mental health. The Day provides an opportunity for all stakeholders working on mental health issues to talk about their work, and what more needs to be done to make mental health care a priority for people worldwide. Efforts are also aimed at attracting investment support to improve treatment of mental health conditions. This year's focus is on suicide prevention and as a World Health Organization (WHO) Collaborating Centre, the NIOH supports fully the initiatives of the WHO to reduce stigma associated with suicide, improve awareness of the significance of suicide as a global public health problem and improve knowledge about what can be done to prevent suicide.

- ### Lead Poisoning Prevention Week - 20-26 October

  In South Africa, lead exposure is estimated to account for 0.6% of the global burden of disease, the highest burden in developing regions. Childhood lead exposure is estimated to contribute to about 600,000 new cases of children with intellectual disabilities every year. However, lead poisoning is entirely preventable. Despite wide recognition of this problem and many countries having taken action, exposure to lead, particularly in childhood, remains of key concern to health care providers and public health officials worldwide. Paints containing high levels of lead are still widely available and used in many countries for decorative purposes, although good substitutes without lead are available. This is an opportunity to mobilise political and social commitment for further progress. The elimination of lead in paint will not only reduce the exposure of lead to children but also adult employees in the painting, construction (demolition), waste sorting and paint manufacturing industries. Therefore, the phasing-out of lead is excellent news to the NIOH, which is concerned with exposures to hazardous substances among workers, especially the exposure to lead among painters in the informal sector. The NIOH, therefore, urges South African authorities to cooperate and participate in the Global Alliance to Eliminate Lead Paint (GAELP) in order to eliminate lead in paint, and pledges its support in raising awareness on the risks of lead in paint among manufacturers, workers, and the general population.

- ### World AIDS Day - 1 December

  Each year on December 1st World AIDS Day is commemorated. The day is an opportunity for every community to unite in the fight against HIV, show support for people living with HIV and remember those who have died. The theme for 2019 is 'It is my right to know my status; Prevention is my responsibility' and the slogan, 'Let Our Actions Count!'. Workplaces can assist by providing a nurturing, stigma-free environment for all employees and ensuring that there is an EAP program in place.

Awards & Recognition

ACHIEVEMENTS

- Mr Thabang Duba received an award for best poster presentation at the Pathred Congress 2019 in the Microbiology discipline.
- Professor M Gulumian was the recipient of the NRF Incentive Fund.
- Dr Volmink was appointed as an examiner in the 2020 South African College of Occupational Medicine examination.

QUALITY ASSURANCE

The NIOH Occupational Hygiene Section was audited by the Department of Employment and Labour following the assessment by SANAS. The Section has been recommended for the renewal of the Approved Inspection Authority (AIA) registration on 19 August 2019.

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH

Division of the National Health Laboratory Service

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